Training in Planning, Monitoring and Evaluation for Agricultural Research Management

Manual 3
Monitoring

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1995

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Reproduction

Send us your ideas

Training materials such as these are not finished products but work in progress. They can always be improved. Since we hope to revise them in future, ***the authors and ISNAR would appreciate receiving your comments and suggestions for improving them***. We would also be interested in learning about your experiences (positive and negative!) using these materials in training and in institutional-change processes.

Manual 3
Monitoring in Agricultural Research Management

IBTA
Bolivian Institute for Agricultural Technology, Bolivia

INIA
National Institute for Agricultural Research, Uruguay

INTA
National Institute for Agricultural Technology, Argentina

MAG
Ministry of Agriculture and Livestock, Costa Rica

1995

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Contents

Preface

During the ISNAR project "Strengthening Agricultural Research Management in Latin America and the Caribbean" a team of individuals representing national, regional, and international organizations produced several publications and training materials on planning, monitoring, and evaluation (PM&E) for agricultural research institutions in Latin America and the Caribbean.

These materials were designed to:

- support learning and training courses and workshops on PM&E;
- facilitate the diffusion of concepts, methods and tools for improving PM&E in the region and elsewhere.

Three types of materials were developed: reference books, training manuals, and training manuals. The training *manuals* are intended for course and workshop *participants*; the training *modules* are to be used by *instructors*. In this sense, the manuals and modules are complementary. The manuals present the training objectives and essential subject matter. In the modules, these components are complemented with special sections for instructors, including exercises, transparencies, and technical annexes. Instructors and course participants who want additional information about the topics discussed in the materials can turn to the project's reference books or to the many references in the course material.

We hope that managers and trainers working in agricultural research will find these materials useful. We hope they will not only distribute them in their institutions but also apply the concepts and tools discussed.

Acknowledgments

The authors would like to express their thanks to the various individuals and institutions that made it possible to produce this training module on monitoring in agricultural research management.

We would like to thank Christian Bonte-Friedheim and Gustavo Nores, Directors General of ISNAR and CIAT, for establishing the inter-center collaboration that facilitated the production of these training materials. We would like to give special thanks to Douglas Horton of ISNAR for his leadership in the project and for giving us the opportunity to participate in it. We are indebted to Juan Cheaz for the efficient arrangements he made for project events and for his dedication and many contributions during preparation of the training materials.

We are thankful to the Inter-American Development Bank (IDB), the International Development Research Centre (IDRC), the Swiss Development Cooperation (SDC), the Technical Centre for Agricultural and Rural Cooperation (CTA), the Government of Spain, and ISNAR for providing the necessary funds for preparing and publishing this module.

We would like to thank Gerardo Häbich, Associate Director for Institutional Relations of CIAT, for the support and hospitality that he arranged for us at CIAT. Vicente Zapata, Train-the-Trainers Project Coordinator, and the entire team of CIAT's Training Materials Unit guided and supported us in our development as instructors and in preparing this training module. The skill and patience of the CIAT team throughout the numerous revisions of this module are much appreciated. In particular, Florencia Satizabal demonstrated a high degree of professionalism and dedication and helped us throughout the complex and tedious process of preparing the text and supporting materials. We would also like to thank Flora Stella de Lozada, who ably transcribed the initial materials; Juan Carlos Londoño for his numerous and invaluable contributions to the design and production of the final module and transparencies.

Finally, we would like to express our gratitude to our own institutions, which kindly relieved us from our normal duties to allow us to participate in the various activities in this project, to develop our training skills, and to prepare these training materials.

Flowchart for Manual 3

Terminal objective

✔ Formulate a proposal for strengthening monitoring of agricultural research in an organization

Sequence 1

A Framework for Monitoring Agricultural Research

Objectives

✔ Determine the scope of a monitoring system
✔ Judge the effectiveness of a monitoring system

Sequence 2

The Project as a PM&E Tool

Objective

✔ Identify elements for project monitoring

Sequence 3

Monitoring Instruments

Objective

✔ Critically analyze progress reports, internal reviews and project databases

Introduction to Manual 3

The function of agricultural research monitoring is to provide useful information on work in progress for management and accountability purposes. Basically, monitoring is a participatory and decentralized analysis of agricultural research in progress; in relation to its context, objectives, expected results, and allocated resources. Monitoring is conducted to foresee deviations, problems, and opportunities; to guide the process; and to train and provide backup for the researchers, administrators, managers, and board members of an institution, by providing information for adequate and timely decision making at each level of the organization.

This monitoring assumes not only a set of concepts, methods, and techniques, but also an attitude that has important implications for the institutional culture.

Monitoring is a part of an integral planning and evaluation process (PM&E). In this sense, this manual is part of a series oriented toward integral training in PM&E for managing agricultural research. Nonetheless, it has been designed in such a way that it can also be used to satisfy specific training needs in agricultural research monitoring.
To construct the basic logic of this manual, the CIPP model has been used, see Figure 1. (Mulholland, 1993). First, an analysis is made of the **Context**, dealing with the status of agricultural research monitoring in the region. As **Input,** participants are given a conceptual framework for monitoring, with special emphasis on the strategic approach for research management, and on the scope and effectiveness of a monitoring system. For the **Process**, emphasis is put on the project as a level of analysis, even though that is provided can be applied to other programming levels.

The process includes the management cycle and the logical framework as tools for formulating projects that facilitate subsequent monitoring. A detailed analysis is made of three relevant procedural instruments: progress reports, internal reviews, and project databases. The main **product** expected in developing the manual is that participants should be able to elaborate proposals for strengthening and improving the effectiveness of the monitoring system in their institutions.

From the point of view of the learning strategy, the manual has been divided into three instructional sequences. **Sequence 1** describes the status of monitoring in the region on the basis of 13 case

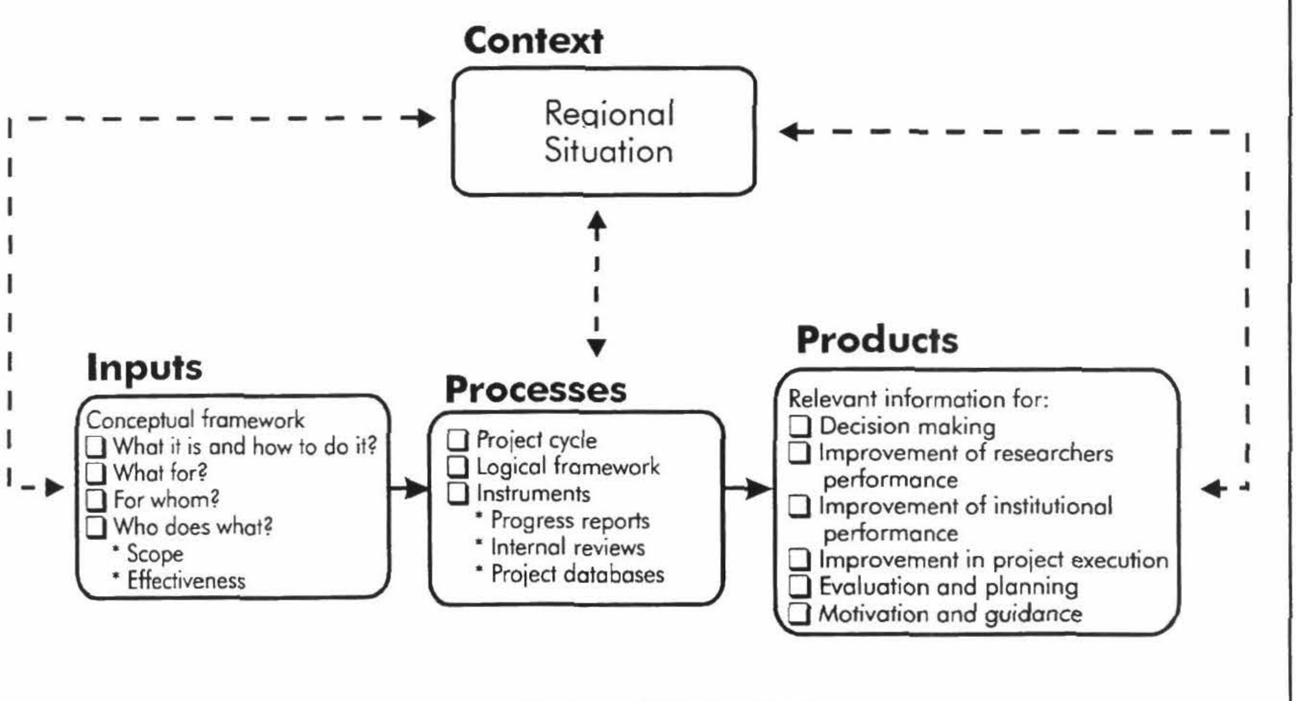

Figure 1. Monitoring within the CIPP approach

studies conducted in 1992 (Novoa and Horton, 1994). A conceptual framework is provided for monitoring agricultural research. It explains what monitoring is, why it is conducted, for whom, the information it puts together, and the way this information circulates. Criteria are specified for analyzing the scope of a monitoring system and elements are provided for organizing the system and analyzing its effectiveness. The main criterion of effectiveness is the usefulness of the information collected, generated, and disseminated. This information must support decision making, research documentation, and the orientation of researchers.

Sequence 2 deals with formulating the research project, since this is the key requirement of agricultural research management. Hovewer, the subject matter is applicable at the program level. At the operational level, the project links PM&E. The following is an explanation of what a project is and an analysis of the project cycle. The following phases can be distinguished: problem identification; the preparation of a proposal; resource revision, approval, and assignment; implementation and monitoring; and the evaluation and dissemination of results. As adequate monitoring of the project can only be done if it has been well formulated, an analysis is made of the logic behind a project during its formulation phase. The logical framework is introduced as an instrument to facilitate the project's coherence analysis and subsequent monitoring and evaluation.

Sequence 3 makes an in-depth analysis of three of the main monitoring instruments: internal reviews, progress reports and project databases. The first two are used frequently in monitoring programs, projects, and activities, in order to provide information at the different management levels. Even though project databases are relatively new instruments in monitoring, several institutions want to incorporate them in their organization.

The manual ends with an exercise for participants on the preparation of proposals for strengthening the monitoring system.

Sequence 1. A Framework for Monitoring in Agricultural Research

Page

Flowchart for Sequence 1

A Framework for Monitoring in Agricultural Research

Objectives

✔ Determine the scope of a monitoring system in relation to the decision-making levels and the types of information
✔ Assess the effectiveness of a monitoring system, using principles and criteria specified in this module

Contents

- Present situation of monitoring in the region
- Conceptual framework for monitoring agricultural research
- Design and implementation of a monitoring system

Summary

Introduction

Monitoring is a continuous process involving observation, supervision, revision, and the documentation of agricultural research activities in relation to needs, objectives, expected results, and the resources allocated for its execution. Formal or informal instruments can be used for monitoring. A good monitoring system is essential for the efficient management of agricultural research.

Monitoring activities are common among the agricultural research organizations in the region; frequently, these take a great deal of time from both scientists and managers. However, in many cases, monitoring is not conducted in an organized and systematic way. Therefore, improvements in the monitoring process can significantly increase its support for decision making as regards on-going work, periodical evaluations, planning future research, and motivating and guiding scientists (see inset with examples of improvements in monitoring processes in the region).

This sequence presents a summary of monitoring experiences in the region and provides concepts and guidelines for systematizing the monitoring process within agricultural research organizations. The application of these concepts and guidelines may increase the efficiency of monitoring results.

The first section describes the status of monitoring in the region, based on 13 case studies conducted in 1992 (Novoa and Horton, 1994). The second section presents several key monitoring concepts and includes criteria for analyzing a monitoring system. The third section identifies the main components of a monitoring system and presents options for organizing the system, and for collecting and managing information. The final section offers criteria for analyzing the effectiveness of a monitoring system. The main criterion identified is the usefulness of the information collected, generated, and processed, in terms of its effective support in decision-making, in documenting research, and in motivating and guiding researchers.

Examples of monitoring in the region

Before its reorganization, the **National Institute for Agricultural Technology (INTA), in Argentina**, had a very centralized structure and all new proposals and progress reports were sent to headquarters to be revised and approved. The revision process was very slow and researchers received no reaction or response for several months (or in some cases never!). Due to delays and lack of feedback, monitoring became a bureaucratic and inoperative process. After its reorganization during the decade of the 80s and the decentralization in decision making, INTA has implemented new and more efficient monitoring mechanisms (such as revising proposal and internal reviews at the level of the research center) (Hogg, 1994).

The **Brazilian Enterprise for Agricultural Research (EMBRAPA)**, operated an information system which included data on research proposals, progress reports, and the final evaluations of all projects carried out in the last 10 years. This was considered an important resource for future evaluations. However, when the information system was to be used for evaluating projects already conducted, it was impossible because the system was specially designed to generate progress reports for external programs, and the computer software used did not allow for any other type of information analyses. After this, a new information system was designed in 1991, with sufficient flexibility to satisfy different internal and external needs (Borges and Horton, 1993).

The recently created **National Institute for Agricultural Research (INIA), in Uruguay**, considers clear definition of research projects and programs as one of its priorities. To facilitate this process, as well as research management and the preparation of reports, INIA is establishing a computerized information system (personal communication).

Present Situation of Monitoring in the Region[1]

Research directors, specialists in organizational development, politicians and development planners have agreed on the importance of improving management and administration in general, and mechanisms for planning, monitoring, and evaluation in particular. During a 1992 workshop in Mexico, strengthening these functions was considered vital for institutional change and modernization, and to guarantee the effectiveness and impact of agricultural research and technology transfer.

PM&E methods and mechanisms designed and adopted in the future must be seen within the context of the region's agricultural sector, based on the patterns and tendencies of regional technological development and on institutional policies promoting these mechanisms. In fact, one of the main results of analyzing case studies and the discussions held at the meeting in Mexico, was the diversity of experiences highlighted in the institutions evaluated, the complexity of technical decisions and their relationship with all the resources allocated for carrying out decisions, the magnitude and type of services provided, the diversity of the clientele, and the heterogeneity of its actions (Novoa and Horton, 1994).

1/ This Section is based on Novoa and Horton, 1994.

It is important to learn from these experiences. ICTA's practical and simple approaches in Guatemala, are focused on direct work with producers in their farms. Other larger institutions, which have greater experience in the use of formal PM&E models and methods, would like to incorporate these valuable aspects of farmer participation. The cases of the National Coffee Research Center (CENICAFE) in Colombia and of Argentina's INTA were outstanding in the way they tailored their activities to their audiences and were, therefore, able to meet the demands and expectations of specific clients.

The following are the main common characteristics of monitoring in agricultural research, which reflect the richness of the experiences analyzed.

Underrated function of monitoring

The function of monitoring in agricultural research management has been underrated, both in essays and conceptual models on the subject, and in its applications. While planning and evaluation have been associated with conceptual models, monitoring has not. This function has been considered as part of the execution phase of plans and has often been seen as **control** or **on-going evaluation.**

Learning on the job

A large number of people working on monitoring in Latin America and the Caribbean have acquired specialized skills through practice and learning by doing. Very few institutions in the region have technical teams with formal training in the general area of monitoring, and even fewer in the specific field of agricultural research monitoring.

Purposes of monitoring

Monitoring has had two main purposes in the institutions studied: (a) to collect information that will enable on-going decision making regarding activities, projects, programs, and research centers, and (b) to document input use and activities carried out for accountability requirements. Monitoring activities are concentrated at the operational level of projects and programs. As an essentially internal activity, monitoring is used to check how activities are running, how resources are being used, and where intermediate goals are being fulfilled

In a few cases monitoring checks on overall institutional performance, which is generally considered as an aspect of evaluation.

The Agricultural Research Center of Washington State University and EMBRAPA have broader definitions. They identify the main purpose of monitoring as contributing to the execution of activities, projects, or programs, and establishing whether these are productive and meet institutional needs and set objectives. Thus understood, monitoring fulfills the function of **training and supporting** research and not just controlling and verifying its execution. The difference in monitoring in the specific, but complementary, dimensions of **institutional monitoring and research program and project monitoring** is identified by EMBRAPA. This institution has also developed methods and instruments that are relevant to each one.

Monitoring instruments

Practically all institutions monitor established plans and programs at some point during their execution. Most methods and instruments used for monitoring are informal and are only partially systematized. The more broadly used instruments are field visits and reports prepared by researchers. Some organizations use data bases, periodical reports, and budget monitoring for project and programs. Experimental stations and regional research centers also use field visits, budget monitoring, and written reports. At the institutional level, the more widely used monitoring instruments are internal and external reviews, administrative meetings, and periodical reports, such as annual reports.

The monitoring instruments more widely used in Latin America and the Caribbean have been:

- *Field visits*
- *Progress reports*
- *Internal reviews*
- *External reviews*

Scientists, managers, and research project and program leaders usually participate in internal reviews. Specialists or technical groups invited from other institutions generally participate in external reviews. External reviews are primarily used for monitoring projects implemented with external funds, for the overall revision of research centers and organizations, and when institutions phase in restructuring processes and new scenarios for activities (such as changes in their mandate or budget).

Information for monitoring

Monitoring activities frequently demand a considerable amount of time on the part of researchers and intermediate level management. Often, activities are not conducted regularly and those that are conducted, are considered "bureaucratic" because the information obtained is not reflected in decision making. Sometimes monitoring activities generate large volumes of information that exceed the institution's analysis capacity and are, therefore, never used. Recently, efforts have been made to design and put into practice specialized data bases (as is the case of INTA, in Argentina, and the Colombian Institute of Agriculture and Livestock in Colombia). However, these have not yet been completely systematized, and institutional mechanisms are lacking which could profit from their full potential.

Information generated from monitoring is generally found in restricted access and consultation media, such as internal reports, but not in journals, scientific articles and other publications.

Summary of experiences

Some organizations in the region have highly-developed monitoring systems. Such is the case of INTA in Argentina, EMBRAPA in Brazil and the Caribbean Agricultural Research and Development Institute (CARDI). These organizations have elaborate systems for collecting information about on-going activities, specialized data bases, and computerized information management systems. The remaining cases have weaknesses in their information systems which limit the monitoring role in decision making, in the execution levels of projects, programs, and research centers, and in the higher management organisms of their institutions, as in documenting research activities and results. This is explicitly recognized by most institutions, which are making an effort to improve their information systems.

An important difference was found in the case studies between monitoring systems in the United States and Canada and those in Latin America and the Caribbean. Institutions in the U.S. and in Canada—characterized as being very efficient—did not have highly developed systems or procedures for planning and evaluation, but did have well organized and systematized monitoring systems with a broad participation by producers.

Overall, monitoring is more organized and systematized in the case of projects financed by external agencies (national or international). Research financed with its own resources, or with the institution's core budget, normally does not monitor activities or results.

Another important pattern observed is that participation of producers in decision making within the organization requires good monitoring of activities and their results. Some examples are INTA (Argentina), CENICAFE (Colombia), Washington State (USA) and Lethbridge (Canada), where producers have representatives at the decision-making level, and frequently participate in internal and external reviews of activities and their results.

