

A Self-learning Course

Planning and Managing Forestry Research

Volume II

Module 2

Initial Steps in Strategic Planning

Module 3

**Identifying Key Issues
for Forestry Research**

Module 4

**Producing and Disseminating
the Strategic Plan**



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PLANNING AND MANAGING FORESTRY RESEARCH: A SELF-LEARNING COURSE

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Planning and Managing Forestry Research
A Self-learning Course

Module 3
**Identifying Key Issues for
Forestry Research**



International Union of Forestry Research Organizations
Special Programme for Developing Countries
Vienna, Austria

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Identifying Key Issues for Forestry Research

List of study units covered in this module:

Study Unit 3.1.
Determining the research needs of users

Study Unit 3.2.
Distinguishing between information needs and research needs

Study Unit 3.3.
Assessing external and internal environments affecting research

Study Unit 3.4.
Identifying emerging issues related to natural resources and forestry

Study Unit 3.5.
Determining strategic issues and setting research priorities

Research organizations nearly always have some sort of formal or informal mission and goals that guide the overall direction and orientation of their research activities. Working within this mission, your organization most likely conducts periodic planning exercises to determine future research needs, and develops research programs to meet those needs. But are your research programs really addressing the key needs and issues important to the end users of your research results? Can you as research manager improve your organization's effectiveness and the relevance and utility of your research results?

In order to continue making substantial contributions to science and society, managers of forestry research must be able to look ahead to begin to answer the research questions of tomorrow. They must be able to anticipate changes in economic, environmental, social, and political conditions which will determine how forests will be managed and used in the future. Forest research managers who anticipate the future are better able to identify and plan for emerging research issues regarding sustainable forest resource development.

We designed this module to help you better identify the key needs of the end-users of your research (your clients), and orient your research programs to meet these needs. Linking your research activities closely to your clients' and stakeholders' needs can strengthen your research organization, result in increased popular and institutional support, and ultimately benefit the users of your research results.

In this module we'll present several valuable methods to enable you to better assess the research needs of your clients, and to make the results of your research programs much more useful and appropriate. You'll learn the difference between information requests and research needs, and how to satisfy each. You'll discover that scientists' perceptions of research priorities may not always agree with those of the research organization's clients. We'll discuss an important step in the strategic planning process—that of assessing external and internal environments that affect the research organization. You'll learn ways to identify and assess the importance of emerging research issues. And finally, we'll show you how to determine important strategic issues and how this information can be used to help set priorities on research.

Skill & Knowledge Assessment

Module 3 - Identifying Key Issues for Forestry Research



Below are listed a number of skill and knowledge statements derived from the objectives of the study units in module 3. These are identical to those listed for this module in Study Unit 0.3 - Self-assessment of Training Needs, which you may have completed initially to guide your course of study. Please read each statement carefully and indicate with a checkmark the level that best describes your current skill or knowledge, from 1 to 5, using the following descriptions

- 1 I cannot perform this skill, or I have not been exposed to the information.
- 2 I cannot perform this skill, but have observed the skill or have been exposed to the information.
- 3 I can perform the skill or express the knowledge with assistance from others.
- 4 I can perform the skill or express the knowledge without assistance from others.
- 5 I can perform the skill or express the knowledge well enough to instruct others.

If you would like to find out how much you improve your skills and knowledge by studying this module, we suggest that you complete this exercise before beginning the module. This will establish your current level of skill and knowledge about the topics covered in this module. At the end of the module there is an identical skill and knowledge assessment form which you can complete once you have finished the module. By completing and comparing the before and after assessments, you can determine the extent to which you have improved your skills and knowledge.

Skill or Knowledge Statement	Your Level of Skill or Knowledge				
	1	2	3	4	5
a) Describe the general differences between research users and scientists in their perceptions of research needs.					
b) Distinguish between information needs and research needs.					
c) Identify and assess potential issues, problems, and opportunities external to your organization, but related to its forestry research activities.					
d) Identify and assess the internal strengths and weaknesses of your organization in relation to potential programs of forestry research.					
e) Describe why the identification of emerging issues in forestry is an important step in developing an organization's strategic plan for research.					
f) Use a structured procedure (the Delphi System) to identify emerging issues that can be used as a basis for specifying research needs relevant to your organization.					
g) Explain the differences between basic, strategic, applied, and adaptive research.					
h) Develop a set of criteria appropriate for judging potential research programs and projects and setting broad research priorities for your organization.					

Determining the Research Needs of Users

Objectives

When you have completed this study unit you should be better able to:

- describe the general differences between research users and scientists in the perceptions of research needs;
- identify the research needs considered important from the perspective of the scientists in your organization;
- identify the users of your organization's research results, and determine the research needs important to them; and
- describe techniques that could be used by your organization to identify research needs.

In developing a strategic plan for research, there is a great temptation to rely upon the expertise within the research organization to identify research needs, including the needs of research users. However, experience has shown that a research scientist's or manager's views of research priorities don't always agree with the views of those who use the end products of research, particularly those who must actually try to apply the results of research to solve real life problems. Research organizations that pursue a research agenda based solely on input from research scientists may end up having little relevance to the actual needs of users. If a forestry research program is perceived by potential users as having little relevance to their needs, that program of research eventually will suffer from lack of credibility and support. Thus, in developing a research program it is essential to incorporate the viewpoints of the end users of research results, as well as the viewpoints of the scientists conducting the research.

In this unit, you'll build on what you learned in Study Unit 2.3 regarding stakeholders and their research needs. You'll learn procedures that can help you to identify the needs of users of your research. And you'll also learn how perceptions of user needs can vary between the users themselves and scientists.