Conceptual Framework for Monitoring Agricultural Research

Monitoring concepts

Monitoring should be a part of an integral planning and evaluation system (PM&E). The process must be developed with the interaction among its components, and its methodological and operational articulation in mind. The design of instruments must be consistent with planning and evaluation processes. This the reason why sometimes it is not easy to distinguish monitoring from evaluation or from planning, since monitoring also provides information for evaluating results and makes recommendations for reassigning resources and redefining priorities.

Monitoring is a process of continuous observation, supervision, revision, and documentation of research activities in relation to its context, objectives, expected results, and resources allocated for its execution.

The main end of monitoring is supporting **decision making** concerning an institution's on-going activities, and advising scientists and administrators about problems and deviations from objectives and from expected results. Monitoring is necessary for quality control and also for identifying and taking advantage of opportunities not anticipated in the original research design.

In addition to supporting decisionmaking concerning an institution's on-going activities, a monitoring system must provide a **record of information** on research objectives as related to needs, the methodologies and designs used, the resources used, the activities conducted, and the results achieved. This record should facilitate the preparation of reports for internal and external use. It should also contribute to an "institutional memory" of the organization, and thus supply information for evaluation and for planning future research.

A good monitoring system includes six essential components (Figure 2):
1. Collection of information.
2. Processing and analysis of information.
3. Information storage.
4. Production and distribution of reports.
5. Decision making based on information collected.
6. Actions.

The first four processes (information collection, processing and storage, and production of reports) are the typical components of an information system. Decision making and implementation of activities are beyond the domain of an information system, but are essential parts of a monitoring system and constitute its justification. Without decisions and activities based on the information generated, the monitoring system becomes a mechanical and bureaucratic exercise of little use in agricultural research management.

The design and implementation of these seven processes are dealt with in detail later in this document.

The concepts discussed to this point are necessary but are not sufficient to ensure an effective monitoring system or to contribute to institutional sustainability or to the quality and social relevance of the research being conducted. To achieve these ends, attitudes and intentions are required which conceive of monitoring as "an institutional process of permanent learning, and internal educational process involving all levels of the organization" (Ayres, 1993).

Taking this into consideration, the following definition of monitoring which complements the one given at the beginning of this section:

Monitoring is a participative and decentralized analysis process of research advances in relation to its context, objectives, expected results and resources allocated, to foresee deviations, problems and opportunities. Monitoring should support researchers, administrators, managers, and directors, providing them with elements for making adequate decisions at each level of the organization.

Uses of monitoring

All management levels should be involved in monitoring. As a mechanism, monitoring allows an institution to ensure the fulfillment of plans and orients all its members towards common and shared objectives.

Monitoring has three main uses in agricultural research:
- Supporting decision making concerning on-going research, by **detecting problems and opportunities and by controlling quality.**
- Documentation of research and its results backs up the **preparation of reports,** and the **evaluation** and **planning** of future research.
- **Motivating and guiding** researchers by promoting self-management and contributions from supervisors and colleagues to progress reports. The credibility and motivational force generated by monitoring activities are influenced by the clearness and continuity of its processes, the genuine participation of beneficiaries, and the flexibility and agility required to acquire information from different sources and have it reach its destination on time to back up adequate decision making at the different levels of the organization (from the researcher to manager).

In designing and operating a monitoring system, these three uses must be kept in mind to avoid them from becoming bureaucratic, mechanical, and time consuming without contributing to good performance by researchers and research programs.

The following parts will analyze the use of a monitoring system.

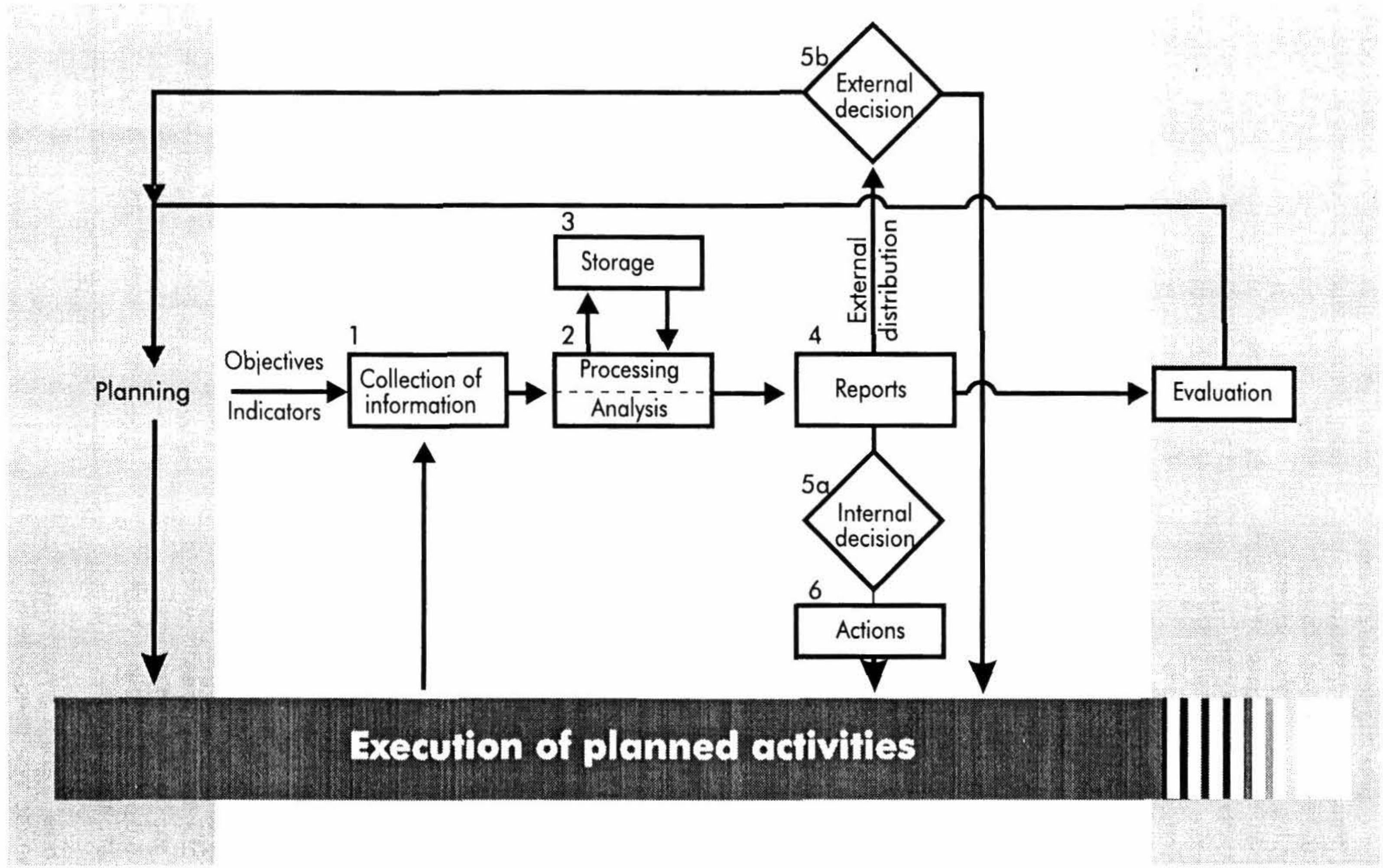

Figure 2. **Components of a monitoring system and their relationship with planning and evaluation**

Detection of problems and opportunities. No matter how good a plan is, it is impossible to anticipate or predict all events that can take place during its execution. Thus, the supervision of planned research activities is necessary for detecting and solving the problems that may arise. In some cases, a problem can be solved at the level of execution; for example, if inputs for an experiment do not arrive on time for planting, this problem may be solved by a change in administrative procedures. In other cases, monitoring of problem can indicate that plans are not realistic and that adjustments are required; for example, if it is impossible to finance a project, cancelling it and reassigning human resources must be considered.

During the execution of activities it is not only problems that arise; unexpected opportunities can occur too. For example, during the process of on-farm selection of new potato varieties resistant to cold, clones were found which were preferred by producers for other reasons such as cooking quality. In this case, instead of discarding those clones (because they do not satisfy the criteria of the original experiment), another activity can be initiated to investigate producers' criteria in selecting new varieties.

A monitoring system must be **flexible and efficient** in detecting problems and opportunities. This means that it detects and processes different types of information, and addresses relevant information to scientists and administrators in an adequate format and at the right moment for decision making.

Experience indicates that monitoring is more efficient in identifying problems and opportunities when administrators and scientists interact directly at the site where work is being conducted (for example during a field visit).

Quality control. Monitoring is essential to insure good scientific quality control of research activities. Reviews, by peers, of research proposals, visits to experimental fields, and internal and external reviews of research projects and programs are useful mechanisms of quality control.

Preparation of reports. Many organizations which do not have an organized monitoring system, require much effort and time from scientists and administrators in preparing reports required by external agencies. On the other hand, organizations with a good monitoring system (with brief but well structured reports from researchers to project, program or research center leaders) can easily prepare reports on research activities and results.

Evaluations. One of the main problems in evaluating agricultural research is the lack of relevant and trustworhty information on research activities and its results. Therefore, the type of information that is to be needed in evaluations must be anticipated and collected as a routine part of the monitoring system.

Planning. It is not just evaluations, but also plans which are commonly made with a great lack of relevant and trustworthy information. For example, priorities are frequently set without information on the current use of resources. This wastes a researcher's time.

Good planning requires a good information base on the context of the research, its objectives, on-going activities, and the results achieved. A great part of this information must come from the monitoring system.

Motivation and guidelines. Monitoring is commonly interpreted as a bureaucratic endeavor to satisfy requirements such as preparing administrative reports. But it can also be an important source of motivation and guidelines for scientists. Experience shows that preparation of substantial (not administrative) reports along with interaction between researchers and users of research results are vital mechanisms for motivating and guiding researchers. Therefore, these practices are regularly used by modern private firms conducting applied research.

Users of monitoring

A monitoring system is effective if it can generate useful information that contributes to the efficiency of research programs. Within an agricultural research organization, the users of the monitoring system are scientists and anyone who has responsibilities in the hierarchy of decision making.

Users of monitoring

- *Researchers*
- *Program and project leaders*
- *Managers*
- *Funding agencies*

The monitoring system must generate information to support these groups in making technical and administrative decisions.

It must also generate useful information for external priority groups participating in the technology generation and transfer process. (Figure 3).

These groups may include agricultural and planning ministries, extension programs, producers, universities, non-governmental organizations, and donors.

Group requirements vary both in information content, and in the format in which the information is presented and in the frequency it needs to be delivered. Due to report production and distribution costs, priorities must be set in relation to the users and the type of reports.

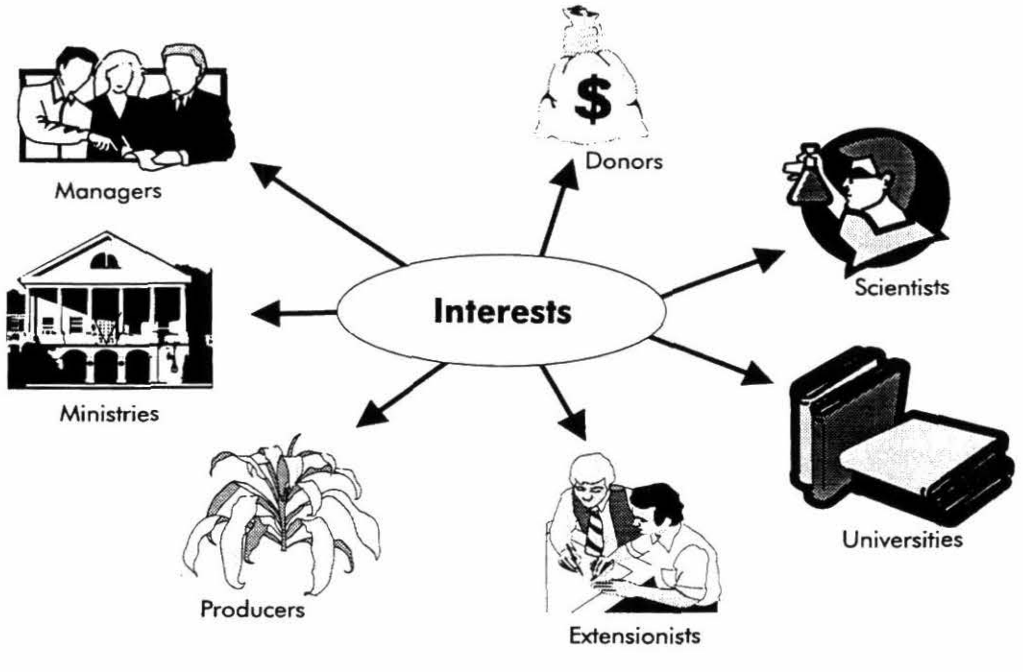

Figure 3. Groups interested in information generated by monitoring

Relation to decision-making levels and information needs

Agricultural research institutions have a hierarchical structure with different **decision-making levels**. Monitoring in a research institution can, and must, have access to administrative and research processes. In the first case, emphasis is placed on aspects related to the logistics and supply of services. In the second case, emphasis is placed on the utilization of available resources. A visual example of this concept is the pyramid of programmatic research decision-making levels (Figure 4), which reflects the fact that more people and activities are involved in the lower than in the upper levels of the organization.

Monitoring must provide relevant information for decision making at all levels. The information required depends on the type of decisions made at each level. At the level of the researcher and program leader, detailed, technical information is required on objectives, aspects of activity design (i.e., experimental designs), task implementation, and results. This information is essential for planning, supervising, and evaluating the scientific quality of the work conducted.

The upper levels require more aggregate and synthesized information on research needs, program objectives and components, the allocation and use of resources, and the results and impact of the different research lines. This information is used for planning, supervision, and the evaluation of research institutions.

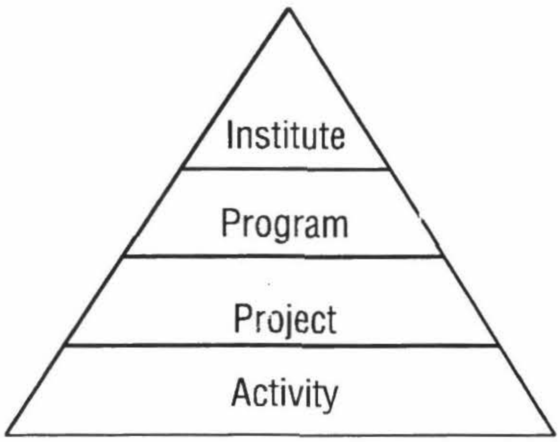

Figure 4. Examples of decision-making levels in an agricultural research organization

Vertical flow of information

Several flows of information are required within a research organization. In the first place, "vertical" flow of information must take place between the different decision-making levels. Figure 5 shows vertical flow of information between different programmatic levels.

Managers need to communicate organizational and program objectives to researchers (top to bottom flow). Then, researchers need to communicate managers information on research proposals, on-going activities, and their results (bottom to top flow). Finally, managers must use the information provided by researchers to make decisions and must communicate these decisions to researchers (feedback).

If decisions are not based on the information delivered and if there is no feedback, researchers soon lose interest in providing information to the monitoring system.

Many organizations have more than one hierarchy of decision-making levels. For example, there may be an **administrative structure** with institutes, regional centers, and experimental stations, and a **programmatic structure** with the program and project levels. In these cases, the monitoring system must address the information required in such a way that it is delivered to each level involved (Figures 4 and 5).

The amount of information is not as important as its relevance and quality. In the fact, delivery of an excessive amount of low quality or irrelevant information for decisions may be highly counter-productive.

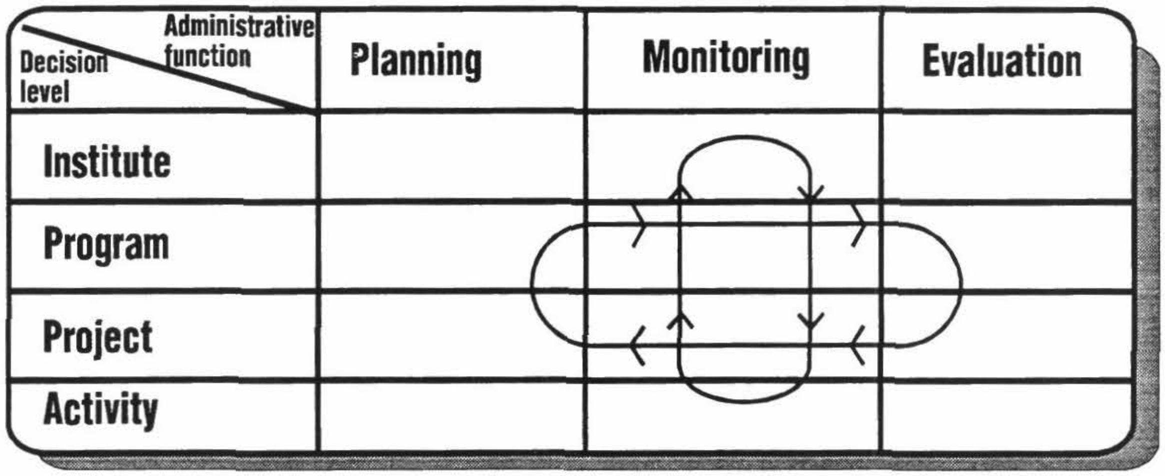

Figure 5. Examples of vertical and horizontal flow of information in a monitoring system

Many monitoring systems fail by delivering excessive amounts of semi-processed information to scientists or managers who do not have the time to analyze and interpret large amounts of information. They need synthesized summaries of situations, critical problems, and alternatives for action. Therefore, the requirements of different users must be analyzed, and concise and appropriate information delivered to each user.

Horizontal flow of information

The "horizontal" flow of information in monitoring, planning and evaluation is very important (Figure 5). Monitoring must start by planning because indicators are defined during this phase for monitoring the use of resources, progress of activities and results obtained. Plans must have appropriate objectives and indicators at each level of decision to serve as monitoring parameters during implementation.

Monitoring can be conceived as a phase of a continuous and iterative cycle in agricultural research management (Figure 6). Therefore, it must be closely linked to planning and evaluation at each different decision-making level.

Information recorded in the monitoring system can also be used as the basis for subsequent evaluations. This requires that information requested by evaluators be anticipated. To anticipate the information required for evaluations, these should be designed during the planning phase to allow for information to be collected and processed during research implementation and supervision.

Types of information

A **comprehensive** monitoring system contains information on four large groups of variables, in a format that is appropriate for making decisions at each decision-making level (Table 1):

- The research **context**, including needs
- **Inputs** for research, including objectives, plans, designs, resources, and foreseen activities
- Execution **processes**, including the use of resources and the activities carried out
- Research **products**, including results and impact on production, economy, social welfare, and environment

These common variables are used in decision making for agricultural research administration, especially in integrated PM&E processes.

Figure 6. Management cycle

Table 1. Examples of the four types of information in a comprehensive monitoring system

The research context • Social, economic, political, technical, and environmental conditions. • Producers and consumers needs. • State of the art of knowledge in the scientific field. • Priorities for research. **Inputs for research** • Objectives. • Strategies. • Plans and designs for studying. • Sequence of activities to be conducted. • Required budget and resources.	**Research processes** • Activities conducted. • Resources used (human, financial, physical). • Administrative procedures used. **Research products** • Results obtained. • Information and technologies generated. • Resulting impact (economic, social, environmental).