Science is Organized Around Scientific Disciplines

Even the most casual observer is likely to notice that science is organized into distinct and relatively self-contained bodies of knowledge. Scientific problems are defined in terms of the research needed to

advance our understanding of the world around us from the viewpoint of a scientific specialty. One of the chief rewards for many scientists is the approval and public recognition they get from their scientific peers for the contributions they make to their field of science. This recognition takes many forms,

including acceptance of articles for publication in recognized scientific journals, invitations to present papers at scientific meetings, election to office in scientific organizations, and success in obtaining grants in response to research proposals, among others.

Further, the research programs in most forestry research organizations tend to be organized and funded along the lines of scientific disciplines. Thus, we may have research programs in entomology, pathology, ecology, soils, hydrology, silviculture, wildlife biology, economics, etc. In evaluating research performance, often a major consideration is the contributions that a scientist has made to the advancement of scientific understanding, as indicated by publications in refereed scientific journals, whose primary audiences are other scientists.

Given the way in which science and research is organized, and the recognition given to contributions to science, it should come as no surprise that, unless otherwise encouraged, scientists will tend to identify research needs in terms of the need to improve scientific understanding of a problem from the viewpoint of their particular discipline. When confronted with the need to solve problems of the real world, a scientist with skills in a particular discipline will address this problem from the viewpoint of that discipline, hoping to contribute part of the information needed to solve that problem. Unfortunately, in many cases this viewpoint may not correspond to the needs of forest land managers, policy makers, forest land users, and other potential clients for forestry research.

Most Natural Resources Problems Are Multidisciplinary

In contrast to the organization of science, the most pressing issues and problems in natural resources tend to cut across lines of scientific disciplines, and involve interactions of physical, biological, and human systems. As Russell Ackoff (1973) has said, "Nature is not organized the way our knowledge of it is."

Managers and others outside of the scientific research community attempt to solve problems of the real world and define their research needs in terms of the information they need to solve these problems, regardless of the scientific discipline involved. To solve the complex problems of human interactions with natural ecosystems they need information that goes far beyond the boundaries of any one particular scientific discipline.

Unfortunately, we cannot expect individual researchers working solely within a particular physical, biological, or social science to solve this multidiscipline problem by themselves.

If forestry research programs are to effectively address problems of the real world, there is a need to go beyond the insights that

scientists derive from their own particular disciplines and add the insights gained by those who must apply the results of research to solve real world problems. Strategic plans for forestry research should be based on a clear understanding of the operational as well as the scientific nature of the problems that are being addressed. This understanding can be gained only from those who actually carry out these operations in the real world.

Approaches to Incorporating Research User Input into the Strategic Plan

After you have identified the various potential users of the results produced by your research program (see Study Unit 2.3), there still remains the task of obtaining their input into the strategic plan being developed for your organization. This task can be approached in several ways:

Research user committee. One method commonly used to obtain input from research client groups is to appoint a committee of research users. Such a committee may consist of representatives from the various interests involved, including public and private forest land managers, forest resource users (including various forest industries), academic institutions, conservation and environmental groups, and others. The committee may meet periodically, perhaps at the instigation of the research administrators or at the request of some of the members, to review existing programs, discuss proposed projects and programs, and develop research suggestions based on member input.

The user committee might be formed to deal with the entire research program, or several more specific committees could be formed to deal with major program elements, such as forest products research, wildlife research, etc. The research user committee approach can provide useful input into the strategic plan if it functions well. However, the effectiveness of this approach depends to a great extent upon the capabilities and interest of the people appointed to the committee, and how well they represent the research needs of their constituents. For example, a representative of a land management agency may actually represent a large number of specific users of forestry research that span almost the entire spectrum of the research being done by your organization. It may be difficult for such a person to adequately represent all of the research needs of the organization. The research organization may find it difficult to justify the amount of time required to prepare formal presentations about the various research programs and results, and conduct other activities, such as field trips, to acquaint the committee with ongoing research.

Formal contact persons in key user organizations or groups.

Another approach to determining research needs is to have key research user organizations or groups designate a particular contact person who could identify the research needs of that organization. The idea is to develop a formal mechanism by which research needs can be identified and transmitted to the research organization, and new research findings can be channeled to potential users. This approach is often attractive to higher level administrators, who then can point with pride at arrangements that have been made to formalize technology transfer and feedback between the research organization and its users.

One weakness of this approach is that this job in the user organization often is viewed as only part-time. It may be assigned to a person in the organization who has other responsibilities as well, to be carried out when time permits. Because it is only part-time, and may suffer from the lack of concrete objectives or plan of action, this job assignment often is neglected. This approach suffers from the same limitation as the advisory committee. For larger research users, such as a public land management agency, a single person with the responsibility of identifying research needs for the entire organization may find it difficult, if not impossible, to be informed about all the research needs in enough detail to be able to effectively represent those needs to the research organization. Similarly, it is difficult for one person to be well enough informed about all areas of research to effectively disseminate research findings to the appropriate users. Further, the individual who is assigned the job may not necessarily be the best one for the work. A disadvantage of this approach is that the ultimate producers and users of research results tend to be insulated from each other, and must interact indirectly through an intermediary.

Surveys or direct observation to determine user needs. Where the research organization is attempting to meet the needs of a large number of diverse and unorganized research users, such as farmers, cattle raisers, villagers, or other forest land users, the above methods may not be useful for determining their research needs. In such cases it may be necessary to rely upon some form of formal or informal survey or direct observation to identify what problems they face, and what research might be useful in helping to solve these problems. This might be done through the use of field observers, who contact a sample of a particular user group and, through personal discussion, conversation, surveys, and observation, identify problems and obtain the user's input on possible solutions. Several different approaches have been used for this purpose.

Questionnaires and surveys. Questionnaires and surveys are often used to gather information from individuals, firms, or organizations. A host of special procedures have been developed to help design and implement questionnaires and surveys, including sampling design, proper wording of questions, interviewing techniques, and analysis of data. Under many circumstances, the use of questionnaires and surveys offer a reliable way to obtain a sample of information from a large population. Data obtained from such an approach can be unreliable if there is a biased sample of respondents, if the respondents choose to ignore some of the questions, if they misunderstand what information is wanted, or if they deliberately provide false data. A major problem with using questionnaires and surveys to obtain information is that it is implicitly assumed that enough is known about the situation being surveyed to enable the development of a questionnaire that will provide all of the information about the situation that may be useful. When the purpose of gathering information is to better determine what the problems are, as would be the case with determining research needs, it may be difficult to design a questionnaire to elicit the information being sought. Questionnaires and surveys are best used when the problem is well structured, and where the information to be obtained is relatively simple, is easily described and explained to respondents, is unambiguous, and is well-known and readily available to potential respondents.

Checklists. Checklists are a structured series of questions to be answered, points to be covered, or items to be checked that can be used in interviews or direct observations to ensure that all of the desired information is obtained, and that the same type of information is gathered from each contact or observation. Such lists usually are developed well in advance, based upon past experience as to which items are relevant. They can be simple or complex in structure and/or content. The major shortcoming of checklists is that they presuppose that enough is known about the situation to be able to put together such a systematic list in the first place. It in effect imposes a predesigned framework on the information gathering task. This approach is best used for more routine types of information gathering efforts, where information is being gathered only for each specific item on the list. It is less likely to uncover information relating to interactions among the various items on the list. It can be useful in more general information gathering tasks, but the types of questions, points, or items to be covered would have to be far more general in nature.

Rapid rural appraisal. One technique that has been useful in many countries is the use of a technique called *rapid rural appraisal*, or *Sondeo* (Beebe 1987). Rapid rural appraisal (RRA)

is a method of obtaining information in rural settings that relies upon multidisciplinary teams that utilize short-term, intensive, on-the-ground observation and interviewing of local people to determine their activities, customs, and problems. RRA can be employed as an aid to identify and formulate key questions for research (for example, see Conway 1987) in a very short period of time.

The core principles of RRA include (Grandstaff, Grandstaff, and Lovelace 1987):

- **Triangulation.** A conscious decision is made to obtain several different viewpoints in making field observations. This includes using a variety of team compositions, units of observation, and research methods.
- **Exploratory and highly iterative research.** The RRA process is highly iterative, using rapidly changing questions and information-gathering methods, developing and rejecting tentative hypotheses, probing new avenues of inquiry as they open up. Those using RRA must always be on the lookout for the unexpected, and be ready to alter procedures as needed.
- **Rapid and progressive learning.** RRA is a rapid, progressive learning process. It is meant to get a preliminary understanding of a situation, and not to produce the final word. It frequently generates as many new questions as it answers. This contrasts sharply with the use of formal survey questionnaires, where procedures and questions are spelled out and fixed in the beginning.
- **Substantial use of indigenous knowledge.** RRA is carried out as close to the source as is possible. If it were used to obtain information on the use of trees by rural people, it is the rural people themselves who would be interviewed and observed, in their own communities, as they went about their work. RRA recognizes that considerable knowledge about forestry use and management is gained by experience. Such knowledge is usually unwritten, but is available through personal contact with individuals who possess such knowledge. Obtaining and assembling such knowledge is often the best way to initiate research into a new area.
- **Interdisciplinary approach and teamwork.** Because of the complexity of local resources use systems, an interdisciplinary approach to obtaining information is mandatory. Normally, RRA uses a small team of workers from different disciplines to get the varied perspectives each member brings to the task. Working closely together, the team members learn from each other, and each contributes to the joint product. Frequent team meetings during the information gathering and analysis stage are used to stimulate interaction.

- **Flexibility and use of conscious judgement.** RRA team members must be ready to change their working procedures and field schedules to adjust to new situations as the information gathering and analysis proceeds. The team uses conscious judgement in making decisions about what types of information to gather and how precise the information needs to be to be useful. Hypotheses that are generated are subject to frequent checks with reality to see if they survive. All team members assist in synthesizing the information being gathered as the RRA process proceeds, and based on preliminary findings, may modify the kind of information or methods of information gathering as needed.

During the past decade, the techniques of rapid rural appraisal have been used in developing research needs and in planning research (for example, see Samart 1987, and Subhadhira et al. 1987).

The RRA technique is useful in identifying and defining problems and information needs of research users. However, unless those conducting the appraisal are the researchers themselves, when the rapid rural appraisal is done, one may still be left with the problem of determining potential research projects or programs from amongst the various information needs identified.

Informal, personal contacts between researchers and research users. Perhaps the most effective means of identifying research needs of users is through close and frequent direct contacts between individual researchers and the research user. The individual user may well know the problem situation, and the information needed to help solve the problem, but may not know just what research might be required in order to provide the necessary information, or how feasible such a program of research may be, given budget, time, and other constraints. This information can be provided through the researcher's years of education and experience in a particular branch of science, and the research manager's knowledge of the research organization's capabilities and constraints. Further, although researchers may know what types of research are feasible and desirable, they are not likely to be fully knowledgeable of the constraints regarding the adaptation and implementation of any new technologies, or of their impacts in solving the real problem. Yet the practitioner who, through hands-on on-the-ground experience has gained an intuitive understanding of how things are likely to work in practice, has the knowledge about the practicability and feasibility of implementation of a new technology.