Costs and benefits of monitoring

Collecting, processing, analyzing, storing, and disseminating information is expensive. Generating reports for all possible users on all possible variables would be so complicated and expensive that no agricultural research organization could afford it.

Due to costs, **priorities should be set for monitoring.** Resources available must be used in the most efficient way. Only relevant information should be recorded on the most important variables. Concise reports should be presented at the right moment for decision making.

A monitoring system must present scientists and administrators with the **minimum** amount of information required for them to be well informed and able to make sound decisions.

In terms of priorities, it is more feasible and less expensive to organize information on inputs and research processes. Finding and managing information on products is more complex and expensive.

Each organization has to evaluate its needs and possibilities and implement a monitoring system that is feasible and useful. A common strategy is to start by organizing information about on-going activities (information on Inputs and Processes) and—based on the experience acquired—broaden the system to include information on results (information on Products).

Design and Implementation of a Monitoring System

The design and implementation of a monitoring system should not follow fixed models; instead, it must adapt to the institution's conditions, objectives, resources and needs. Nonetheless, it is worth highlighting the fact that decentralized implementation of a monitoring system allows different actors to participate at different institutional levels, contributes the flexibility and agility required to be efficient, supports constant feedback, and increases the possibilities for clients and users to exert social control on the use of resources and on the results obtained.

Though planning, design, and coordination of monitoring may be centralized, implementation should be decentralized.

A decentralized system also brings about an increasing social acknowledgment of the institution and of the usefulness of researchers and managers.

This section analyses seven aspects in the design and implementation of a monitoring system:

- Prerequisites of an effective system
- Priorities for the system.
- System components.
- Instruments for monitoring.
- Organization of monitoring.

- System implementation.
- Indicators of monitoring effectiveness.

Prerequisites of an effective system

Two conditions are required for a monitoring system to be efficient. First, top management must see the system as a priority tool for research administration and decision making. Without the commitment of managers, the system will not be allocated the resources and support required for efficient operation.

The second condition is a planning system that generates clear objectives and measurable indicators, to orient the collection and analysis of information during the monitoring process. Objectives and progress indicators are essential for conducting monitoring. (Strictly speaking, objectives and indicators need not be written, but writing them down has been found very useful in practice.)

Priorities for monitoring

Monitoring a large number of variables is possible but expensive. Priorities should be established in the design of a monitoring system in terms of the type of information to be collected, processed and distributed. Priorities should be established based on different user demands, on costs, and on the feasibility of generating the information requested.

In establishing priorities for information to be collected, the following questions should be answered:

- **Why** is monitoring being conducted?
- **For whom** is monitoring being done?
- **What information is required**?
- **How should this information circulate**?

The person in charge of designing the monitoring system needs to get together with internal groups in the institution, and also with external groups related to agricultural research, to analyze their demands for monitoring information.

Based on this analysis, the institution's directors must determine priorities among the different types of information to be collected, processed and delivered to different users.

In addition to a list of priorities on the type of information to be delivered, the costs and feasibility of generating the information must be analyzed.

Realistic priorities must be established; there is no use for example in trying to generate a series of reports on impact of technology disseminated among producers in the last 10 years if the institution does not have the resources needed to conduct such studies, or to contract them externally.

Components of the system

A monitoring system has six essential components (see again Figure 2):

1. Collection of information
2. Processing and analysis of information
3. Information storage
4. Production and distribution of reports
4. Decision making
5. Actions

In designing a monitoring system, the following five questions should be answered for each of the above components:

- Why is it done?
- What must be done?
- How should it be done?
- For whom is it done?
- Who must do it?

In designing a monitoring system, **the first thing to be done is to decide what reports will be produced and their distribution.** Then proceed with the other components.

Design of reports

As mentioned above, the preparation and distribution of reports must contribute to decision making, to documenting research, and to motivating and guiding scientists. In designing a monitoring system, the types of reports needed to contribute to the achievement of these three objectives must be specified.

The monitoring system must generate two types of reports: periodical and routine reports, and made reports specially requested.
The report contents and format must satisfy readers' interests as well as complying with their criteria and the feasibility of performing the different alternatives proposed.

As a general rule, administrative reports must be designed to satisfy the requirements of the different audiences (government offices and local, national and foreign donors). The design of administrative reports must consider their audience in order to identify common and specific requirements.

Agricultural research institutions have more flexibility regarding the design of their substantial research reports. In this case, the institution can establish its own norms in terms of frequency, content, style, and distribution of reports.

In terms of frequency in distributing information, four types of reports are important: one at the end of each agricultural cycle, one at the end of each experiment or project, one for each internal review, and one for each external review.

Fortunately, the report for the internal review cycle often coincides with that of the agricultural cycle and the same report can meet both needs. Also, the first three types of reports are the basis for preparing external review reports.

Reports must be designed as a function of readers' priority needs. Other scientists, program and research centers leaders, and extensionists are the main readers of reports at the project or experiment level. Therefore, these reports must include detailed information on research objectives, design, activities, and results.

Program, center, or institution reports need not include so many technical details but should rather emphasize the context and justification, for the research, the objectives, and the results expected and achieved. Furthermore, program, center, or institution reports must provide a global view of research.

As an overall rule, **reports must be well-structured and have a clear and short format.** Currently, many reports are hardly any use because they are extremely long or poorly written; they include too many details and lack clear and relevant conclusions.

Collection of information

The information collection, processing, analysis, and storage systems can be designed once the design of reports is complete and the compatibility of reports that the monitoring system must generate and distribute has been assured.

Monitoring systems have a tendency to collect more information than will be needed or used. Therefore, it is important to emphasize that only information required to produce the reports designed should be collected. Monitoring systems can generally increase their efficiency by reducing the amount of information collected.

Once it has been decided what information is needed, different collection sources and methods must be considered. In many cases, information required for monitoring context and products is available from secondary sources or institutional documents. This eliminates the need for collecting primary information. Information already collected must be full taken advantage of to minimize the need for collecting primary information.

Information required for monitoring inputs and processes is produced in the development of agricultural research activities. If possible, this information should be collected, revised, and verified only once.

Before initiating information collection, care must be given to the importance of the information and to the feasibility of using it with the time and resources available. For example, researchers should not be requested to give information on their age, sex, education, specialization, and years of service in the organization if this information is available in the personnel files.

Information analysis and processing

The processing and analysis of information has several possible ends. An important one is **verifying the information collected**. This can be done by preparing lists and tables, summarizing information, confirming it with other sources, and asking original reporters to review the lists and tables used.

Another aim is to **facilitate storage in clear formats** (on paper or in electronic databases).

A third aim is **combining the information with information from several other sources** in order to make analyses. For example, information on experiments conducted during the current year can be put together with that of previous experiments. The results of a working cycle can be compared vis-a-vis initial objectives.

A fourth aim of processing is **conducting analyses** and converting data and information originally collected into more synthesized information to facilitate **arriving at conclusions** and making decisions. For example, information on the use of scientists' time and the use of other resources at the experimental stations can be aggregated at the national level to arrive at conclusions on the use of resources in the different research programs and regions in the country. This information may be valuable for establishing research priorities and evaluating results.

Finally, the fifth aim of information processing is **presenting results in different formats** such as summary tables and graphs. Modern computer software, calculation programs, and data bases help enormously in presenting information graphically to facilitate comprehension, scientific analysis, and administrative decision making.

Decisions on what information to process and how to process it must be made on the basis of reports required and on readers' needs. Information processing and analysis have the tendency to "over-process" information, thus loosing sight of the value of initial information and of users' priority needs. Therefore, the team responsible for information processing must contact final users (those that make decisions) frequently to receive orientation on priority needs.

Information storage

Part of the information generated by the monitoring system must be stored for future use. As in the case of other components of the monitoring system, **information storage must be tailored on the basis of future use**. A common mistake is storing too much information that can neither be found or used when needed. Therefore, information storage must have priorities and be organized on the basis of foreseen uses.

Generally scientists save information on their experiments and programs. **But what worries us are institutional files:** those that are kept at the level of agricultural research programs, centers, or institutions. Often these files are very inadequate and researchers lose valuable information on research conducted when they leave their institutions.

Since the central objective of an agricultural research institution is precisely to conduct research, **good scientific files must be kept.**

The three most important elements of a scientific file are: project proposals, progress reports, and final reports.

The profile must include concise information on research context (justification, previous work, needs) and on plans (objectives, materials and methods, experimental design, activities, required resources, expected results, and monitoring and evaluation parameters). Progress reports must specify activities and results for the period under analysis, in relation to objectives. Final reports must summarize all activities and results in relation to objectives and initial plans, and include an auto-evaluation of the experiment or project. Experimental data must be included in the final report to be useful to future researchers.

Two basic means can be used for filing: traditional files on paper and computerized data bases and spreadsheets. "Project databases" are becoming more popular every day for the computerized filing of research data. Computers offer important advantages for handling and storing information. However, many institutions have had serious problems with information management systems and with information transfer from one computing system to another. Therefore, keeping files on paper with the most important information on research (objectives, design, and outstanding results) is recommended during the implementation phase and while electronic files are being tried out.

Production and distribution of reports

Other reports may be prepared on the basis of project proposals and progress reports, as well as on the basis of reviews and field visits.

Scientists' project proposals and progress reports should be critically assessed and feedback provided. The program co-ordinator plays a key role in this process. The proposals, progress reports, and final reports, as well as those produced in internal meetings and field visits to an experimental station, can serve as the basis for elaborating the unit's annual report. The latter will be distributed and analyzed by the councils and users in the unit's mandate area and elevated to the regional level. The main activities, difficulties, breakthrough and achievements in the region will be synthesized at the regional level. Once approved by decision makers, these will have national scope for elaborating the institutional proceedings.

Having appropriate information at all levels of the organization will facilitate preparing reports according to demands and needs. Each report's contents must be adapted in terms of its principal audience.

Decision making

Eventually, the monitoring process *must* end up in decision making, either within or outside the institution. There are two major types of decisions: implementation decisions, related to conducting on-going research, and planning decisions, addressed at establishing priorities and designing future research.

Decisions must be implemented. Therefore, in making decisions, it is not only the things that need to be changed which must be specified, but also who is responsible for the actions required.

Actions

One of the main ends of a monitoring system is executing actions that improve research implementation. In fact, it is actions which respond to the information provided, which make the investment of time and other resources in the whole monitoring process worthwhile. If the people who provide the information for the monitoring system do not perceive its utilization and value, it is doubtful whether that they can *continue to provide* quality information to the system.

Monitoring instruments

Information can be collected, processed, analyzed, and stored in many ways, and monitoring reports can be presented and distributed in many ways (Table 2). Some instruments used have very specific functions, for example, surveys for collection informat*ion and data* bases for storing this information.

On the contrary, other instruments have multiple uses, for example, internal reviews are useful for collecting and analyzing information by the direct users themselves. This section will briefly address three monitoring instruments widely used in the region: internal reviews, progress reports, and management information systems.

Internal reviews

One of the main advantages of an internal review is the possibility of direct communication among participants coming from different units and decision-making levels of the organization. This "face-to-face" communication is usually more effective than written communication for identifying and solving problems; also it avoids the production and circulation of large amounts of paperwork. On the other hand, the disadvantage of an internal review is that it does not generate the systematic documentation of *the activities* and results produced by an organization, the problems encountered, and the recommendations made for future activities.

For this reason, internal reviews should be combined with the preparation of progress reports

Table 2. Monitoring instruments and levels at which they are organized (Org) and implemented (Imp).

Instruments	Institution		Center		Program		Project	
	Org	Imp	Org	Imp	Org	Imp	Org	Imp
Administration committee	X	X						
Annual programming meetings	X	X	X	X	X	X	X	X*
Internal reviews	X	X	X	X	X	X	X*	X
External reviews	X	X		X				X*
Technical seminars	X	X	X	X	X	X	X	X
Quarterly *or bi-annual* reports	X							X
Annual reportsX	X		X		X		X	
Final reports	X							X
Project banks X	X		X		X		X	
Technical meetings of the Regional Council			X	X				
Field visits			X	X	X	X	X	X

* Generally, these revisions are organized at the project level when the projects concerned have external funding

on projects and programs. A report of presentations, discussions, conclusions, and recommendations made during the review as a whole should also be prepared.

Progress report

Virtually all agricultural research organizations have to generate some kind of annual report on their activities and results. Inside the organization, scientists and heads of their projects, programs, and centers prepare progress reports on their activities. Similarly, many institutions do not prepare annual reports, or simply produce reports that are just a collection of progress reports of experiments and projects. The design of appropriate formats and training in technical writing are useful means for improving reports.

Management information systems

A management information system (MIS) provides research administrators with condensed or summarized information to support decision making. Each administrator has an information system, even though most of them are relatively informal. A MIS is designed and implemented with the purpose of providing relevant information to the administrator when he or she needs it for making decisions.

A very useful type of MIS in agricultural research is the **database project** which has information on approved research plans, resources allocated (or used), activities, and results.

Organization of monitoring

A crucial aspect in the organization of monitoring is defining responsibilities. In terms of monitoring responsibilities there are several options; the one selected depends on each institution's conditions. The overall principle is that monitoring responsibilities must be associated with the persons responsible for decision making. Therefore, highly centralized institutions centralize monitoring responsibilities. In the same way, responsibilities need to be decentralized in decentralized institutions.

Monitoring is frequently believed to be the responsibility of a specialized unit, such as the Planning Department or the Monitoring and Evaluation Department. In large organizations, a department or a specialized unit can play an important role in designing procedures and in supervising monitoring processes. However, in general **it is not advisable that a specialized unit be directly in charge of implementing monitoring. Rather, the responsibility of implementing monitoring should be in the hands of those that make decisions**—those in charge of research projects, programs, centers and institutions.

Implementation of the system

Four general rules for implementing a monitoring system are:

- Start on a small scale, trying out and revising procedures.
- Implement procedures in a disciplined way.
- Generate useful information for different user groups.
- Revise the system periodically.

A monitoring system is very complex and it is impossible to predict its functionality before trying it out. Hence the importance of trying out the system on a small scale before generalizing its use throughout the institution. A useful strategy is to try the system at the research program or center level, revise it, and then implement it at the other centers.

Once the system is running, disciplined implementation is important. If scientists or administrators perceive that deadlines and other norms need not be met for the delivery of information, the system may quickly become outdated and be useless for making decisions.

The best way to insure institutionalization of a monitoring system is to deliver useful information to the different priority users, including the scientists themselves.

Once the system has been installed, it must be periodically reviewed (every three to five years) to evaluate its effectiveness and efficiency in relation to current circumstances, and to make necessary adjustments. On the other hand, it is not convenient to make continuous changes to procedures, since this would show signs of insecurity and disorder.

Monitoring effectiveness

The effectiveness of a monitoring system is defined in terms of the degree to which it fulfills its objectives. Since objectives vary from institution to institution, specific effectiveness criteria may vary among monitoring systems. However, as a general rule, a monitoring system must meet the following three basic criteria:

- **Deliver useful information at the correct moment** to decision makers (internal and external).
- **Generate adequate documentation on research** (use of resources, activities, and results) that is useful for preparing several types of reports, planning future research, and making evaluations.
- **Motivate and guide scientists** toward the institution's priority objectives by means of feedback on decisions and actions taken.

Summary

Monitoring is a continuous process of observation, supervision, revision, and documentation of research activities in relation to their context, objectives, expected results, and resources budgeted for their execution. This sequence has presented an overall description of the status of monitoring in the region, a conceptual framework for monitoring agricultural research, and some points for designing and implementing a monitoring system.

The monitoring of agricultural research has not been given the theoretical attention received by planning and evaluation. However, monitoring activities in the region's agricultural research institutions are more common than planning and evaluation, and absorb an important portion of scientists' and research managers' time. But these activities are not conducted in a systematic way. Systematic monitoring of research in relation to its context, objectives, and resources allocated is not common. The donors of agricultural research (both national and foreign) have established norms for monitoring the programs, projects and activities they finance, norms that have to be complied with by the agricultural research institutions. Basically, these are administrative norms dealing with the use of resources and the activities conducted. In contrast, there is a lesser degree of development of internal procedures for monitoring research programs, projects, and activities. Therefore, potential improvements can be made to the contribution of monitoring to sound decision making at the different programmatic levels of the organization.

A good monitoring system must make three contributions to agricultural research management: it must support decision making about on-going activities; it must be a source of documentation on research activities for preparing reports, evaluations, and planning; and it must motivate and guide scientists towards priority institutional objectives. A monitoring system includes six essential processes: information collection; information processing and analysis; information storage; production and distribution of reports; decision making; and corrective actions.

A monitoring system must operate as a component or subsystem within an integral PM&E system. The scope of the monitoring system is determined by the type of information it contains and by the decision-making levels it covers. A monitoring system has a broad scope when it contains—for each decision-making level—systematized information on: (a) research context and users needs; (b) objectives, plans, designs, and expected results; (c) activities conducted and resources used; and (d) results and impact achieved.

No monitoring system covers all possible variables. Variables to be included have to be selected in designing the system, in terms of their usefulness (potential benefits), and the feasibility and costs involved in including them. Efforts should concentrate on aspects related to the research process.

The following variables should be considered in the design and implementation of a monitoring system: prerequisites for the system's success, priorities for the system, the basic system components, instruments available for monitoring, organization of monitoring, and system implementation.

This sequence deals with each of these points and ends with a discussion of indicators of effectiveness in a monitoring system. A monitoring system's effectiveness can be measured in terms of three main variables: timely delivery of information, useful to those who have to make decisions about on-going activities; generation of adequate information on research which can be used to prepare reports, for planning, and for evaluations; and motivation and guidance for scientists towards the organization's priority objectives.

Sequence 2. The Project as a PM&E Tool

Page

Flowchart for Sequence 2

The Project as a PM&E Tool

Objective

✔ Identify the elements required for monitoring a project, using the project cycle and the logical framework

Contents

- The project as a management unit in agricultural research
- The logical framework as a tool for preparing, monitoring, and evaluating projects

Summary

Introduction

The first sequence of this module studied the principles, scope, effectiveness, and organization of a monitoring system. This sequence will focus on the project as a unit of agricultural research management and particularly for monitoring. Nonetheless, the subjects covered in this sequence are applicable at the program, research center, or institutional level.

Research project management is an approach in which research activities are structured and managed in units called projects. The projects, in turn are managed as units of larger research efforts, called programs. Monitoring is used to keep activities and projects on track and ensure that they contribute to broader program and institutional objectives.

Projects can be managed following specific steps within the project cycle. These steps refer to planning, monitoring, and evaluation of agricultural research activities.

The first section presents the concepts of "project" and "project cycle" and identifies the main requirements for monitoring a project.

The second section presents the logical framework as a tool for preparing, monitoring, and evaluating projects. The advantages and inconveniences of using the logical framework are analyzed and suggestions are made for using the logical framework in agricultural research institutions.

The Project as a Management Unit in Agricultural Research

The project concept

A **project** is a set of interrelated activities, oriented toward solving a problem, with specific results expected at points in time, by applying certain resources, and methods. This definition suggests various project components that can be monitored:

- The solution of a problem
- Results obtained
- Deadlines
- Resources used
- Methods used

The project is the most common organizational and operational unit for managing international technical assistance. It is also frequently used in research management, by both the private and public sectors. The industrial sector has abundant experience in research and development project management. The application of project management is more recent in agricultural research (with the exception of projects financed by external agents).