For an effective determination of research needs, both points of view are needed. By working together and sharing their particular

expertise, the researcher and the research user can be a highly effective team, determining research needs that are both feasible and useful. However, working in partnerships to identify and define particular research needs can be time consuming. It is likely to work best when there is a clearcut, important problem to be addressed, and when research is likely to be of use in solving that problem.

Overall, there is no one satisfactory method by which to determine the research needs of users. Because each method has its own particular usefulness and limitations, in developing its strategic plan research organizations may decide to use more than one method to identify the varied research needs of its potential clients.

Activities

Situation Analysis

Your forestry research institution is responsible for helping the agroforestry field extension unit determine their research needs, and of subsequently addressing these needs in your research program. After meeting with the agroforestry unit's staff, you have compiled a preliminary list of research needs. However, some of the items on the list seem to be rather vague and general in nature. You all agree that further clarification is needed, preferably by working together in some sort of a collaborative arrangement. Someone suggests forming a multidisciplinary team to further clarify these issues and to refine and convert the research needs to specific research topics.

Answer the following questions regarding this situation by circling all responses which you feel are correct.

STUDY UNIT ACTIVITIES

Activity 1



What is the primary goal of this multidisciplinary team?

- To generate a research agenda that meets the needs of the agroforestry unit, and which ultimately benefits the farmers that participate in the unit's program.
- To improve collaboration between your research organization and the agroforestry unit.
- To try out a new methodology for the collaborative identification of research issues, and to publish the results of the trial.
- To get your researchers out of the office once in a while to be better grounded in the reality of their work.



Comment 1

- a. We agree! The most appropriate goal of this collaborative effort is to directly meet the needs of the agroforestry unit. The entire agroforestry program will benefit, including the ultimate beneficiaries of the program—the farmers.
- b. While this will certainly occur during a successful collaborative effort, this is not the primary goal of forming this team. A positive by-product, yes, but not its overriding goal.
- c. Again, the point of creating this team is to better identify the research needs of the agroforestry program. A particular researcher's secondary objective may be to try out new collaborative methodologies, but this should not be the main focus, nor should any unproven method be used which may create obstacles to attaining the group's primary goal.
- d. Sorry, but getting out of the office once in a while should never be the primary reason for establishing a collaborative effort.

Activity 2



Who do you think should participate in this multidisciplinary team effort?

- a. Farmers active in the agroforestry unit's programs.
- b. A sociologist on your staff skilled in rural development issues.
- c. A forester on your staff with extensive experience in industrial wood processing.
- d. An agronomist who specializes in tree-crop interactions.
- e. An economist particularly well versed in quantitative economic modeling of national economies.
- f. A forester-extensionist with the agroforestry unit.
- g. An agroforestry technician with the agroforestry unit who spends the majority of his time in the field.



Comment 2

- a. This is a tough one! Farmers will be interviewed by the group during the survey, thus their input is already assured. While some may accompany the group to aid in introductions and enhance open and honest interactions, it probably isn't appropriate for the farmers to actually be members of the group. However, where a farmer's educational background approximates that of the team members, it may be desirable to include that farmer as a member of the team.
- b. A sociologist would be an excellent addition to such a team. This person's understanding of the social aspects of rural development issues might be crucial to adequately documenting the range of issues facing the agroforestry unit's programs.
- c. A forester's input might be useful, particularly if the forester is skilled and experienced in agroforestry and industrial applications of trees grown on agroforestry configurations. One should be certain, however, that the background of the forester is applicable to the situation at hand.
- d. An agronomist who specializes in tree-crop interactions, or agroforestry, would be an important member of this team.
- e. A quantitative economist who specializes in macroeconomic issues is unlikely to contribute much to this particular team's goals, and should not be included.
- f. This forester-extensionist should definitely be included because of his or her knowledge of agroforestry, and experience with the unit.
- g. Technicians are usually valuable members of a survey team. Their knowledge of local conditions may be unsurpassed by any other member of the team. And they are probably acutely aware of the research questions facing farmers and the project.

Activity 3



What will this team do?

- a. Conduct a survey of the literature to identify research topics likely to be useful.
- b. Develop survey procedures and systematically conduct several day-long trips to the field to interview farmers and residents of the villages participating with the agroforestry project. Assign members particular technical areas in which to focus their questions, and meet collectively to review findings and exchange information after each interview session.
- c. Ride around the countryside to get a feel of the important issues affecting people living in that area.
- d. Have many team meetings to discuss the important issues affecting the agroforestry unit's program, and generate a research program that addresses these issues.



Comment 3

- a. A literature survey is unlikely to help to identify and clarify the research needs of the agroforestry unit. The team's resources should be directed in other ways.
- b. This is the best way to identify the research needs of the client, at least in an agroforestry extension project. Rapid Rural Appraisal techniques should be systematically utilized to determine the programmatic needs of the farmers, and thus of the agroforestry unit.
- c. This would probably be a waste of the group's time. Merely driving around cannot permit the team members to assess the problems facing the residents of that area. Interaction with village members, farmers, and field extension staff is essential to accurately determine their research needs.
- d. Although team meetings are needed to plan team activities, interaction with villagers and farmers is essential. Without such interaction, team members would not be completely successful in determining research needs. Any research program developed without adequate feedback from research users runs the risk of not being relevant to these users.

For activities 4 and 5, please read the question and circle all the answers you believe are correct.

STUDY UNIT ACTIVITIES

Activity 4



How would you, as manager of forestry research, determine the relevance of the current research agenda to the real needs of *your* organization's clients (or users of the research results)?

- a. Read as many internal reports as you can find.
- b. Drive out into the countryside and ask a few farmers who live along the roads in the project areas.
- c. Meet with and ask your staff their opinions.
- d. Conduct annual meetings of you and your research staff with clients to jointly determine the research agenda, within the structure of your organizational mission, goals, and objectives.
- e. Ask clients to fill out a questionnaire.
- f. Assemble a small team of scientists of several disciplines to conduct a brief, but thorough survey to identify the users of your research results, and assess the needs of these groups.
- g. Encourage your scientists to develop personal contacts with potential users.



Comment 4

- a. While it is good idea for a newly appointed research manager to review internal documents for information on the users of your organization's research, pre-existing problems of research irrelevance may not have been recognized or noted in such documents. There are better options, noted below.
- b. It is extremely important for research managers to be keenly aware of their client groups (in this case farmers) and the conditions within which they function. However, a short cursory visit, biased by visiting only the most easily accessible clients, can create a skewed picture of their environment, and may result in inappropriate directions for research.
- c. This is a good idea, at least as part of a greater solution. Your staff is composed of highly knowledgeable and skilled individuals. By all means ask your staff their perceptions of the research needs of your organization's clients. If they are in touch with their clients and with the overall trends in field, they may indeed have a very good picture of user research needs. But beware of biased viewpoints, separate agenda, research priorities that contribute more to the scientists advancement than the solution of user problems, and inappropriate perceptions of clients or their needs.
- d. Such meetings can be useful in determining client research needs. They allow for interaction between scientists and research users, foster contacts among scientists and users, and can help to better link user needs to research conducted.
- e. Questionnaires are helpful for determining who uses your research, but because of their structured noninteractive format, they cannot be relied upon to create a complete picture of your clients and their research needs. Further, if your ultimate clients are farmers, they may not be functionally literate, and thus may not be able to read and understand the questionnaire.
- f. This is an excellent way to complement some of the approaches already discussed. A systematic review by a multidisciplinary team of scientists of the users of your organization's research and their needs is extremely effective in quickly obtaining a clear picture of the research needs of your clients. The team will have time to interact with the clients and to explore their needs in a more thorough fashion.
- g. Personal contacts and frequent interactions between researchers and potential users of research results are perhaps the best way to ensure that the research being conducted is appropriate for the needs of the clients. As a research manager, you have the opportunity for encouraging and supporting such contacts where they are appropriate and where resources permit.



Comment 5

- a. A scientist's personal interest in a research topic is an important criterion for developing the research agenda. It is not often desirable to force a scientist to investigate a particular topic, when he or she is not interested in the topic at hand. On the other hand, if a particular topic is investigated solely because of a scientist's strong personal interest, yet lacks relevance to user needs, then scarce resources are being expended to conduct research with little utility. The research manager must balance these competing needs while working with his or her staff to formulate the research agenda.
- b. Good choice! A research agenda that is developed to address real problems encountered in the field will receive great support from current and potential users of that research. It should be clear that applied research must be clearly relevant to user needs.
- c. Hot topics in research come and go. Scientists may be tempted to focus on such topics because of career advancement considerations. However, such topics should be pursued *only* if the research results will directly address the needs of your clients.
- d. Yes! Client surveys are valuable tools that are used to identify client research needs. By all means, a research agenda must closely address these needs, but it is important that clients assist in defining those needs to ensure that the scientists have not misinterpreted those needs.
- e. We hope you didn't choose this response. Again, because of career considerations, some scientists may wish to focus solely on basic research which can be published in refereed journals. We must again state, however, that in most cases such topics should be pursued only if the research results will directly address the needs of your clients. Striking a balance between user and scientist needs is necessary and important.
- f. Excellent choice! Focusing on emerging trends is an extremely important role research organizations can play. Research takes time to implement. In applied research, by the time the research is conceived, implemented, analyzed, and reported, it may only confirm what field practitioners discovered some time earlier. Thus, it is extremely important for researchers, in consultation with users of their research, to look into the future and to identify emerging issues which will become important to clients, and which require research to resolve.

Summary

This unit has stressed the importance of ensuring that the research agenda addresses the needs of both the scientists and research users. Knowing the differences between basic and applied research is vital to determining the orientation of your research agenda. Identifying the users of your research and clarifying their research needs is critically important if the research is to be relevant and used. In formulating the research agenda, research managers must constantly strike a balance between user and scientist needs. Many effective methods exist (such as rapid rural appraisal) to identify research users and their needs. Research organizations must be continually aware of the users of forestry research in order to assure that their efforts and outputs are relevant and useful.

If you would like more information about this topic, we encourage you to obtain and review the interesting articles identified in the literature cited and other references listed at the end of the module. Two key articles directly related to the topics covered in the module, and cited in the text, are reprinting for your use in the section on readings at the end of the module.



Distinguishing Between Information Needs and Research Needs

Objectives

When you have completed this study unit you should be better able to:

- *distinguish between information needs and research needs;*
- *determine the information and research needs of your organization's clients (the users of research results);*
- *describe ways your organization could satisfy requests for information without resorting to new research; and*
- *outline the role of your organization in providing information dissemination services to your research clients.*

Managers of forestry research organizations should recognize that what many of their research clients may call “research needs,” are actually needs for information that they don’t have, but that already exists. In dealing with clients, the research manager is often called upon to distinguish between requests for information that can be satisfied adequately using existing knowledge, and requests that may require additional research by the research organization. The problem of the research manager then becomes one of deciding whether or not the additional research should be part of the strategic research plan.

In this unit you’ll learn the importance of distinguishing between information and research needs, and will do some practical exercises that will help you to better understand these differences. We’ll also give you tips on how to improve your organization’s ability to efficiently deal with information requests.