Project management principles have recently been introduced to agricultural research, to improve its effectiveness and efficiency through planning, monitoring, and evaluation. Project management is particularly relevant when researchers compete for external resources and when research donors require clear information on research plans and results.

Historically, agricultural research has not been managed by projects. On the contrary, researchers have worked with relative autonomy and without a formal sense of planning and public responsibility. However, agricultural research donors have started to demand improvements in resource and program management. The introduction of project management concepts has been often a response to these external requirements. Thus, a large part of agricultural research in industrialized countries such as Australia, Canada, and the United States is managed through projects. Project management is also becoming common in Europe, Asia, Latin America, and the Caribbean. Likewise the use of participative methodologies at all stages of the project cycle is ever more frequent.

The project cycle

Project management follows a series of steps that constitute what is called the **project cycle**. Several organization have defined different cycles to meet their specific needs. But all variants of the project cycle include at least three general steps: preparation and planning, implementation, and evaluation.

A six-step cycle is suggested for agricultural research project management (Figure 7):

1. Identification of priority research areas.
2. Preparation of proposals.
3. Revision of proposals.
4. Approval of proposals and allocation of resources.
5. Implementation of research and monitoring.
6. Evaluation of results and impacts.

Step 1. Identification of priority areas

Priority areas for research are identified within the framework of plans at the program and institution levels. A priority area must correspond to an important problem and pass the initial feasibility test: that research may generate a solution to a problem. Continuous institutional monitoring should be conducted in order to: (a) identify constant changes in priority areas, (b) confirm that on-going projects are relevant, and (c) guarantee a constant flow of resources by conceptualizing, formulating, and presenting new projects.

Step 2. Preparation of proposals

Preparation of research proposals is one of the most important steps in project management because implementation, monitoring, and evaluation are based, to a large extent, on the initial proposal. Several formats may be used for proposals; these generally include the following components:

- Title
- Summary
- Individuals and units in charge
- Objectives
- Expected outputs
- Justification and initial situation
- Previous research and status of current knowledge
- Strategies and methods
- Schedule of activities
- Resources required
- Methods and indicators for monitoring and evaluation

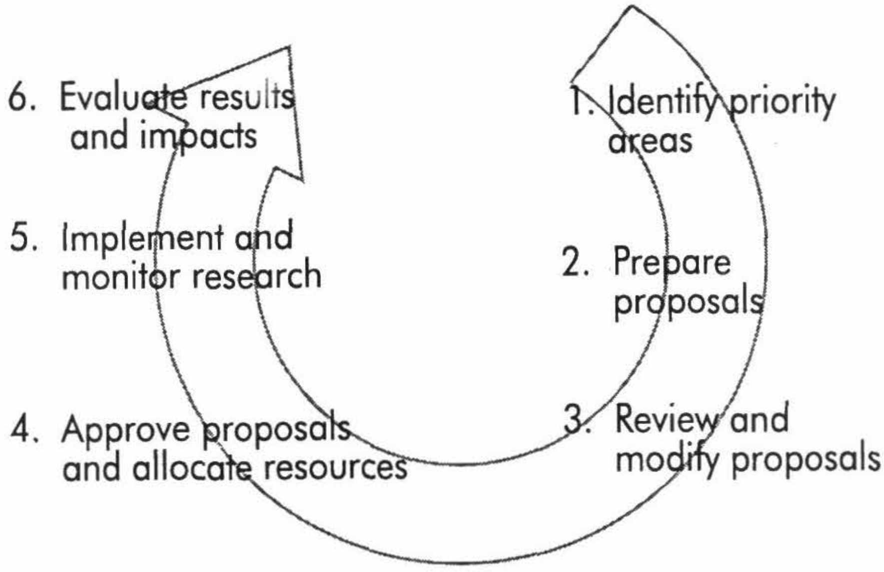

Figure 7. The Project Cycle

Step 3. *Review and reformulation of* proposals

Research proposals must be reviewed in terms of their relevance, feasibility, and scientific quality. Feasibility and scientific quality in agricultural research are usually reviewed by experts. In additions, it is important that producers or other users of research results review the relevance of proposals to assure that projects approved respond to actual needs.

Step 4. Approval of proposals and allocation of resources

While initial proposal review is the responsibility of experts, approval of proposals and allocation of resources is the responsibility of those who manage or direct the institution. Resources required for each proposal must be considered in project approval. It is better to implement a few, adequately-financed projects than disperse available resources among many, poorly-financed projects.

Monitoring of the four previous steps has become more important in later years due to an increasing tendency for research institutions to be financed through projects by external, national or international, donors.

Since proposal preparation implies the use of institutional resources, success indicators must be available for these steps. For example, the percentage of proposals approved by donors among those presented can be analyzed periodically. This percentage could be classified by variables such as: researcher, program, and type of donor.

If the percentage is very low, an internal cause must be identified; for example: deficiencies in identifying priority areas, preparing the proposal, and identifying possible donors.

The reason may also be found in external causes. The most important is the donor's lack of administrative flexibility to make decisions on time.

Regional agricultural research institutions, especially the larger ones, already have specialized offices to serve as liaison between donors and programs. An example the Colombian Agricultural Institute (ICA) in Colombia.

Step 5. Implementation and monitoring of research

This step starts once the project is approved and researchers have received the resources necessary, and continues until the project ends. This step includes daily research activities, and monitoring of activities and results.

The monitoring of a research project's implementation consists of the periodical review of activities, of the use of resources, and of results in relation to initial objectives and plans. Progress reports are useful mechanisms for internal project review. Some key questions for monitoring project implementation follow:

- Do objectives continue to be relevant and adequate?
- Have objectives been met?
- To date, what are the results of research?
- What have been the problems in implementing the project?
- Do experimental designs need to be changed?

Step 6. Evaluation of results and impact
Upon completion of a project, two types of evaluations can be made: a final evaluation and an impact evaluation. A final evaluation puts the emphasis on "extracting" knowledge to improve future research projects. This type of evaluation must analyze the following:

- Relevance of objectives
- Achievement of objectives (project effectiveness)
- Appropriateness of designs and methods (project efficiency)
- Products generated by the project (in relation to expectations)
- Contributions to overall knowledge
- Adoption and use of information and technologies generated
- Lessons from the project
- Recommendations for future research

An impact evaluation's objective is to determine the long-term impact of research on production, the economy, social welfare, and the environment.

Actually, few evaluations of finished projects are done in agricultural research. This is partially due to the lack of emphasis put on evaluations in general; another factor is that research activities tend to develop on their own and never end. An advantage of organizing research in projects and going through the steps in the project cycle is ensuring more discipline during planning, monitoring, and evaluating research activities.

Every one of the steps in the project cycle can be monitored. For example, monitoring of Step 1 (identification of priority areas) should focus on the compatibility of the problem identified with the objectives of the program, research center, or institution. The objective of monitoring Step 4 (proposal approval and allocation of resources) is determining budget availability.

An agricultural research project must be seen as a complex social phenomenon, having—from the moment that the first phase activities start until the last is completed—a strong interaction among actors involved. These actors may at times have conflicting interests (different strata of producers) or points of view (researchers and extensionists). This drives actors to try to allocate resources to where they can obtain more benefits (scientific, technological, social, economic, etc.). Negotiation of resources is done all the way from identification, planning, and implementation to evaluation, as expressed by Dusseldorp and Zijderveld (1990). An example can be found in the preparation of participatory research projects whose actors are producers, extensionists and researchers. From different perspectives, they are all seeking to find solutions to a production problem in a specific area. In such cases, formal and informal monitoring activities are more viable.

The Logical Framework as a Tool for Designing, Monitoring, and Evaluating Projects[1]

As previously indicated, preparing a research proposal is a central stage in the project cycle and is the basic requirement for subsequent monitoring. In many cases, projects show methodological deficiencies such as the following:

- The problem or the objectives are not clearly defined.
- There is no coherence between the problem and the objectives.
- The design and chronogram of planned activities is not consistent with resources available.

Therefore, the consistency of a project proposal must be analyzed, on the basis of the following requirements:

- The problem must be clearly formulated, justified, and within previously established priorities.
- The problem to be solved must be clearly related to the objectives.
- Objectives must be formulated coherently at all levels.
- The hypothesis that tries to answer the problem must be adequately formulated.
- Methods and techniques selected must be relevant for testing the hypothesis.

[1] This section is based on MSI, 1992

- Objectives, planned activities, and available resources must all be clearly related.
- All aspects indicated must be coherent.
- Achievement indicators must be clearly established.

A project should be part of a broader institutional program and address national and regional priorities and especific users' needs. In addition, the project should have a precise definition, or monitoring looses its sense and utility.

Institutional difficulties are found in the project's preparation and implementation, for example, in the absence of a medium-term institutional program including a clear prioritization of objectives. This absence impedes the establishment of a relationship between objectives, programs, and projects. A second institutional difficulty is that the role, attributes, and responsibilities of the project's leader and participants are not clearly defined in the organizational structure. This makes identification of responsibilities difficult during key stages of the project.

In these circumstances monitoring is senseless and useless, because it is very difficult to have clear comparison parameters. When consensus is not reached on criteria to be used in monitoring, whoever establishes the criteria does it based on his own points of view, and these may not always coincide with those of the people executing the project. From that point on, conflicting attitudes arise toward the monitoring process.

What is the logical framework?

The "logical framework" is an instrument that can help solve several of these difficulties. Its main contributions are the overall logic it provides, the way in which it interrelates the main project components, and the relation it establishes among them and indicators which facilitate monitoring and evaluation. Each institution can decide in each case on its degree of applicability. The logical framework includes the structure of the main elements in a project, by establishing a clear relationship among:

- Initial problem.
- Expected results.
- Activities and resources required.
- External factors to the project which condition its fulfillment.
- Verifiable indicators of results and the place and procedure to find this information.

Use of the logical framework allows a quick way to interrelate these concepts and define indicators that guarantee project monitoring and evaluation. This summary is presented in a matrix having 4 rows and 4 columns.

Use of the logical framework

The logical framework can be used to:

- Define the project's initial situation precisely.
- Clarify objectives at different levels, and their interrelations.
- Give the project a framework within higher objectives.
- Quantify expected results, establishing success or failure parameters.
- Determine relationships between objectives and inputs (activities and resources) required to meet objectives.
- Identify external factors that condition the project's success.
- Identify information needs for monitoring and evaluation.
- Facilitate communication among the parties involved.
- Facilitate assignment of responsibilities to the project leader (or coordinator) and to participants.
- Serve as a guide for detailed preparation of the project.

The logical framework can be applied at any planning or decision-making level, from programs to experiments. If formulated at the program level or line of work, it facilitates formulating new plans. The logical framework articulates well with PM&E participative methodologies by orienting debate and consensus toward key decisions for a project. It is compatible with other techniques such as bar diagrams, flow diagrams, PERT networks, and cost-benefit analyses. Based on a cause analysis of current problems, the logical framework operates as an agglutinating factor in forming multi- or interdisciplinary teams.

The logical framework prepared for a project is not something definite or static; rather, it can be reformulated during any phase of the project cycle by quickly identifying the effects of modifications on other key project aspects. This implies a monitoring activity.

Some of the difficulties found in using the logical framework are:

- Includes identification of factors that escape the project's area of influence, but which are critical for the project's success
- Requires clear specification of activities and resources required for developing the whole project. This can make planning and execution relatively inflexible.
- Preparation is time consuming.
- If not cautiously introduced in an institution, it can overwhelm researchers who may think its preparation is excessively complex.
- Its formulation requires previous training and methodological support, at least during the first stages of elaboration at the institution.

Structure of a logical framework

A logical framework is made up of:

- The main elements of a project, expressed in terms of objectives at their different levels (outputs, purpose, and goal), and of inputs required to achieve them (activities and resources).
- The main assumptions of the project—factors external to the project that condition its success and are independent of its management. (Figure 8).

Goals

- The higher level objective to which the project contributes.

> *The logical framework enables preparation of well-structured research proposals that are more readily approved, monitored and evaluated.*

- The project is necessary but not sufficient to achieve the goal.
- It is a long-term objective. If must specify the target population.

Purpose

- The project's final objective.
- Marks the solution to the problem that originated the project.
- Defines the effect expected by the project and the target population.

- The project's direct results.
- Achievements expected from the adequate management of inputs (activities and resources).
- Are made available to direct beneficiaries of the project.

Outputs

- The activities that must be developed and the human, economic, and physical resources required for executing the activities planned.

The concepts of goal, purpose, outputs, and inputs are illustrated with examples in Table 3.

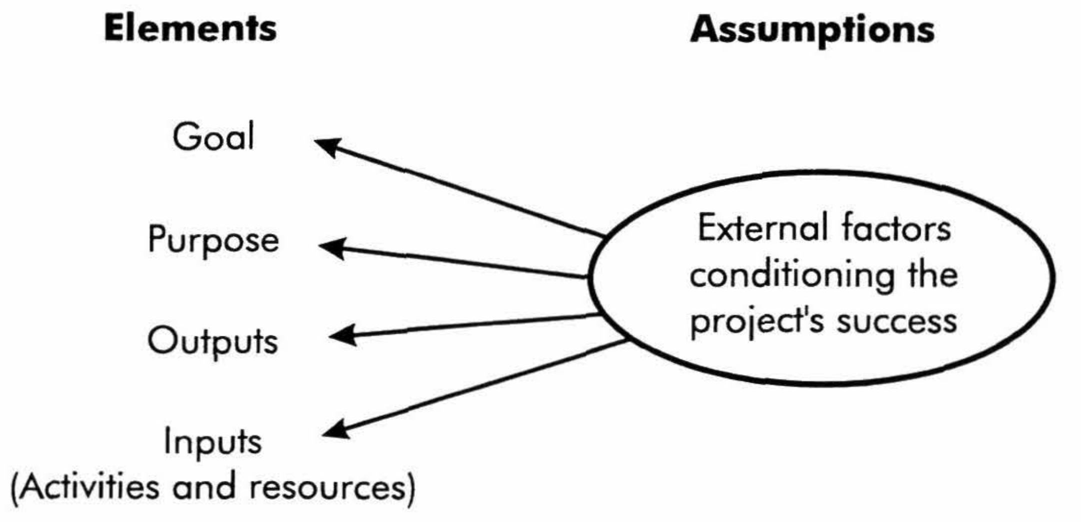

Figure 8. Basic structure of a project's logical framework

Table 3. Summary and example of the main elements of a project: Development of postharvest technology for tomatoes and peaches

Concept	Example - Narrative summary
Goal • This is the ultimate objective of the program to which the project contributes • The project is a necessary but not sufficient condition to attain the goal • A set of projects shares a common goal	**Goal** Facilitate tomato and peach exports by sea
Purpose • Describe the impact expected of the project, and what it is expected to achieve if the project is thoroughly executed within the deadline • The project is a necessary and sometimes sufficient condition to attain the purpose	**Purpose** Develop technologies that maintain quality and extend shelf life of tomatoes and peaches
Outputs • Are achieved once the project is finished • Are the result of a project's activities and resource use • The project is a necessary and sufficient condition to achieve them	**Outputs** • 3 tomato cvs. and 3 peach cvs. having export quality and 30-day shelf life identified • Specific maturity indexes • Established atmosphere levels for 2 tomato and 2 peach cvs. • Susceptibility of 3 tomato and 3 peach cvs. to set quarantine treatments • Cost studies completed • Pre-freezing equipment developed
Inputs • Describe how the project is to be implemented, including personnel, and physical and financial resources • Arise from the operational task plan • Include activities and resources to put it in operation	**Inputs** • Peach and tomato plots • Cold storage rooms • Packing materials • Laboratory equipment • Work plans • Personnel from INTA and other institutions involved in the project • Bibliographic and information science materials • Activities with: adaptation of cultivars, harvesting date, pre-freezing effects, alternative treatments, costs, chemical inputs

Source: Furlani, 1993

Assumptions

Assumptions are factors (agronomic, socioeconomic, political, cultural) that can limit achievement of a project's objectives and that cannot be controlled by those in charge of the project. Several assumptions are found at each level of objectives. Each level of objectives is conditioned by external factors outside the project's control, but that are required to: provide an end goal, fulfill a purpose, obtain outputs, and conduct the activities. These external factors are called relevant assumptions. A project must solve a relevant problem within its broader scope objectives. This principle is illustrated in Figure 9.

The higher the level of an objective, the less control one has over the assumptions. To a large extent, both activities and outputs are the direct results of a good management of the project's resources. In

normal circumstances, they depend only slightly on factors external to the project and uncontrollable by those in charge of managing and executing the project.
On the contrary, the project goal depends on many external factors that cannot be controlled by those involved in the project. (Nevertheless, this does not mean that it is not necessary to show the contribution that achieving the purpose will have for reaching the goal, Table 4).

The "vertical logic"

Three causal relations (hypothetical) exist from inputs to the ultimate goal (Figure 10):

- between inputs (resources and activities) and outputs

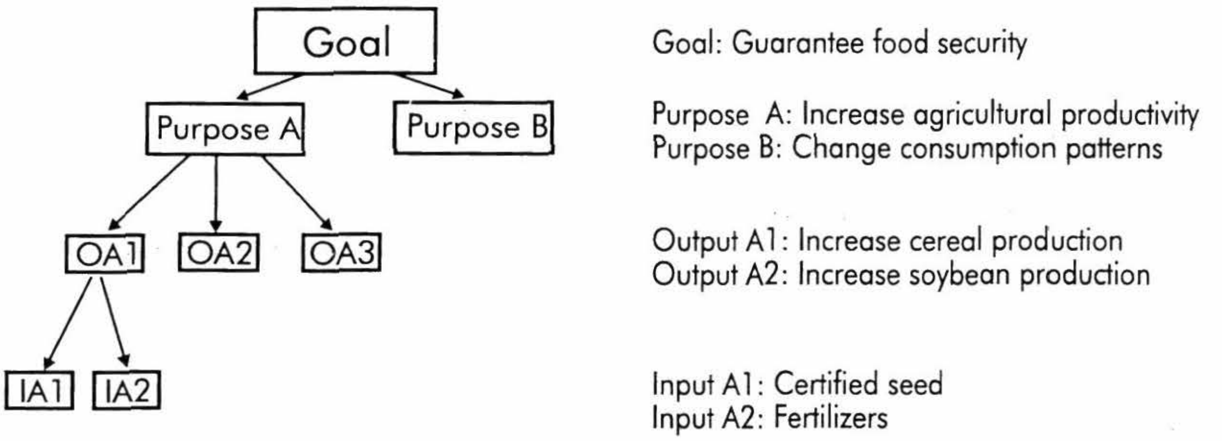

Figure 9. Illustration of relationships between inputs, outputs, prupose and goal

Table 4. Summary and example of a project's assumptions

Narrative summary	Assumptions: Concept	Assumptions: Example
Goal	• Conditions that affect the purpose-goal relationship. • Must take place in order to achieve the goal. • Slight control over them.	• Economic policies are maintained. • Technologies generated are compatible with production costs and are adopted.
Purpose	• Conditions that must be present to achieve purpose. • Slight control over them.	• The structures, human resources and priorities of the participating Units are maintained
Outputs	• Conditions necessary to produce the outputs.	• Favorable climatic conditions
Inputs	• Conditions required to carry out activities and make adequate use of resources.	• Timely availability of funds

Source: Furlani, 1993

- between outputs and the purpose
- between the purpose and the goal

When a project's logical framework is designed, the inputs must be both necessary and sufficient to produce the outputs. Outputs, in turn must be necessary, but are sometimes insufficient to achieve the purpose. *For example, in a national* program, other complementary projects may be necessary to achieve the purpose of a project. The purpose is necessary, but never sufficient to achieve the goal.