Research, Information, and Forestry Research

Throughout the world, the job of managing forest resources has become increasingly complex. Expanding populations have placed ever-increasing demands upon forest resources, and have increased conflicts among various forest users. In many countries, overuse of forests has resulted in a declining and degraded forest resource base from which future demands for goods and services must be

met. There is growing recognition that ecological and environmental concerns must be addressed in forest land planning and management. In many countries, this is now being mandated by law.

As the scope of forest management expands, so does the need for information on which to base policies, plans, and decisions regarding the sustainable use of forest ecosystems. Forest managers and users face different problems from one week to the next, and must somehow find

the information they need to resolve those problems. The nature of the problem, and the analytical approach chosen for assessing alternative solutions, determine the kind and form of information needed by the decision maker. When forest managers, policy and other decision makers cannot find the information they need, they often turn to forestry research organizations for help in filling what they may term research needs. Although forest managers, users, and policy makers may refer to the information they need as research needs, what they really have are information needs that may or may not require research in the conventional sense. Such information needs may exist for several reasons, including:

- the needed information may be well-known to some people and be readily available upon request, but is not known to some managers and users who need it;
- the information may be known to exist, but is not readily available to field practitioners;
- the needed information may have been sent to field offices at one time, but has since been misplaced, destroyed, taken by other field people, and is currently not available to those who need it;
- information related to this problem may have been transmitted to the field, but cannot be used by them in its current form because it is inadequate or incomplete, too complex, or cannot be used without some modification or adaptations;
- the information needed may exist as unorganized pieces of information scattered here and there, and may never have been assembled into a coherent, systematic, useful whole;
- the information may exist, but to use it and apply it may require special skills and knowledge that are unavailable to the client;
- the information needed may not exist in a form that can be applied by the manager or other user;
- the information is not available, and neither researchers nor users know for sure whether or not the desired information exists; and
- it is known that the information does not exist.

Thus, in trying to determine the research needs as perceived by their clients, forestry researchers and managers must first clearly describe the information needed by the client, and then determine if that information need can be met from existing information, if some additional work may be required to make the information available in a more useful form, if additional research would be required to provide the needed information, or if it is possible and feasible to generate the desired information by research in time to be useful.

Please read the situation analysis below and complete the activities that follow.

Activities

Situation Analysis

Imagine that you have just accepted a position as the manager of a moderately-sized forestry research organization (congratulations!) which has had management problems in the past (prior to your appointment as manager, of course). Despite these past management problems, however, the organization has produced some comprehensive reports on the silvicultural requirements and wood characteristics of several native tree species. While skimming the many reports and planning documents produced by your organization during the past several years, you find a list of requests vaguely titled "Research Needs." This list is reproduced below:

- a. Request from one of the field offices for silvicultural information for species X.
- b. Request from an NGO on the characteristics and marketing potential of oil made from the nut of a native palm.
- c. Field request for species/site matching guidelines for species X and Z, and two other native species.
- d. Field request for the best provenance of **Acacia mangium** for local conditions.
- e. A request from the ecocertification board on the difference between wood characteristics of mahogany grown in native forests vs. those grown in plantations.
- f. Field request for more detailed soil surveys in their area.
- g. A funding agency request for an economic analysis comparing seedlings grown in root trainer containers vs. those grown in poly bags.
- h. Request from participating NGOs for guides to the design and management of an agroforestry extension system.
- i. An inquiry from farmers to explain why their **Casuarina** trees die 3 years after planting, usually with deformed stems.
- j. A nursery request for better ways to inoculate their seedlings with microsymbionts (mycorrhizae, **Frankia**, and **Rhizobium**).
- k. A nursery request concerning the necessity for inoculation of seedlings when microsymbionts have been observed on trees in the field.
- l. Inquiries from field foresters/extensionists regarding the rate of growth of **Eucalyptus camaldulensis**, and how soon after planting they can expect to harvest 8 cm poles.
- m. A funding agency request for figures detailing the economic impact of forestry extension and research programs they support.

Activity 1

Upon review, you are skeptical about the appropriateness of some of the items as bonafide research topics. Choose from this list what you think are truly research needs and write their letters to the left below under "Research Needs" Identify the items which you feel are information needs and write their letters to the right under "Information Needs."

Research Needs**Information Needs**

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____



Comment 1

- a. This may be more of an information issue than a research request. If your organization has already produced silvicultural guidelines for species X, this request can be best dealt with (and can be avoided in the future!) by better distribution of research results within your organization, and by making a special effort to inform potential users of what types of information are available.
- b. This is a tough choice! A detailed review of the literature may be needed to determine what information is known about the species and its products. This information could then be given to the NGO. If this preliminary review shows that an economic potential exists, a research program may be appropriate.
- c. We're not trying to trick you, but this is both an information request and a topic for research. If work has already been done on species X and Y, this information simply needs to be directed to those in need. If little is known about the other native species, however, research may be needed.
- d. If local provenance trials for *Acacia mangium* have not been done, then research may be warranted.
- e. There may be information in the scientific literature on this subject. A short literature review could be conducted and a report of the results sent to the ecocertification board. Since this literature review and report may keep a researcher busy, it could be considered a research need.
- f. Although routine soil surveys may be conducted outside of research, if there is little information on the soils in this particular location, some research may be needed before additional soil surveys could be conducted.
- g. Funding agencies are always asking tough questions! Since much of the data that would go into such an economic analysis is country-specific and can become quickly antiquated, chances are this analysis will need to be done. Good job if you choose this as a research issue.
- h. This is a rather general request, and can most likely be met by recommending several books (of the many in print) which can serve as practical guides to agroforestry extension.
- i. We hope you listed this as a research need. Discovering the cause of death of the Casuarina trees will involve field and possibly laboratory investigations, requiring research methods and scientists.