The relevant assumptions (or necessary conditions) are added to these three causal relations to fulfill each level of objectives (Figure 11).

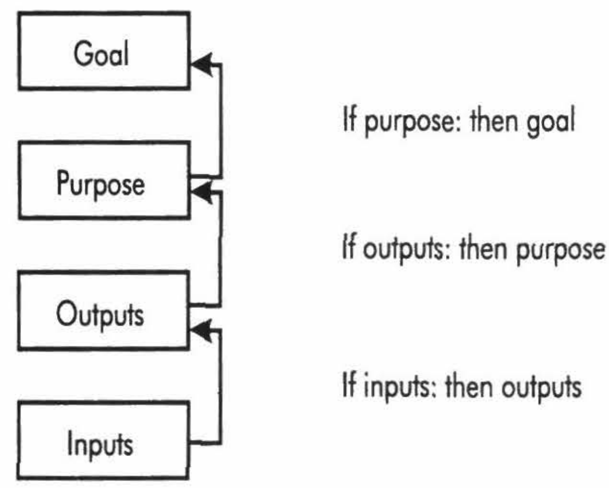

Figure 10. Relations among objective levels

The initial situation and the intervention strategy

A project can be seen as a proposal to solve a problem. Executing a project is setting a proposal to

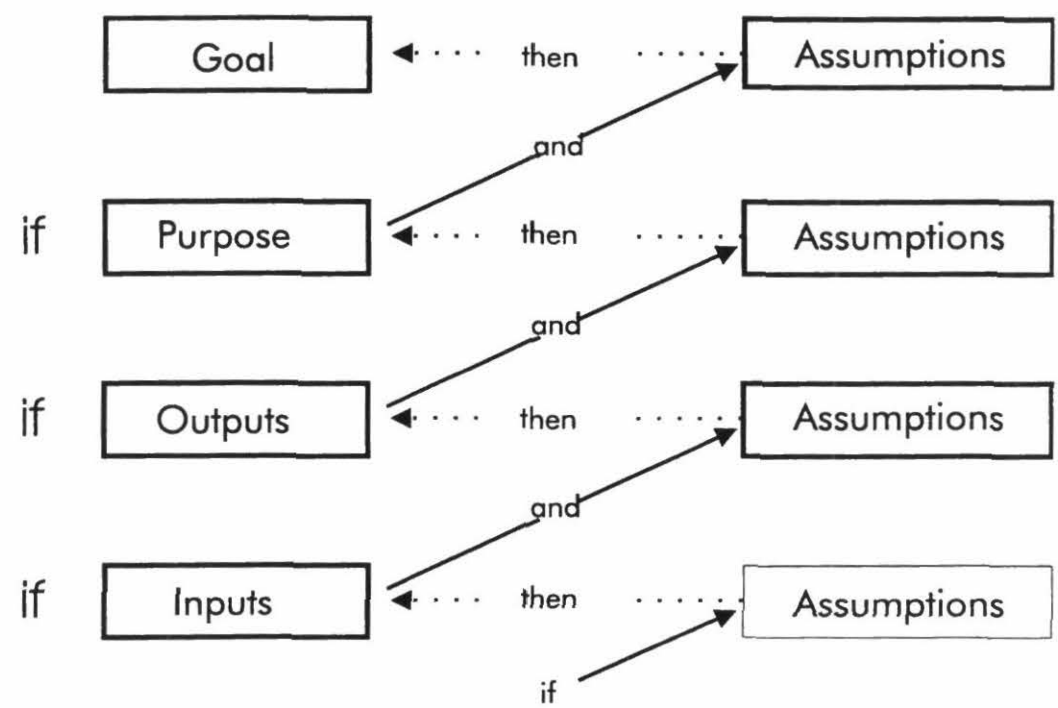

Figure 11. Relations between objectives and assumptions

Example: Development of postharvest technology for tomatoes and peaches

	Narrative summary		Relevant assumptions
	Goal		
	Facilitate export of tomatoes and peaches by sea	← then —	- The economic model and economic stability are maintained - Technologies generated are compatible with production costs and it is feasible that they be commercially adopted
		and	
	Purpose		
If	Develop technologies that enable maintaining quality and extending shelf life of tomatoes and peaches	← then —	Structures, human resources, and priorities of participating units are maintained
		and	
	Outputs		
If	- Identification of 3 tomato cvs. and 3 peach cvs. having export quality and 30-day shelf life - Specific maturity indexes - Established atmosphere levels for 2 tomato and 2 peach cvs. - Susceptibility of 3 tomato and 3 peach cvs. to set quarantine treatments - Cost studies completed - Pre-freezing equipment developed	← then —	Favorable climatic conditions
		and	
	Inputs		
If	- Peach and tomato plantations - Cold storage rooms - Packaging materials - Laboratory equipment - Work plans - Personnel from INTA and other institutions involved in the project - Bibliographic and information science materials	← then —	Resources available according to budget

Source: Furlani,1993

work until the problem has been solved and the initial situation has been modified or replaced by another. Thus, the starting point of a project is the *initial situation which must* be clearly defined and described.

Diagnosis of the situation must include:

- The problem(s) correctly identified.
- Relationships between problems and other incidental factors which should have already been revealed.
- Explanations of cause(s) of the problem(s).

Only then is it possible to imagine the intervention alternatives that, acting on one or more factors or incidental causes, tend to modify the situation in the desired way. Only after comparing the best alternatives it is possible to select the strategy that offers the problem's most advantageous solution.

In characterizing the initial situation, the problem *must be:*

- Qualitatively and quantitatively described
- Adequately circumscribed according to relevant criteria (geographic, economic, social, environmental, or technical-scientific)
- Clearly justified in terms of its relevance and demand to solve it

Given the importance of characterizing the initial *situation, INTA in Argentina has incorporated* it within the logical framework's structure in the column of assumptions at the level of inputs. Assumptions at the level of inputs are thus eliminated since the fact that the institution approves the project means that the factors that affect it at this level can be controlled.

Indicators and means of verification

Indicators and means of *verification serve* as the basis for monitoring and evaluating a project.

Indicators

Indicators are data or signs that allow the objective verification of an objective's fulfillment (be it a product, purpose, or goal) and of the inputs. They are direct or indirect measures of achievements. They make it possible to remember how achievements are *measured at each level of the* objectives. Therefore, they should be identified by a team and by consensus. As indicators show results, more than one may be needed to evaluate an objective's success. Since the purpose defines the project's expected achievements, indicators show "the project's final situation". In fact, the presence of indicators show the project's success and represent modification of the initial situation.

Indicators must meet various characteristics (MSI, 1992):

- Measure what is important in the objectives.
- Must be valid.
- Must be measurable.
- Must be independent.

Importance. Indicators must measure what is relevant in an objective. For example, in the formulation of the goal "increasing small farmers' income", it is easier to measure farmers' income. But the interest is in small farmers' income. Therefore, the indicator must reflect the interests of the small farmers and particularly, their income.

Validity. Indicators selected must be related closely enough with what needs to be measured, that one can be confident that the project was a decisive factor in obtaining the observable results. For example, saying that farmers profits are due to the establishment of a credit system is not enough. Other factors, such as a successful harvest, a high level of demand, or the scarcity of a specific product in the market, may have affected farmers' incomes. To demonstrate the role of the credit system, indicators must be found which link the credits systems to farmers, for example, the number of loans made to farmers and the incomes of these farmers.

Measurable. Indicators must be specified in terms of quantity, quality, and time (QQT). If one of these three factors is not present, failure or success cannot be measured objectively. A simple and progressive process allows specifying an indicator; this is described below, using an indicator of purpose achievement.

First step:	**Identify the indicator** Small farmers increase rice production.
Second step:	**Quantify it** 30,000 small farmers (defined as those having 7 hectares or less) increase rice production by 50%.
Third step:	**Define its quality** 30,000 small farmers (defined as those having 7 hectares or less)

increase rice production by 50%, while maintaining the same quality of the 1992 harvest.

Fourth step: **Specify the time limit**
30,000 small farmers (defined as those having 7 hectares or less) increase rice production by 50% between October 1992 and October 1994 while maintaining the quality of the 1992 harvest.

Not all indicators can include these three characteristics. In the progressive process described, all steps have been included, but the resulting indicator is rather complex. The best indicator is a simple one. The quality aspect is very important, but many times ignored. In this example, the greatest concern is clear; if more rice is produced at the expense of quality, the project will have failed. In specifying, we must ask "how much is sufficient to achieve the objective? what should be its quality? and when is it needed?".

Independence. Indicators that show the achievement of an objective at a specific level cannot be used to demonstrate achievements in higher levels too. In spite of the fact that this is one of the simplest concepts of the logical framework methodology, it is also one of the most common errors. Another common error is that achievement of a result is commonly demonstrated by measuring the means used to achieve it.

For example, the development of a short-cycle onion variety (purpose) is not an indicator of increase in production (goal). In the latter case it could be: increase average yields from 400 to 800 kg/ha (100%) in the Cuyana region of Argentina, from 1990 to 1994, among vegetable producers having more than 5-hectare farms.

Special indicators. Good indicators are not always available. A good indicator is a direct measure of achievement; for example, increase in crop productivity can be measured by change in production, per hectare, in fields where the project operates, and evaluators can measure the project's success.

Frequently verification of the preferred indicators turns out to be very expensive. Such is the case when a survey has to be run among a large, dispersed, and heterogeneous target population. Then it is convenient to find indirect or approximate indicators or if these are not available, to change the means of verification (instead of using a survey with probabilistic sampling, use information provided by "key" informers).

Means of verification[2]

The next step in the application of the logical framework is to ask: How can indicators be measured? Indicators gauge the achievement of objectives. But if data cannot be found about the amount of rice harvested by farmers, then it is impossible to demonstrate that the harvest increased. Therefore, an increase in overall production cannot be shown. If success, or failure cannot be measured, the project's rationality must be questioned. Usually, the preferred indicator can be substituted by an alternative indicator that is closely correlated with the first one (for example, marketed rice). In many cases, appropriate data can be found using different means of verificatión. If farmers do not report their harvest, or do not have the means to weight their products, a survey can be made to count the number of sacks collected.

The value of an indicator is limited by the means available to verify it. In the previous example, another indicator must be found if a broad survey is required to obtain the data needed to verify the indicator and the project does not have funds to finance the survey. Verification of some indicators could simply require a quick revision of records from the project or from the government, while verification of other indicators require data collection and sophisticated analysis.

If verification of indicators is expensive and time-consuming, means of verification must be identified during the project's design stage. Therefore, project inputs must include human and financial resources required. If these are not planned at the beginning of the project, they may not be available when required. In the same way, sources of evidence must be identify for all important elements of an indicator. An example will make these concepts clear.

In the example above, the indicator has two complementary means of verification. Means of verification must be carefully examined to assure that data is complete and trustworthy. Frequently, project leaders trust government records but later discover that these records are outdated or that data was informally collected and is therefore not reliable.

2 This section is based on the MSI document, 1992

Example: Project: Reduced incidence of white mold in lima bean production in Tanzania

Purpose	Verifiable indicators	Means of verification
Reduce the incidence of white mold in lima bean production in sub-Saharan Africa.	Final situation: 70% increase in lima bean production in farmers' fields after the seventh year	• Farm surveys • Experimental project data

Table 5 summarizes some useful indicators for research program monitoring and their means of verification. Table 6 presents the complete matrix of the logical framework which we have been studying in this section. Table 7 is an example of the main concepts used.

Table 5. Example of a research program's indicators

Level of achievement	Possible indicators	Means of verification	Responsible for collecting data
Inputs - determined by projects, based on operational plans:			
• Personnel	Researchers' and assistants' time	Chronograms	Individual reports
• Funds	Expenses made	Accounting data,	Accounting office
• Infrastructure	Constructions or purchases	Work reports Data/supplies	Architecture/engin. office Accounting office
• Equipment and other goods	Acquisitions/utilization	Experiment station lab. reports Meeting proceedings	Accounting office Exp. station or lab. director
• Leadership	Meetings/projects Meetings/program	Individual reports Individual reports	Project leader Program coordinator
• Training	Complete courses	Reports/training	Training head
Outputs- considered by project and by program:			
• Preliminary research results	Protocols of experiments	Reports, publications, and revisions	Researchers Project leader
• Results of research already completed	Recommendations from the program committee	Program records Annual reports	Program coordinator Director of institution
• Improved research capacities	Trained personnel and better infrastructure	Records/training Management records	Head of training Director of institution
Purpose -contribution of program knowledge to research and development, and to decision makers:			
• New knowledge interest for research, extension, and decision makers	Proven technology and recommendations	Program record Certificates Communication about policies	Program coordinator Extension service Director of institution
Goal - relation of research with national development objectives:			
• Increased production	Data/production	Direct observation on used areas	Office of statistics
• More intensive land use	Changes in crop rotation *and inputs*	Statistics on inputs	Equitable distribution of income
• Soil conservation and use	Reduced erosion Resource planning	Rotation methods Planning document	*Land use/distribution* planning
• Greater income	Per capita income Greater consumption	Statistical data Rotation of area planted and regional rotation	Office of statistics Equitable distribution of income
• Improved nutrition	Reduced morbidity and mortality	Evidence of nutritional status	National health service

Source: McLean, 1989

Table 6. Matrix for the logical framework

Narrative summary	Verifiable indicators	Means of verification	Assumptions
Goal • This is the ultimate objective of the program to which the project contributes • The project is necessary but not sufficient to attain the goal • A set of projects share a common goal	Means or parameters that indicate that the goal has been achieved	Sources of information that allow verifying or measuring the indicators established (government statistics, reports, surveys)	• Conditions that affect the purpose-goal relationship • Must take place in order to achieve the goal • Slight control over them is possible
Purpose • Describe the impact expected of the project, what is expected to achieve if the project is thoroughly executed and within the deadline • The project is necessary and sometimes sufficient to attain the purpose	• Expected final situation of the project. • Final status of the project • Indicates the project is successful	Sources of information that allow verifying or measuring the indicators established (government statistics, reports, surveys)	• Conditions that must be present to achieve the purposes • Slight control over them is possible
Outputs • Are achieved once the project is finished • Are the result of a projects activities and resource use of the project • The project is necessary and sufficient to achieve them	• Magnitude of results	Sources of information that allow verifying or measuring the indicators established (government statistics, reports, surveys)	• Conditions that must be present to obtain the products
Inputs • Describe how the project is to be implemented, including personnel, and physical and financial resources • Arise from the operational task plan • Include activities and resources to put it in operation	• Type and cost of resources for each activity according to the chronogram • Project budget	Accounting and management reports	**Initial situation** • Characterization by analyzing the causes of the problem to be solved

Source: adapted from McLean, 1989

Table 7. **Development of postharvest technology for tomatoes and peaches**

Narrative summary	Verifiable indicators	Means of verification	Relevant assumptions
Goal Facilitate tomato and peach exports by sea	Volume of tomatoes and peaches exported	• Custom's export records • Officials statistics • FAO statistics	• The economic model and economic stability are maintained • Technologies generated are compatible with production costs and it is feasible that they be commercially adopted
Purpose Develop technologies that enable maintaining quality and extending shelf life of tomatoes and peaches	***Final situation*** (at end of 5th year) Definition of postharvest technologies that allow more than 30-days of shelf life for 3 tomato and 3 peach cultivars	• Final report • Publications	• The structures, human resources and priorities of the participating Units are maintained
Outputs • Identification of 3 tomato cvs. and 3 peach cvs. having export quality and 30-day shelf life • Specific maturity indexes • Established atmosphere levels for 2 tomato and 2 peach cvs. • Susceptibility of 3 tomato and 3 peach cvs. to set quarantine treatments • Cost studies completed • Pre-freezing equipment developed	• Table of harvesting indexes and physical and chemical factors • *Tables with O_2 and CO_2 values* • Tables on white mold damage • Cost record sheets • Tables on heat transfer and freezing efficiency	• Partial reports of the project • Annual report of work plans • Publications	• Favorable climatic conditions

Table 7. Continued

Narrative summary	Verifiable indicators	Means of verification	Relevant assumptions
Inputs • Peach and tomato plantations • Cold storage rooms • Packaging materials • Laboratory equipment • Work plans • Personnel from INTA and other institutions involved • Bibliographic and information science materials	• Budgeted expenditures • Chronogram of activities • Percentage of time that participants have dedicated to the project	• Accounting records of participating Units • Partial reports on activities carried out • Personnel records	**Initial situation** • Minimum or nil peach and tomato exports • Off-season international demand for fruits and vegetables • Need for very high-quality products • Air freight is 2 to 3 times more expensive than sea freight • Lack of ample information about peaches, and no information available on tomatoes (quality, favorable harvesting date, and marketing periods of cvs. having export quality)

Source: Furlani, 1993

The "horizontal logic"

As shown in the previous examples, columns are interwoven for achievement indicators and means of verification , between the column of objectives and that of *assumptions.* This generates a horizontal logic. For the analysis of each objective, at the different levels, the best indicator and the most appropriate means of verification must be selected.

How to formulate a logical framework

It is important to remember that the logical framework is a structured summary of: the main elements of a project, the assumptions on external factors that condition it, the indicators of project achievements, and the means of verification.

The "vertical logic" relates objectives to assumptions.
The "horizontal logic" relates objectives to indicators and verification means

The logical framework must be formulated together with the project's proposal. This task must be done in groups or teams, using participatory techniques. Team participants will vary depending on the type of project (research or extension), the subject, complexity, and geographical scope covered by the project. The group should include: groups affected by the project, institutions that may become involved, and specialists from several disciplines. INTA's Guide (1992) for project preparation, monitoring and evaluation, describes the methodology used by this institution for formulating projects using the logical framework.

Participatory methods are recommended, such as project planning by objectives (ZOPP), adapted to different circumstances (Saravia, s.f.). The steps to follow are:

1. Characterize the initial situation.
2. Formulate objectives.
3. Identify relevant assumptions.
4. Verify the vertical logic.
5. Select indicators.
6. Specify means of verification.
7. Verify the horizontal logic.
8. Review the complete logframe.

Step 1. Characterize the initial situation

A problem is an existing, underisable situation, not the absence of a solution. At this stage, the following should be done:

- Identify existing problems in relation to the underlying causes.
- Show the cause-effect relations of the problems, distinguishing the central problem, its more relevant causes, and its most important effects.
- Give an explanation of the problem's causes or diagnosis

Based on the problem diagnosis, imagine solution alternatives that act on one or various of the factors that cause the central problem. These should be compared, in order to select the one that offers the most advantageous solution and which is also feasible.

Remember:

- The problem should be set within specific boundaries (from the geographical, economic, environmental, or technical-scientific point of view)
- Its causes should be made clear
- Its relevance should be justified
- Intervention strategies should be analyzed, and the most advantageous selected
- To carry out this process, participative methods should be used

Step 2. Formulate the objectives

Objectives should be formulated on the basis of the problem diagnosis, the intervention strategy selected, and the higher level objectives (for example, social development, or medium- or long-term institutional objectives).

The project objectives are formulated for the different levels. This can be done by going from the general to the specific objectives, and then analyzing their consistency, ascending from the level of inputs.

Then the following are specified:

- **Goal**
- **Purpose(s)** (reverse the problem or initial situation)
- **Outputs**
- **Inputs** (activities and resources)

Inputs. Resources and activities internal to the project. Careful estimation of all inputs is essential for preparation of the budget and workplan. In general, inputs should be carefully estimated in full detail for the first year; for subsequent years they can be grouped. Each year, when annual approval is required, these inputs must be updated.

Outputs are the results of project actions or activities; they differ from inputs in that they are delivered, or made available to end users or direct project beneficiaries.

Inputs and outputs are closely interrelated. Each input leads to one or more outputs, in the same way that an output is not possible without applying one or more inputs. This relationship must be made evident in the description of these two levels of objectives.

Step 3. Identify the relevant assumptions

The incidence of factors of any kind (agronomic, social, legal, political, psychological, etc.) that cannot be controlled by the project is increasingly intense as the level of objectives ascends. Generally, at the level of the goal, external factors have a considerably stronger impact than the project itself.

Impossibility of exerting control over these factors does not imply they should be left unattended by the project. On the contrary, they must be carefully watched in order to prevent or counteract any unfavorable influence they may exert. The way to keep an eye out for them is to formulate relevant hypotheses, also called basic or relevant assumptions, concerning the behavior of these factors. Any variation in the expected behavior is a warning sign and may require modifying the project's action program.

Each level of objectives must be accompanied by the relevant assumptions, which will be more detailed and complete for the purpose and goal levels. At these latter levels, assumptions have their maximum importance. At any level, assumptions must refer to external factors with relevant incidence (actual or possible, immediate or mediate) over the project's results. The behavior of these assumptions should be specified under normal expected conditions. It is senseless to formulate assumptions for anomalous circumstances or improbable happenings.

Scaled objectives and corresponding assumptions form the logical framework of the project, which must be clearly set out during project design.

Step 4. Verify the vertical logic and make necessary adjustments

After characterizing the initial situation, formulating project objectives and spelling out the relevant assumptions, it is important to write the results of these three steps in a logframe matrix, to review them, to ensure their clarity and conherence, and to make any needed adjustments.

Step 5. Select indicators for each objective

- Identify it.
- Specify the target population.
- Determine the amount.
- Define the quality.
- Locate it in time.
- Locate it in space.
- Combine all these elements in one phrase.
- Verify whether the indicators selected are sound, and whether others with greater advantages have been left out.

Step 6. Specify means of verification for the indicators (MOV)

Contrary to indicators which cannot be related to two different objectives (this would indicate a mistake), the same MOV can be used for different indicators. In fact, more than one mean can be used for the same indicator.

If selected MOV imply a significative additional cost, it must be calculated and forecast in the budget.

To evaluate means of verification selected, ask the following questions:

- Does the source of information exist?
- Is it updated and trustworthy?
- In the case of collecting primary data, is there an adequate cost-benefit relation?

Step 7. Verify the horizontal logic

After steps 5 and 6, the selected indicators and means of verification should be summarized in the logframe matrix and the "horizontal logic" —the relationship between the objectives, indicators and means of verification— should be checked, and necessary adjustments made.

Step 8. Review the entire logframe

By this time, the entire logframe matrix should be filled out. The final step is to review the entire logframe for gaps in logic, clarity or adequacy of information. Here it is important to "step back" and try to view the completed logframe as an outsider would review it, and to make any needed changes to ensure that its logical, complete and easily understood.

Introducing the logical framework in agricultural research institutions

Several institutions use the logical framework in planning, monitoring, and evaluating agricultural research (Horton *et al.*, 1993):

- The National Bolivian Potato Program has used it for planning and review of its activities. The Bolivian Institute of Agricultural Technology has applied it in planning other research programs.
- The National Institute for Agricultural Technology in Argentina uses the logical framework for project planning, monitoring, and evaluation.
- Recently the logframe has been used for planning a research system in Ghana; manager and researchers were brought together to discuss the objectives of the plan, indicators, and means of verification.
- It is also used for planning and evaluating the SADC/ISNAR (South African Development Community/International Service for National Agricultural Research) training project in Agricultural Research Management in Africa.
- Most international agencies use it to formulate and manage their projects, including those in agricultural research.

A new management instrument, like as the logical framework, is not easily introduced in agricultural research institutions. A strategy to introduce the logframe must consider the following points:

- Make logical framework procedures and formats compatible with existing ones for preparing of projects and reports, budgeting, and personnel management.
- Training seminars and workshops on the logical framework and on the preparation and management of projects.
- Use of the logical framework should start out with a few pilot experiences in each region and address one national program. As to advantages become obvious, other persons will be more favorably inclined to use it. Those trained in the seminars and workshops will be able to train other colleagues.
- The first group to be convinced is the top managers, who can induce the use of this instrument in priority projects and programs.

Summary

This sequence focuses on projects as the central units that link the planning, monitoring, and evaluation process of agricultural research at the operational level.

The project was defined as a set of interrelated activities in which inputs (activities and resources) are specified for achieving specific results within a set time limit.

The project cycle was analyzed, identifying the following phases: identification of problems and research areas, preparation of proposals, review of proposal, approval and allocation of resources, implementation and monitoring, evaluation, and diffusion of results.

Efficient monitoring can only be done if the project has been coherently formulated. The logic that the project should have during its preparation phase was analyzed taking into account: clear formulation of problem within the framework of previously established priorities, adequate relation between the problem to be solved and the specified objectives, coherent formulation of objectives at different levels, appropriate formulation of hypotheses, appropriate relationships between objectives and the resources required for implementing the project, and the analysis of external factors or conditions that can affect the project's development.

The methodology must be clearly defined, and it must be adequate for the type of research project proposed.

The logical framework was proposed as an instrument to facilitate project preparation, monitoring and evaluation. The logframe structure was introduced, with the basic concepts that make up this structure: the initial situation, the objectives at different levels, the required inputs, the relevant assumptions or conditions that cannot be controlled but which affect the project's development, the indicators to measure the degree to which objectives have been fulfilled, use of project inputs, and the corresponding means of verification.

The "vertical" and "horizontal" logic of a project logframe was analyzed.

Indicators and means of verification for monitoring a project and their requirements were discussed in depth. In short, indicators must be relevant, valid, measurable, and independent.

The following stages were suggested for elaborating a project logical framework:

- Characterize the initial situation (the problem).
- Formulate objectives (elaborate the narrative summary, including goal, purpose, outputs, and inputs for the project).
- Identify relevant assumption for each level of objectives.
- Verify the vertical logic (among inputs, outputs, purpose, goal, and assumptions).
- Select indicators for verifying the achievement of each objective and use of inputs.
- Specify means of verification for each indicator.
- Verify the horizontal logic (among objectives, indicators, and means of verification)
- Review the complete logframe

Finally, recommendations were made to introduce use of the logframe in project design and monitoring in agricultural research institutions. These recommendations include: make procedures and formats compatible, train key personnel in the use of the logframe and in project management, incorporate this in some pilot experiences, and—prior to this—make sure that top management is convinced of the usefulness of the logical framework.

Sequence 3. Instruments for Monitoring: Progress Reports, Internal Reviews and Project Databases

Page

Flowchart for Sequence 3

Instruments for Monitoring: Progress Reports, Internal Reviews and Project Databases

Objective

✔ Critically analyze progress reports, internal reviews, and project databases as monitoring instruments

Contents

- Progress reports
- Internal reviews
- Project databases

Summary

Introduction

This sequence briefly presents three monitoring instruments frequently used in agricultural research in Latin America and the Caribbean. Information provided on each instrument will enable participants to have analytic tools and evaluation criteria applicable in their institutions.

Each monitoring instrument should be used as a component of the PM&E system as a whole. Therefore, the design and effectiveness of each one must be considered in terms of its contribution—jointly with other instruments —to PM&E, and to improving management and the performance of researchers.

Instruments used should not become a bureaucratic burden. They should be as simple as possible, be compatible, always provide feedback to researchers, and help support researchers, managers, and directors in performing their work.

Analysis of the 13 PM&E case studies in the Americas shows that different monitoring instruments are used at different institutional levels (project, program, and institute) (Table 8).

For example, field visits are most common at the project level, while meetings of directors are most common at the institute level.

Monitoring activities tend to be more frequent and involve more detailed information at lower levels; they are more general and less frequent at the institute level. Information generated at lower levels of the management hierarchy is transmitted up to higher levels, where it is aggregated for use in planning, evaluation, and decision making related to on-going activities.

Case studies conducted indicate that written reports and internal reviews are frequently used in research institutions, but have several deficiencies in their organization, management and the use of information presented. Researchers and persons in charge of projects, programs, and institutions invest a great deal of time in meetings and in preparing reports. However while these meetings and reports may satisfy external information requirements, they seldom are useful for improving the managament

Table 8. **Monitoring instruments and level at which they are organized (Org) and implemented (Imp)**

	Institution		Program		Project	
Instruments	**Org**	**Imp**	**Org**	**Imp**	**Org**	**Imp**
Management committee	X	X				
Internal review	X	X	X	X	X	X*
External review	X	X				X*
Quarterly or bi-annual report	X					X
Annual report	X	X		X		X
Project databases	X	X		X		X
Regional council meetings	X					
Field visits			X		X	X

* Internal and external reviews are sometimes organized for major projects with external funding.

and outputs of research. In this Sequence we offer some recommendations for improving reporting and internal review procedures.

The increasing demand for information on research programs, the need to modernize management, and the development of information technology have motivated and facilitated the establishment of computerized information systems in agricultural research institutions. Experience has demonstrated that for monitoring, the research project is the most appropriate unit for generating and analyzing information. The research project brings together persons in charge, input application and production results. Therefore efforts are being made throughout most of the region to develop databases with information on projects. To date experiences have been mixed; some have been successful, others have failed, but have allowed for the establishment of criteria on the design and operation of project databases in future.

Progress reports, internal reviews, and project databases were selected in the development of this sequence as models of monitoring instruments. With the concepts presented, participants will be able to analyze the design, application, and use of other instruments that might be more useful in their own institutions.

Progress Reports

Research results must be communicated in one way or another, through written reports, oral, or visual presentations. The most common way of presenting information on a research project is the written report, which can be supplemented with oral presentations and audiovisual aids.

People at different decision-making levels in research institutions normally invest significant amounts of time in preparing progress reports. However, they consider preparing reports as a bureaucratic and not very useful activity since those that receive the reports seldom show much interest in their content, make no comments on them, and seem to disregard them in decision making.

Uses

Reporting involves the collection and analysis of information related to agricultural research activities, resources, and results, and its presentation so as satisfy the needs of different groups or audiences. Research results may be recorded and presented to scientists, managers, producers' associations, goverment agencies or donors. Reports can allow managers and others to compare research progress to pre-established objectives and goals, to identify significant deviations, and to take the necessary actions. However, often reports seem to be filed, unread, and there seems to be little followup.

Since researchers seldom feel that their report are used, report preparation is generally seen as a tedious, unproductive requirement. However, it can be very useful in decision making, in consolidating and scientifically documenting research achievements and findings, and in disseminating results among the different research clients or beneficiaries. Preparation, presentation, and revision of reports can be a useful element in the scientific process and for professional development since it forces to periodically take stock of their work, it helps disseminate information during the research project's execution (cycle) and, it provides evidence on research findings and impact to interested audiences.

Types

Several types of progress reports can be useful in a research organization; for example:

- Technical-administrative reports
- Progress reports on research projects, programs, and institutions
- Final projects reports
- Special reports

Each type of progress report has its own style, contents, and difussion channel according to the audience to which it is addessed.

Technical-administrative reports

Generally, these are administrative and financial reports required by governments and donors, containing information on the expenditure of funds over a specified period of time, in addition to a brief description of the project's technical aspects. The project leader usually prepares this report and submits it for review to the institute's director, program leader, or donors. Its format varies depending on donors' requirements.

Research progress reports

Annual reports are commonly prepared by research organizations. Researchers may prepare an annual technical report on experiments and field trials. This is afterwards sent to research managers. Sometimes these reports are formally presented in annual program reviews or in other meetings and technical seminars.

This type of report generally summarizes a research project's achievements during the year. It commonly includes technical information. Its analysis and the interpretation of data collected throughout the year allow managers to evaluate the project's scientific quality. It can also include financial information to compare the use and expenditure of resources with what had been planned.

Annual reports for research projects can be consolidated to prepare program reports and the institution's annual report.

The format used to prepare annual reports should not be complex, while emphasizing the information considered important. The use of standardized formats facilitates comparison, synthesis, and the aggregation of information to be used at the upper management levels, i.e., the program or institution. (This standardization is also essential for computerized management information systems.)

Final project report

Ideally, at the end of a project a final report is prepared which summarizes the project's activities, and principal achievements. Such a report complements the routine progress reports, but should be more lengthy, substantive and analytical. In addition to presenting the project's initial objectives, justification, methodlogy and expected results, a final report should contain information and conclusions on the following topics:

- Primary experimental data collected during research (for future use by other researchers.)
- Important scientific achievements and findings of significance for policy makers.
- New research areas for future projects.
- Lessons on the project's execution that can serve for other projects
- Indicators for future impact analysis.

Content of a final project report:

- *Project or activity title*
- *Report summary*
- *Objectives and expected results*
- *Methodology used*
- *Main achievements and findings*
- *Problems and possible solutions*
- *General conclusions*
- *Financial summary (for administrative reports)*

This report should start with an "executive summary" of the most significant findings and lessons.

From a strictly research stand point, final project reports are perhaps the most important of all reports prepared by an agricultural research organization. However, in practice they are seldom prepared, because when a project is completed, project staff are quickly deployed to other activities.

Special reports

Some special reports related to project execution may be needed. For example, a field evaluation report can be prepared by the evaluator during a visit to an experimental site to observe research work. This report may include comments on research design, execution, achievements, problems and recommendations. A technical report describing details of a technology recommended to farmers, can be prepared by a researcher. It might specify the agroecological and socioeconomic conditions for which the technology is designed, as well as benefits that may be derived from it. An impact study can be prepared by an evaluator after research results have been disseminated, to estimate the use and effects of technologies on production, consumption, employment and the environment.

Preparation

Agricultural researchers should not limit themselves to studying problems and finding solutions, they should also communicate results to those who can benefit from this information (Arnon, 1978).

This section will present five aspects of preparing and using progress reports.

- Incentives for preparing good reports
- Formats and instructions
- Periodicity
- Audience and style
- Reports at different decision-making levels
- Distribution and use of reports

Incentives for preparing good reports

The presentation of progress reports is considered in many organizations as a bureaucratic obligation, and not as an opportunity to review research, improve on it, or distribute its results. What is needed is to give clear signals that progress reports are valuable instruments for research management and the diffusion of results.

Experience in different organizations shows two very important stimuli for preparing progress reports:

- The **use of reports** in decision making and preparing other synthesis or diffusion documents.
- **Comments and reactions** from managers on the reports presented by scientists.

These types of positive stimulation in a research organization are much more effective than the obligation to present reports.

Formats and instructions

The advantage of using **predefined formats** for preparing reports is researchers can quickly fill them out and managers can quickly compare results presented for different projects. However, standardized formats may hinder reporting unexpected events or situations not included in the predefined categories or items. Therefore, even where most aspects of preparing reports are standardized, a certain level of **flexibility** should also be possible.

Formats have the advantage of orienting report preparation. Brief instructions can facilitate comprehension for preparing the report and allows for unification of the most important criteria.

The inset is an example of a format for a bi-annual progress report.

Bi-annual Progress Report

Program ______________________________

Project ______________________________

Person(s) in charge ______________________________

Objectives for the period ______________________________

____

Progress in relation to objectives ______________________________

Activities planned for next period ______________________________

____

____

Required modifications (budget, schedule, methods, etc). ______________________________

Frequency of reports

The frequency of progress reports depends on the purpose, type of information, and audience to which they are addressed. For example, project progress reports are usually more frequent than those for institutions. Reports can be prepared according to fixed schedules, or at crucial moments during the execution of research . They can also be done at different management levels for several purposes.

Progress reports are generally prepared quarterly, bi-annually, or annually, depending on administrative requirements. Progress reports on agricultural research activities should be schedule in relation to agricultural growth cycles. Experience indicates that annual reports are generally more useful than more frequent ones.

Audience and style

Reports have different audiences and each audience has specific information needs. The style and format of a report should depend on the audience, in such a way that the person interested can quickly and efficiently find and comprehend the information he/she needs.

Following are some of the audiences for which research reports are prepared.

- **researchers** working in related areas and whose language is generally technical;
- **extensionists** in charge of transferring practical knowledge to farmers
- **planners** who need to keep up-to-date on research progress and who needs this information to plan future research.
- **professors** in agricultural schools who need to update their knowledge and transfer it to their students;
- **farmers,** who are the main intended beneficiaries of the research process;
- **managers** who need the information to guide and control activities at different levels in their institution;
- **donors** who require information on the use of resources they have provided.

Reports at the different decision-making levels

Reporting is a critical activity at different management levels. Good management requires a flow of information from the researcher level, where experiments are conducted, to the higher administrative levels, where decisions are made. During this flow, information has to be synthesized and "translated", having the user in mind.

This flow of information can link different management levels through summaries and syntheses (for the institution, center, or experiment station) based on technical research reports (prepared by researchers). Research managers at each level can supervise the preparation of reports by researchers and consolidate a clear summary report to be delivered to the managers at higher levels.

Methods and technical data predominate as subjects in discussions among researchers; but what the upper levels need is a more general vision of progress and the problems related with project. Therefore, the focus of monitoring at higher levels is on the main progress elements, the breakthroughs and results achieved, and on problems found. Research results and achievements have to be translated here to relate them directly with users' needs and decision making. Clear summarize must be included and the content must be adjusted to the needs and interests of specific audiences at each management level.

Distribution and use of reports

The way reports are distributed is crucial to decision making. A monitoring system should be developed in such a way that it reaches all management levels with reports on relevant information at the moment required.

Preparation and distribution of reports is expensive; thus, reports must be designed for specific users. They should be distributed on time to the appropriate users for decision making.

Often, the worste failure of a monitoring system is not using the information generated. This generally happens because information does not reach the person who needed it, does not arrive on time, or is not properly prepared (brief, clear, and synthesized).

These problems highlight the importance for those who request and distribute progress reports of periodically evaluate the usefulness and use of these reports to those who receive them. Based on these periodical evaluations, procedures for preparing them can be improved and thus increase their usefulness.

Problems

The value of progress reports is frequently underestimated by researchers and managers. Consequently, institutions do not assign a high priority to preparing reports. As a result, many research findings are not documented in a way that could be useful for research administration.