- j. This is a little tricky. While there may not be much information in-country about microsymbiont inoculation, there is a great deal available in the international scientific literature. Thus, a literature search and a few phone calls to specialists would be in order, but field trials would probably not be necessary.
- k. This is clearly a research topic. Species of microsymbionts vary from place to place, and in their ability to fix nitrogen. A study carefully designed to look at the advantages of nursery inoculation would be appropriate.
- l. There may be lots of information from many studies available on the growth rates on *Eucalyptus camaldulensis* on similar soils and in similar climates. Again, a literature search is the appropriate first step. If you suspect this research base is inappropriate for your region's conditions, then field trials could be established.
- m. If data regarding the economic impact of the activities of your research organization and the extension organization are not available, then research should be promptly implemented to provide such information.

Activity 2

What do you think is the best way for a research organization to deal with requests for information? (Choose one response)

- a. Tell the people requesting the information to go to the library.
- b. Refer their request to a particular scientist for follow-up and response.
- c. Refer their request to the extension division of your organization.
- d. Look up the information in your own files and respond to the request personally.



Comment 2

- a. Remember, it's important to continually work on gaining public support, and to enhance your organization's image as providing a valuable public service. It would be better to refer persons requesting information to another person, perhaps the librarian of your organization's library, extension personnel, or to a specialist.
- b. This is a correct response if the question is sufficiently technical to require a scientist's review and assistance. With relatively simple questions, the client requesting the information may be quite willing to talk with an extension person specializing in this particular subject area, or may wish to pursue researching their question in the library.
- c. Extension branches are probably the best place for clients to find answers to their information requests. Extension personnel are best equipped to deal with the public, and may have published pamphlets or manuals specifically dealing with problems commonly encountered by the public.
- d. While this is a most gracious thing for you to do, we must remind you that you are the manager of a research organization, and as such should be quite busy. We suggest that you could better spend your management time assuring that there will be persons or branches within your organization that can provide these services to the public on a continual basis.

Activity 3



Organizations that can efficiently handle requests for information have: *(Choose as many as you think apply).*

- a. lots of secretaries
- b. libraries available for public/client use
- c. scientists and technical staff eager to assist the public with their information needs
- d. modern offices
- e. public information/extension personnel
- f. publications designed for public use which detail commonly experienced problems and their solutions
- g. well-trained, well-informed technical staff who are able to discriminate between information and research needs
- h. managers capable of delegating information requests to the appropriate persons or departments
- i. an established system to handle information requests



Comment 3

- a. One well-trained and informed secretary is worth many who are not so well informed. Focus on quality of your staff, not quantity.
- b. Libraries are an important resource which every research organization should make available to those requesting information. Your organization's major product or output is *information*, which should be shared with whomever requests it.
- c. It's great to have highly skilled staff willing and competent to deal with the general public and with others requesting information. As manager, however, you must ensure that scientists have enough time to conduct their research without excessive interruptions. Many information requests do not require high levels of expertise and can be handled by less skilled persons.
- d. Research organizations don't require fancy, modern offices (although they are nice to have!) to adequately deal with information requests. Dedicated, motivated, knowledgeable people, and an organizational orientation towards service are far more important than expensive, elaborate facilities.
- e. Yes, this is important! Research organizations should have personnel that are trained to deal with information requests, and who can translate complex scientific studies into meaningful answers and techniques that can be used by your clients.
- f. Many information requests center on a particular subject area that has already had the benefit of extensive research. A good way to deal with repetitive requests for information on the same topic is to produce simple publications answering the most commonly asked questions.
- g. Your technical staff also needs to be well-versed in discriminating between information needs and research needs, and highly knowledgeable of the current scientific literature in order to efficiently utilize their own time.
- h. Managers who can delegate requests for information to the appropriate responder are valuable staff members who know the value of their own time, and the importance of fully utilizing the resources of the organization.
- i. Yes, having an organizational structure specifically established to deal with information requests is an efficient and effective approach which every organization would be wise to follow.

STUDY UNIT ACTIVITIES

Activity 4



Under the heading "Information Request" below, list as many requests for information that you can remember your organization received from clients/users. Note next to each item how the request was processed.

Information Request

How Processed?

STUDY UNIT ACTIVITIES

Activity 5



List as many requests for bonafide research your organization has received from clients during the past year, and note the potential users of the research results.

Research Needs

Users Of Research (Clients)



We can't really anticipate what you'll write here. If in doubt whether the requests are information or for research, reread the module, and repeat the self-assessment activities, particularly number 1.

Comments

4 & 5

Summary

It is important for managers of forestry research organizations to recognize that many requests from clients for “research,” are actually requests for information that the clients don’t possess or know is available. These requests for information can often be satisfied adequately using existing knowledge.

This study unit has focused on helping you to improve your ability to discriminate between the information needs and research needs of your clients. We also provided some basic methods your organization can use to better deal with the variety of requests for research and information it receives on a daily basis.

If you would like more information about distinguishing between information and research needs, we encourage you to obtain and review the interesting articles identified in the literature cited and other references listed at the end of the module. Two key articles directly related to the topics covered in the module, and cited in the text, are reprinted for your use in the section on readings at the end of the module.

Assessing External and Internal Environments Affecting Research

Objectives

When you have completed this study unit you should be better able to:

- *identify and assess potential issues, problems, and opportunities external to your organization, but related to forestry research, and incorporate these into your strategic plan; and*
- *identify and assess the internal strengths and weaknesses of your organization in relation to potential programs of forestry research.*

In developing the strategic plan, the research manager must appraise carefully any conditions and trends external to the organization that might affect the research program being developed. The present and future external environment within which your organization will operate should be described and taken into consideration in developing the strategic plan. A strong effort should be made to identify both any potential impediments to the successful implementation of your organization's program, and also any opportunities for new research program activities that may appear.