Progress reports are more useful when they become integrated through the flow of information with decision-making at the different levels of the national research system. In this sense, the style and contents of progress reports must be consistent with future users' needs.

Some common problems of progress reports are:

- *Standardized formats do not exist or are not used.*
- *Reports are not presented at the right time*
- *Quality of reports is poor: little substance and analysis, and poorly written.*
- *Synthesis reports are not prepared at the program or institution levels.*
- *Reports are not used to make decisions and scientists do not receive feedback information.*

It is advisable that the preparation of progress reports be linked to other management instruments (i.e., annual reports to be presented during annual revision meetings) so that information flow takes place in decision making at different execution levels. Reports thus become useful tools in research management and accountability.

Requirements for reports in the organization should coincide if at all possible with those of donors. This is important because it avoids duplicating efforts and makes the process of collecting, analyzing, and writing up information more efficient.

What makes a good report?

Summarizing the main points covered in this section, a progress report can be evaluated on the basis of the following criteria:

- Complementarity with other management instruments.
- Adequate format and organization.
- Appropriate frequency.
- Style in accordance with audience.
- Content relevant to audience.

Internal Reviews

Internal reviews are meetings conducted at the level of agricultural research projects, programs or institutions with the object of monitoring the development of activities conducted, discussing highlights and results, identifying problems and opportunities, enhancing motivation and interaction among researchers, and providing inputs for evaluation and reprogramming. Periodicity of these reviews varies, depending on the research activity to be evaluated and the institutional level at which it is developed.

Internal reviews are an excellent means for stimulating professional dialogue, achieving consensus on program issues, and generating information for planning and evaluation. Internal reviews are a monitoring instrument frequently used in agricultural research institutions in the region. However, in many cases, internal reviews are poorly organized, documentation is inadequate, or there is litlle followup after the event.

This section analyzes the objectives and uses of internal reviews in monitoring, and provides criteria for evaluating the organization, development, and results of an internal review.

Uses

Internal reviews can be used in at least seven ways:

- Checking on activities and results
- Problem identification
- Identification and analysis of possible solutions
- Re-evaluating priorities
- Annual planning
- Documentation
- Motivating and guiding scientists

Checking on activities and results. The first use of an internal review is verifying the fulfillment of activities and results in relation to goals established during planning. Therefore, the existence of plans is fundamental for an internal review. Plans should have clearly established objectives, goals, and chronograms for the agricultural research unit to which monitoring will be applied.

Monitoring of agricultural research activities should include at least four dimensions:

- **Context** - justification of work, main assumptions, and current situation.

- **Objectives and design used.**
- **Implementation** - activities carried out, problems and solutions.
- **Results** - in quantity and quality, with relation to objectives.

It is advisable to provide part of this information to participants in advance so that the meeting can concentrate on substantial issues. Conclusions should arise during discussions, and consensus reached among the persons in charge (researchers) and reviewers.

Problem identification. A second use for internal reviews is detecting problems limiting the achievement of objectives. Problems may be classified according to their origin:

Internal problems - for example, the experimental design was not adequate to produce the information required.

External problems - inputs took longer than expected to arrive.

Other classifications may relate to the type of problems: conceptual (project design) vs. operational, or research design problems vs administrative problems. Identification of problems should be clear and precise, and avoid personalizing them. Persons in charge of project should identify, as far as possible in advance, the problems causing the greatest limitations in fulfilling what has been planned. Otherwise a review meeting can become to long and tedious.

Identification and analysis of possible solutions. After problems are identified possible solutions need to be identified and assessed. For example, the researcher could propose a new experimental design; the project head could authorize contracting extra personnel; the experimental station manager could allocate use of a new plot; the financial director could authorize additional expenditures. It is then necessary to consider if the solution is feasible. For example, constructing a drip irrigation system is not likely to be in an experiment station with financial problems. In each case, several alternative solutions should be considered (i.e., contracting temporary labor, or purchasing a harvesting machine).
When several problems arise at the same time, priorities must be established. Needs should be faced with the availability of resources. To optimize use of resources, reviewers should have as much information as possible on alternative solutions. Personal biases and preferences should be avoided.

Re-evaluating priorities. Re-evaluation of priorities, or objectives, in an internal review can arise from two different situations: (1) it is not possible to find a viable solution to the problem originally identified; or (2) changes have taken place in the environment.

Before suggesting a change of priorities or objectives, careful consideration should be given to the degree of autonomy of those participating in the review. Autonomy is limited at inferior hierarchical levels. For example, in an internal project review, autonomy is related to the methods and materials used, while a change in objectives should be submitted for consideration by the respective program.

Changes in priorities or objectives should be formulated in consensus with participants, considering the availability of resources and the coherence with priorities. Changes of this nature should remain within the general framework established during planning.

Thus, re-evaluation of priorities or objectives is not the end objective of internal reviews. If this is the conclusion, it must be considered as an intermediate product to be used in other instances of the PM&E process.

Annual planning. An important function of internal reviews is planning activities for the following period. In some institutions, two meetings are organized each year to avoid extending the length of each meeting. One is organized to review activities conducted during the previous period (generally one year), and another to plan activities for the following period.

Documentation. Another use of internal reviews is generating information for "institutional memory", for evaluations, and for future planning exercises. If internal reviews are combined with preparation of annual reports for research activities, a useful record can be created of research work and its results. Internal reviews can be effective instruments in preparing for external evaluations. Well-organized and documented, they can also be a useful for medium and long-term planning.

Motivating and guiding scientists. Internal reviews, with ample discussion among scientists and directors, can motivate and guide researchers toward institutional priorities.

Summary. The main contribution of an internal review is facilitating and institutionalizing communication among scientists and the different hierarchical levels of a research institution. Internal reviews are an incentive for compiling information and elaborating progress reports. They can also provide information for evaluations and for planning.

Organization

The usefulness of an internal review as a monitoring instrument basically depends on its organization and execution. These responsibilities must be assigned to a person or team.

Identification of objectives. All internal review meetings should have clear objectives (i.e., review all programs of a research institution, or review in depth all the work of a specific program). Themes to be covered should be established and then developed during the meeting. Both objectives and themes should be clearly transmitted to participants in such a way that each one of them can prepare the corresponding presentations and reports.

An internal review meeting should cover a limited number of objectives and themes. This is the only way to keep discussions, analyses, and recommendations sufficiently in depth to be useful for decision making.

Reviewing group. An internal review, generally speaking, is an extensive exchange of information among members of a program or institution; in this sense it serves as a self-evaluating group mechanism. Nonetheless, the process may be formalized by forming a review panel. The panel group must have a chairperson in charge of directing the meeting, and a number of other reviewers. (as a general rule, four or less.)

The panel's chairperson should be a good leader with knowledge of group management. The reviewers should be familiar with the review's objectives and know the subject matter being treated. At least one of the reviewers should have the capacity and authority to make high level decisions to guarantee the viability of recommendations (for example, the institute's director could be included in the review panel).

Occasionally, persons that do not belong to the unit being reviewed are included in the review panel. This has its advantages and disadvantages. Advantages may come from the objectiveness of the person that has not been involved in internal unit operation. Disadvantages arise from inhibitions that participants may feel during the discussions in front of "outsiders."

Documentation. Prior to the meeting, all participants should receive appropriate documentation. Clear and concise progress reports can help shorten the length of presentations and focus discussions on relevatn subjects. This documentation can include reports prepared in previous reviews, especially if one of the objectives is to follow up on previous recommendations.

If reviewers receive reports beforehand, they can prepare comments and suggestions. The meeting's co-ordinator is responsible for ensuring that documentation is circulated on time. To ensure subsequent use, a file should be kept of all information given out for the internal review.

Oral presentations. Establishing and abiding by time limits for presentations is very important, to allow sufficient time for discussions, analysis, and preparing recommendations.

Speakers must receive appropriate instructions on the time available and the content. The co-ordinator should recommend that presentations be as specific as possible, emphasizing the presentation of results and future implications, and avoiding methodological details (i.e., treatment replication records).

As a rule, brief presentations (10 to 20 minutes) are more effective than long presentations (over 30 minutes). To be informative and effective, presentations must be well prepared and structured. Visual aids are also very helpful.

During agricultural research reviews, field visits are frequently advisable. These can be supplemented with a presentation to highlight its objective or make it clearer. In many cases, this has to be replaced by visual aids (photos or videos) because of time limits, logistical problems and costs.

The review panel should evaluate presentations in both terms of their, content, and their presentation. Most agricultural research institutions have communications units or departments.

Communications personnel can play an important role in preparing the meeting and its presentations.

Managing the meeting. The effectiveness of an internal review depends greatly on how it is managed. The meeting should focus on presentations and discussions which enhance the formulation of constructive criticisms and practical recommendations.

The meeting's chairperson should avoid the polarization of discussions and should promote the participation of junior research personnel. Interventions should be short and precise, and within the subject established in the agenda. Discussions should be interrupted when information is sufficient to arrive at a conclusion or make a decision. Personal references should be avoided, or references to facts different from those in the development of the work.

Each session should be managed by a chairperson. A secretary should take notes of main points of discussion, and write down conclusions. At the end of each subject or at the end of the meeting, either the chairperson or the secretary should make a summary of the conclusions drawn and the decision taken.

Flexibility is needed within the general program for adequate discussion of subjects arising during the meeting.

Size of the meeting. Beyond a certain number of persons and a certain number of themes, an internal review can become innefective. Discussions in meetings that are too large tend to be so brief and superficial that they have little value for evaluation or decision making.

The optimum size of a review meeting depends on review objectives, the know-how and ability of organizers, the facilities available, and the meeting's organization and dynamics.

For example, if the objective of a meeting is a thorough revision of a project's methods and results in relation to its objectives, it may be best to organize a small meeting with detailed presentations and sufficient time for discussions and field visits. On the other hand, another meeting may be organized at the program or research center level to improve communication and team work. In this case, the depth of discussions may be sacrificed to allow all team members to have the opportunity of presenting their work and learning about the work of others.

Reports. All internal reviews should produce a concise yet substantial report, highlighting the review objectives, the subjects treated, the review methods, and the conclusions and decisions arrived at. The object is to document the information exchanged to formalize decisions made and to facilitate the required follow-up. The report is also an instrument for communicating with other units and institutional levels, particularly if legal or administrative support is required.

The institution should establish a format for internal review reports, to enahance the institutional memory and to allow comparisions to be made over time.

Institutionalization. Internal reviews require a variety of resources, among them, scientists' and managers' time, meeting rooms, and office supplies. To guarantee the availability of these inputs, internal reviews should be backed by management and be considered as an integral part of institutional activities. Internal reviews must have continuity and periodicity depending on other institutional activities; i.e., budget and planning.

Summary. The objectives aimed at must be clearly established in preparing an internal review. The subjects to be covered, the documentation, and review mechanisms should be provided to participants. To guarantee an internal review's success, panel participants, especially of the meeting's co-ordinator, should be selected on the basis of leadership skills and know-how. The meeting should be conducted in such a way that it allows ample and open discussion among all participants, but is focused on central subjects. The review should produce conclusions and decisions which are documented in a report and followed up on.

Use of results

The conclusions and recommendations of an internal review must reflect themselves in decisions made in relation to planning, implementation, and evaluation of research activities. Therefore, utilization of the information generated and analyzed during an internal review depends on how this event is integrated into the research and institution's decision-making processes.

For the results to be used, internal reviews must be seen by both higher level managers and by scientists as an important source of information and a sound analysis mechanism. Also, they have to be designed and managed as an integral part of a PM&E system.

Ideally, all projects to be reviewed have been formulated with common norms and formats. Also, all research indicators and criteria for evaluating results should be previously established. Operational plans should be used as a point of reference in internal reviews at the research program level.

Information generated by an internal review should be presented in a such way that it can be incorporated into the institution's monitoring process. It must be an instrument of information for researchers and thus the event's co-ordinator is responsible for guaranteeing that everyone participates and that the report is distributed among all those interested.

What makes a good internal review?

As any institutional event in which resources are used, internal reviews should be evaluated. This evaluation should be conducted by participants, bearing in mind previously established criteria such as:

- organization and coordination.
- conformation of the evaluating group.
- conduction of the meetings.
- availability and timeliness of background information.
- quality of oral presentations.
- coverage of objectives and subjects proposed.
- conclusions drawn and decisions taken.
- utilization of results.

Project Databases

The concept of Management Information System was introduced and defined before, in Sequence 1 of this module. This section discussed the use of an information system at the project level as an instrument for agricultural research monitoring. This type of database is called a Project Database.
All agricultural research organizations have some type of filing system with information on projects or activities. These systems normally have sets of cards or paper files, with descriptions of on-going studies and progress reports. Today's tendency is to organize by project and use information systems employing computers and databases (Figure 12), which increases the number of variables that can be included, and eases storage, analysis and preparation of reports.

*A **project database** facilitates organized storing of information, to generate different types of reports with different combinations of variables.*

Figure 12 highlights the fact that a good project database does not necessarily have to have a computer; however, they are recommended in view of the low cost today and the growing availability of personal computer and commercial software.

Uses

The project database has several potential uses, but the most valuable is **supporting** decision making at different levels in the organization. A project database that contains information on on-going projects and programs, their costs, expected benefits, and results achieved to date, can be very helpful for making decisions in various areas, like the following:

- Planning and setting priorities
- Technical-scientific decisions on research
- Monitoring and evaluating projects, programs, and organizational units

Usefulness of Project Databases

- *Support decision making*
- *Filing of scientific information*
- *Production of reports*

Other uses are filing scientific information and producing reports of several types. Some of these are scientific, others are administrative.

Design and operation

Certain requirements need to be met for designing and operating a project database. The main one is organizing research by projects. This may sound a little redundant. But it is important to note that in most cases, agricultural research is not organized by projects, but by activities under the responsibility of individual researchers, or by programs that rarely have clear definitions. Thus, a common prerequisite is defining the basic research unit as the "project".

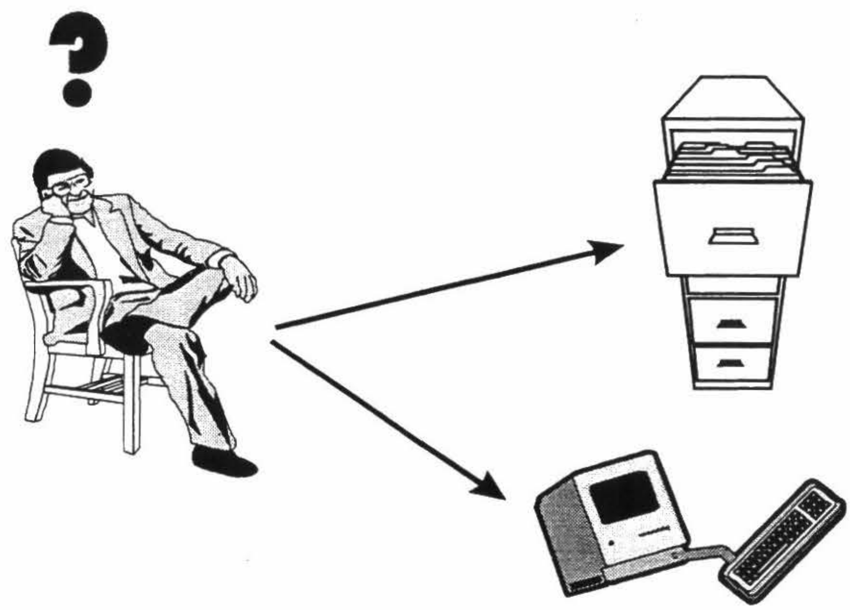

Figure 12. Types of project databases

The other prerequisite is institutional commitment at the director level. A project database not only requires resources, but also decisions on research organization, and the flow and use of information for decision making.

Designing the system

Designing a project database requires making decisions on the following points:

- Type of information to be generated.
- Degree of integration with accounting.
- Compatibility with other databases.
- Degree of decentralization.
- Technical design.

Type of information to be generated. The most important decisions in establishing a project database, as with a Management Information System, refer to the type of information and reports that the database must generate. This normally reduces the question to "What is it that you want to know?"

This decision is very important. Therefore, mistakes in answering this question, or never asking the question (!) frequently leads to the creation of databases which are of little use to managers and researchers and which are quickly abandoned.

Many projects databases are "underutilized". This may be because researchers and managers do not know how their information might be used. But more often it is because their design was inadequate, and they cannot provide timely and useful information.

In designing a project databse, it is important to begin with the types of information which are most frequently requested over time, and to leave special-request data for later.

Most agricultural research managers know what type of information is most often requested.

For example, relevant information for the Office of the Director General may include:

- Total budget by program and project.
- Use of human resources by program and project.
- Cost of research by program and project.
- Training activities.
- Inventory data..

In contrast, a scientist in charge of a Program, may want to know for each project:

- Current objectives.
- Schedule of activities for the year.
- Percent of budget spent to date.
- Results obtained to date.

A Center Director may require the same type of information as a Director General or program leader, but at the center level.

A project database needs to be design to satisfy these types of information requests. Additionally, recurrent information requests from external donors (government, producers, international agencies) need to be incorporated. This may imply, for example, having to separate budget information by financing source.

Degree of integration with accounting. Another critical aspect of a project database is the degree to which it is integrated with the institution's accounting systems.

Traditional financial and administrative systems often have accounting formats that are not compatible with the requirements of project management. For example, a typical accounting report may include information on total expenditure on salaries in an institution, but cannot indicate the cost of a project or program.

The current tendency in research institutions is to introduce budgeting and accounting by project. This can be a source of conflict due to the partial delegation of power from the accounting administrator into the hands of project or program leaders.

Accounting systems do not have to be completely integrated with the project database. They can be independent systems, as long as they produce the desired information, aggregated on the same criteria used in the project database.

Compatibility with other databases. There are probably at least as many databases as institutions. It is impossible to design a database that is compatible with all others. But efforts should be made to make project databases compatible with other managament databases in the institution (e.g. with those for human resources and accounting) and with those of major funding sources and oversight functions (e.g. the ministry of planning).

Figure 13 shows the relationships of project databases to the different levels of information storage.

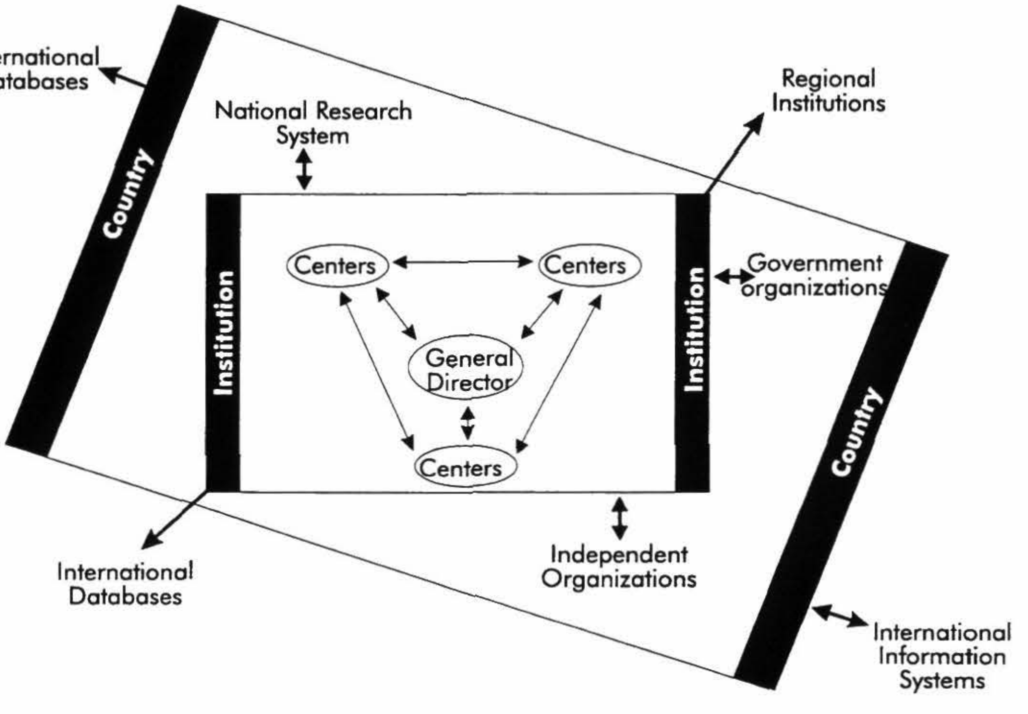

Figure 13. **Relationship among project databases**

Degree of decentralization. The ideal is a unified design with implementation decentralized. This is technically possible thanks to advances that enable communication among different units through network connections.

Sometimes top managers consider that the most important information is that which they need for decision making at their level. In such cases, researchers may view a project database as a control mechanism. This is bound to limit the value of a project database for monitoring research activities.

Decentralization decisions must consider all the processes involved: data collection, storage, and processing and the production of reports. Some processes can be centralized, while others are decentralized, depending on the information and expertise available at each level.

For example, one alternative is to collect data at the regional level, storing and processing them at the central level. Another alternative is to delegate responsability for certain analytical processes to the regions and provide researchers access to certain information on their computers.

Technical design. Many options exist for the technical design of an information system at the project level. Decisions on design are important since their execution can imply large investments in hardware and software, in addition to personnel training. Once these investments have been made, it is difficult to change the system and its operation without discarding the initial investments.

Some institutions have made complex designs, covering a large number of variables to generate specific reports using mainframe computer. But after a few years, institutional needs changed and different reports were needed. Often they could not be produced because the software would not take these changes. Today the tendency is toward the use of personal computers and more flexible software, that permit more flexibility in data processing and the reports produced.

In another case, software selection has been made without considering the capacity of available computer equipment. When the capacity of the equipment or personnel is inadequate, data processing is slow and may not be possible to produce the required reports.

Critical decisions on design:

- *Information to be generated.*
- *Integration with accounting.*
- *Compatibility with other databases.*
- *Decentralization.*
- *Technical design.*

System operation

Operating a project database requires three basic activities:

- Collecting, entering, processing, and storing data
- Periodical updating of files
- Production of reports

Collecting, entering, processing, and storing data. These are the daily tasks of database operators. The validity and usefulness of the information stored in databases depends on the rigor and care with which these activities are conducted. Procedures for these activities must be included in designing the system. Also, the only way to assure high quality information is through the careful and rigorous administration of the project database operation in all its aspects.

Periodical updating of files. An important aspect in designing a project database, and one that has many implications for its operation, is the mechanism for updating files. With what frequency should new projects be added? Two extreme options would be annual updating, or daily updating. Another decision needs to be taken on the frequency and procedures for updating existing files.

Production of reports. The term "report" is used for two main products of project databases: routine reports (such as project lists and cost estimates of research conducted at different research centers and programs), and specialized reports produced on request for managers, scientists, and other users (such as donors).
Planning and producing reports that meet the requirements of different groups of users is very important in terms of their periodicity, content, and form.

Desirable characteristics

A good project database provides the information required, in the format required, and at the appropriate time and at an acceptable cost. General criteria are effectiveness and efficiency.

Institutional characteristics. For a project database to be effective and efficient the project must be the basic unit in research management, both in technical-scientific terms as in administrative terms. A quick verification can be done by consulting a project leader and finding that he has updated information at hand that allows him to control project activities on time.

__Effectiveness__ involves producing the right information at the right time for decision making or other uses at each institutional level. __Efficiency__ involves delivering this information, at the lowest cost possible.

Characteristics of the database itself. The database must be **flexible** to allow entering additional information during project execution, as well as entering new projects. Access to information should **not be complex.** Existing information should be easy to manage and even a non-qualified user should be able to enter the information. This avoids the situation where only a few can have access to the information and makes decision making more transparent.

Characteristics of the data. The data must be **valid**, in other words, they must be reflect the actual activities of the institution. Data must be **relevant** to facilitate decision making, and must be **updated**, that is, correspond to a period of time that is relevant for decision making. Information that is available too late is of only historical value. Timeliness requires efficient information collection, storage and analysis.

Characteristics of the database operation. An efficient database outputs information quickly, even where several different variables need to be combined. Decision making often needs this speed and flexibility. Another desirable aspect is that database operation are affordable.

Characteristics of the database's outputs. Reports from the database are its final objective. Reports should be able to combine variables requested by users. Rigid databases that can only produce routine reports on a fixed schedule quickly become obsolete.

Experience indicates that the **cost of research is a key variable** which a project database should be able to provide. Many reports on resources are of little use if they do not include the cost figures.

A final point: One must never forget that the researcher is the key manager of his/her own projects and activities and he/she needs information to fulfill his/her management functions. Researchers also need feedback and encouragement. If they do not receive feedback information from the database, they will soon lose the incentive to provide the system with valid information.

Table 9 summarizes a project databases' desirable characteristics.

An institution´s project database should be flexible enough to satisfy changing monitoring and decision-making needs.

Table 9. Desirable characteristics of a project database

Institutional characteristics	•	Clear definition of objectives.
	•	Organization of research by projects.
Design	•	Flexible.
	•	Simple.
Data	•	Valid.
	•	Relevant.
	•	Updated.
Operation	•	Timely flexibile.
	•	Low cost.
Outputs	•	Reports on request.
	•	Useful for decision making.
	•	Include cost estimates.
	•	Feedback information to scientists.

Example

To illustrate the principles discussed above, an example is included on how a project database can be initiated in an institution, using commercial software for database management.

A central message of this sequence is that a monitoring instrument's usefulness depends on its relation to other instruments. In this case, preparation of research project proposals needs to be related to the project database. According to Sequence 2, the proposal should contain least the following types of information:

- Title
- Summary
- Individuals and units in charge
- Objectives
- Expected outputs
- Justifications and state of knowledge
- Methods to be employed
- Schedule of activities
- Required resources
- Methods and indicators for monitoring and evaluation

A central project database can be constructed with this information. The basic structure of the database could include the following:

- Program
- Project
- Unit in charge
- Researchers in charge
- Initiation date
- Date ended
- Estimated cost

Bi-annual listings could be generated from these data, with the following characteristics:

General information

Program	Project	Unit	Cost	Date ended

Information by resech

Program	Project	Cost	Completition date

Information by program

Project	Unit	Researcher	Cost	Completition due

Table 10 shows a hypothetical case for this exercise

Table 10. Bi-annual listing of general information of a project database, based on project proposals

Program	Project	Unit	Cost US$	Completion date
Rice	Pest control	Entomology	20.000	March 96
Rice	Weed control	Agronomy	45.000	December 97
Beans	Pest control	Entomology	15.000	April 96
Beans	Regional trial	Agronomy	100.000	January 98
Cattle	Complement	Nutrition	56.000	August 96
Tech transfer	Fertilizer use	Agronomy	33.000	May 97
Economics	Competitiveness	Economics	10.000	June 98

If information were available on geographic location, for example, the basic structure of a project database could be broadened to generate a list by location, as follows:

Information by geographic unit

Program	Project	Cost	Date ended

It is important to find out who needs this information and what for in order to consider the additional cost of producing it vis-a-vis the benefits it would bring.

Summary

Progress reports, internal reviews, and project databases have been discussed in this sequence, as instruments for monitoring agricultural research. These instruments are frequently used to supervise programs and projects, in order to provide relevant and timely information to different management levels in agricultural research organizations.

Progress reports are mechanisms that put information on work in progress, in an appropriate format for specific audiences. Progress reports are important inputs for internal review meetings. Several aspects of format and content must be taken into consideration when preparing reports. The most appropriate style, frequency and content depend on the audience to which they are addressed. Different decision-making levels in an agricultural research institution have different needs. Progress reports should be prepared which are based on the needs of potential users. The timeliness and frequency of these reports should always be considered.

Internal reviews help establish direct relationships and dialogue among researchers, administrators, and program directors in an institution. This is done by organizing meetings where an agenda is developed covering the institution's activities and programs. Project or program achievements and findings are presented during the meeting, as well as problems found during the execution of activities, and possible solutions. An internal review should generate a report to transmit information to different management levels and to provide a basis for re-evaluating priorities and planning future actions.

Project databases are relatively new monitoring instruments. They are managerial information systems at the project level.

The basic monitoring unit in a project database is the project and the information generated by the information system relates to this project.

This section presents the mechanics of a project database, as well as its usefulness in terms of helping decision making and as a reservoir of scientific information. Also introduced are requirements, for designing and operating a project database. Characteristics of the system itself are presented at a more detailed level, including: the effectiveness and efficiency of a project database, components (i.e., data), characteristics, and the products it generates.

In agricultural research, one should not attempt use a single instrument for monitoring. A whole range of instruments are available which can be used according to institutional, program, or project needs. The ideal combination of methods or instruments is the one that best satisfies information needs in a research organization, and at the same time allows this information to flow to all levels: not only to the directors who make decisions on policies, but also to the researchers who conduct research activities.

Appendices

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Appendix 1. Terms Used in the PM&E Manuals

The training materials on PM&E use a number of general concepts related to agricultural research management. Not strictly limited to definitions of terms, they propose concepts that reflect the thinking of the authors in relation to the general theme.

Accountability
The obligation to report, explain, or justify something. The responsibility of an organization or its staff to provide evidence of research expenditures and performance to donors or higher levels of management.

Assumption
A fact or statement that is accepted as true. In relation to the logical framework, it is a statement about factors that can influence the achievement of objectives but which are beyond the control of researchers, such as political or economic policies or the availability of farming inputs.

Beneficiaries
People, households, organizations, communities, or other units that are affected positively by (or *benefit* from) a research program or activity.

CIPP evaluation model
A conceptual framework for improvement-oriented evaluation. CIPP stands for four kinds of evaluation:

- *Context evaluation.* Assessing the context of a program, identifying target populations and their needs, identifying opportunities and problems in addressing needs, and judging the responsiveness of goals and objectives to assessed needs.
- *Input evaluation.* Identifying and assessing alternative strategies, schedules, budgets, resource requirements, and procedural designs needed to accomplish the goals and objectives of a research activity.
- *Process evaluation.* Assessing the implementation of a plan by recording and judging ongoing activities and accomplishments in relation to the procedural design. It provides information helpful for changing operational plans during implementation.
- *Product evaluation.* Measuring, interpreting, and judging the attainments of a research activity. Intended to interpret the work and merit of an activity's final outcomes in relation to the needs of the group it is intended to serve.

Clients
The intended users of agricultural research products, generally including farmers, agribusiness entrepreneurs, policymakers, extensionists, and consumers.

Criteria
A standard of judgement. The basis for a comparison, a test or an evaluation.

Decision-making level
The level within a research organization or system (for example, the level of the researcher, project manager, experiment station or institute manager, or policymaker) at which a particular decision is made, or to which an evaluator reports.

Effectiveness
The degree to which an activity, project, or program attains its objectives. The extent to which outputs are obtained and effects achieved in relation to objectives.

Efficiency
The degree to which an activity produces outputs at the least cost.

Evaluation
Judging, appraising, or determining the worth, value, or quality of research — whether it is proposed, ongoing, or completed — in terms of its relevance, effectiveness, efficiency, and impact.

Ex ante evaluation
An assessment done before research begins, usually in terms of its relevance, feasibility, potential impact, or expected benefits. Can be used to define a baseline against which progress towards objectives can be measured or to set priorities among several research areas.

Expert review
(See *peer review.*)

Ex post evaluation
An assessment of an activity or its outputs after the activity has been completed. The purpose is usually to estimate benefits in relation to costs.

External analysis
Sometimes called prospective analysis of the

external environment (or context analysis). The process of assessing and evaluating the external environment, to identify present and potential opportunities and threats, which can influence the institution's ability to achieve its objectives. (See also *organizational analysis.*)

External environment
In the case of agricultural research the macro-environment that affects an institution, program, or project. At this level, events are practically beyond the organization's control. Examples are governmental policies, consumption trends and development of new scientific knowledge.

External review
Evaluation of a research system, organization, program, or project carried out by persons from outside the unit being evaluated. Usually conducted by experts or peers, but research clients, supporters, or stakeholders may also participate in the evaluation.

External validation
The process by which internal decisions are discussed within external stakeholders, in order to confirm or revise them. In strategic planning, conclusions about threats and opportunities, and the mission, objectives, and policies are generally validated externally.

Formative evaluation
An evaluation aimed at providing information to planners and implementors on how to improve an ongoing program or project.

Gap analysis
An assessment of the requirements of a research plan in terms of the resources needed (financial, human, and physical) to achieve the desired goals.

Goal
Used in the logical framework, a goal is the ultimate end or objective towards which a research activity, project, or program is directed. It is usually something like improving incomes for farmers. (See also *objective*, *purpose* and *output.*)

Impact
The broad, long-term effects resulting from research, usually economic, social, and environmental.

Input
In terms of the logical framework, inputs refer to the resources needed to implement a project, including personnel, operating funds, facilities, and management.

Institutional sustainability
An organization's condition of being accepted and considered legitimate by society. Institutional sustainability has several requirements including (a) an institutional project (clearly defined mission, objectives, policies, and strategies); (b) institutional competence; (c) institutional credibility.

Institutionalization
A process that impersonally establishes a structure, plan, program, project, or activity in the day-to-day operation of an organization.

Internal review
Evaluation of a research project, program, or organization that is organized and carried out by the management and staff of the unit. (See also internal program review).

Logical framework
Often called the *logframe,* it is a tool for planning, monitoring, and evaluating projects in the broader context of programs and national goals. It clarifies the logical links between project inputs and a hierarchy of objectives: direct outputs, broader purposes, and the ultimate goal.

Means of verification
The sources and methods used to obtain and assess information about the achievement of research objectives.

Metaevaluation
Critical assessment and overview of evaluation procedures and experiences. Metaevaluation is done to learn from past evaluations and improve future ones.

Mission
The offiCial statement of the reason for an organization's existence — its basic goals and purpose. (See also *strategic planning.*)

Objective
The expected output, purpose, or goal of a research effort; something towards which efforts are directed. Objectives may also be specific operational

statements regarding the desired accomplishments of an activity. (See also *goal, output* and *purpose.*)

Objectively verifiable indicator
Specific measures of progress or results at a specific level of a project's hierarchy of objectives.

Ongoing evaluation
Evaluation carried out during implementation of an activity. It involves observing or checking on research activities and their context, results, and impact. Ensures that inputs, work schedules, and outputs are proceeding according to plan (in other words, that implementation is on course). It also provides a record of input use, activities, and results and warns of deviations from initial goals and expected outcomes. (See also *monitoring.*)

Operational planning
A process for defining what an organization intends to accomplish, how and when this will take place, and who will be held accountable.

Organizational analysis
Internal analysis carried out by gathering and assessing information on the inputs, processes, and products of an organization. The purpose is to identify strengths and weaknesses in relation to opportunities and threats posed by the external environment, and in relation to the organization's objectives.

Output
The specific product or service that an activity produces or is expected to produce. Used in the logical framework to refer to specific results for which the project manager may be held accountable, such as the release of a new maize variety. See also *goal, purpose* and *objective.*

Participatory management
Creating a culture of effective participation of an organization's members at all levels. It involves sharing ideas and responsibilities, and getting members' commitment to design and carry out activities that will contribute to institutional objectives and bring about desired institutional changes.

Peer review
Process by which the scientific merit (conceptual and technical soundness) of a research proposal, publication, or activity is evaluated by other scientists working in the same or a closely related field.

Planning
A process for setting organizational goals and establishing the resources needed to achieve them. It is also a way of building a consensus around the mandate, direction, and priorities of a research program or organization.

Policies
Major guidelines for reaching ends in accordance with priorities. Policies should be formulated after, or as a consequence of, the formulation of the organization's mission and objectives. Policies give direction to decisions on inputs and processes.

Products
Specific goods or services produced by an organization program, project or activity. (See also *outputs.*

Program
An organized set of research projects or activities that are oriented towards the attainment of common set of objectives. A program is not time-bound, as projects are, and programs are higher in the research hierarchy than projects.

Programming levels
The areas that encompass activities of an agricultural research institution, according to the specificity of the objectives. The two most common levels are projects and programs.

Project
A set of research activities designed to achieve specific objectives within a specified period of time. A research project is composed of a group of interrelated research activities or experiments that share a rationale, objectives, plan of action, schedule for completion, budget, inputs, outputs, and intended beneficiaries.

Project cycle
A framework for planning and managing projects. It is composed of distinct phases through which a project moves during its lifetime. Variations of the project cycle are used to manage large-scale investments, development-agency activities, and various kinds of research.

Project management
A framework for the systematic planning, implementation, monitoring, and evaluation of research projects and activities.

Purpose
The desired effect or impact of a project. (See also *goal, output,* and *objective.*)

Quality control
A set of planned and systematized activities to guarantee that the products and services of an institution will fulfill the expectations of the public, beneficiaries, and stakeholders.

Relevance
The appropriateness and importance of research activity's objectives in relation to broader (e.g. regional or national) goals or clients' needs.

Scenario
The simulation of a probable future situation, in the context of the institution's location, taking into consideration the interaction among economic, political, social, and cultural factors, and how these may affect the institution's ability to act.

Stakeholders
Groups whose interests are affected by research activities. The stakeholders of a research organization include staff members, farmers, and extension agents, among others.

Strategic planning
A process by which an organization builds a vision of its future and develops the necessary structure, resources, procedures, and operations to achieve it. The process is generally participatory, and based on analyses of the external environment, the organization, and "gaps". External opportunities and threats and internal strengths and weaknesses are assessed. This is followed by formulation of the organization's mission, objectives, policies, and strategies. Strategic planning is long-term in nature (e.g. for 10 or more years.) It serves as a base for tactical and operation planning. (See also *tactical planning* and *operational planning.*)

Strategy
A course of action involving a logical combination of actors, factors and actions chosen to reach a long-term goal or vision. It is important to distinguish policy from strategy. Policies are general guidelines to achieve given objectives. In addition, Strategies incorporate a logical sequence of steps. (See also *strategic planning.*)

Summative evaluation
A summary statement about the accomplishments, effectiveness, value, and impact of programs. Summative evaluations are made for accountability purposes and for policy-making.

Survey
A technique for gathering information from individuals or groups. It can be done by observing, administering questionnaires to, or having discussions with members of the group being surveyed.

Tactical planning
A process of organizational planning at the intermediate management level. The objectives, goals, policies, priorities, and strategies defined through tactical planning are for the medium term (generally 3-5 years); they are based on the strategic planning, and are the guidelines for the operational planning.

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