It is equally important that the strategic planning team candidly assess your organization's own internal environment to identify its strengths and weaknesses. Only by knowing what your organization is good at doing, and acknowledging the areas where it is weak, can the team develop a strategic plan that will take advantage of these strengths, and avoid its weaknesses.

Such a candid appraisal also provides an opportunity to identify potential institutional-building needs of your organization.

In this study unit we'll suggest ways in which you can assess the external environment to identify potential research opportunities, and assess your organization's internal strengths and weaknesses as they relate to your forestry research program.

Assessing the External Environment

A major purpose of strategic planning is to identify external challenges and opportunities not controlled by the research organization, yet which may demand a response in the

foreseeable future. The idea is to prepare an organization to respond effectively before a crisis develops or an opportunity is lost, by anticipating possible future events and thinking about potential responses before they occur. Assessing trends in the

external environment for research is therefore an important part of strategic research planning. It requires that your strategic planning team identify factors in your organization's environment that might have an impact on your forestry research program in the future.

A critical factor in the external environment, of growing importance in developing countries, is the existence of the bilateral, regional, and international donor agencies and programs related to forestry. These organizations and programs provide funding opportunities for supplementing national forestry research appropriations, but also constrain potential research programs because of their particular interests. Because of their potential influence on forestry research programs and capabilities, these donor groups cannot be overlooked in assessing the external environment.

Research organizations can establish procedures to monitor a variety of political, economic, social, and technological forces and trends in the external environment. The strategic planning team should also monitor and work with the organization's stakeholder groups to detect emerging opportunities or challenges (e.g., Milne 1988, Jakes et al. 1989). Most research organizations rely on the knowledge of members of the strategic planning team, and use group discussions to identify external challenges and opportunities and assess their significance to the organization. As a rule, those who are responsible for relating the organization to its external environment (top management, members of the organization's governing body, etc.) are better suited to identifying external opportunities and challenges (Bryson 1988).

Formal, institutionalized "external scanning" procedures (Pflaum and Delmont 1987) can be used to identify important factors in the external environment. But elaborate and demanding procedures are generally less desirable than simple and practical approaches. Whatever the approach, the monitoring of the external environment should be formalized within the organization to better relate the organization to its external environment.

The identification of emerging issues is a form of external environmental evaluation that will be discussed in more detail in Study Unit 3.4.

Seeking public input into the strategic planning process

In assessing the external environments that may affect the research program of the organization, it is important to get input from those outside the organization, and from the public at large. By identifying and addressing the concerns of people outside the

organization before finalizing the strategic plan, one can address some of the key concerns of important research clients during the planning process and perhaps in the plan itself.

Public input may be sought by announcing and publicizing planning proposals and/or drafts of initial planning documents in several ways, including: sending copies of proposed plans to key groups or individuals for review and comment; meeting with specific outside groups, organizations, and individuals to discuss proposed plans; and/or holding public meetings at appropriate times and places to explain proposed plans and obtain comments from those attending.

Assessing the Internal Environment

It is equally important to assess the internal environment, to identify those strengths and weaknesses that help or hinder the organization in carrying out its mission. Categories of internal strengths and weaknesses include: (1) the resources (inputs) available to the organization, including scientific and technical personnel, support personnel, scientific equipment, facilities, and supplies, library and information resources, computer resources, funding, and so on (see Study Unit 6.1 and Module 8); (2) the internal structure of the organization (see Study Unit 5.1); (3) the organization's performance in terms of outputs and the impacts of past and present outputs on clients (see Module 10); and (4) the organization's present strategic plan and planning process. Using these categories, the planning team should develop a list of the major internal strengths and weaknesses of the organization. This list, along with the list of external opportunities and challenges, can then be discussed and analyzed.

Typically, research organizations collect a great deal of data regarding inputs (salaries, supplies, physical facilities, employees, etc.). Current strategies or operational processes are often less clear or well understood. Performance, expressed as outputs or impacts, are often poorly known, if at all (Bryson 1988). Without clear performance information, the organization has no way of knowing whether or not it is addressing stakeholder needs and criteria. Should stakeholders determine that the organization is not addressing their needs, or is performing poorly according to their judgement criteria, they may withdraw their support.

Pfeiffer et al. (1989) note that scanning and assessing the external and internal environments should be a continual activity in an organization so that relevant information is always available to key decision makers.

Please read the following situation and answer the questions that follow.

Activities

Situation Analysis

Assume that you are the manager of a forest research organization that has been in operation for some time. Your research agenda has focused on research topics requested by field professionals, and has generated important information that you assume has been useful to solve real problems in the field. You have many well-trained, high quality staff members who are motivated and dedicated to their work, and who publish their results in reputable journals worldwide. The organization has good physical facilities, and is well respected among forestry research organizations in other countries in your region. Though core funding from the national government, and project funding from international organizations is getting tighter, it has been adequate to achieve much of what your staff wish to do. It seems that demands for research needs stimulated by rapid changes in your country are beginning to seriously outpace your organization's capacity to address them. Despite these trends, however, you have been pleased with the performance of the organization in its research activities.

Lately, however, you have been hearing of some frustration from field professionals regarding the speed with which your institution progresses from problem identification to final reporting of research results, and the overall relevance of the research to their problems. In fact, you have heard disturbing stories where frustrated field practitioners have conducted their own informal studies to solve their own immediate problems, resulting in your organization's more formal long-term research only confirming what the field practitioners had already discovered on their own. While your organization attempts to address research questions identified in the field, it seems that many new and contentious forestry issues requiring research have suddenly burst on the national scene, catching you and your organization off guard and unprepared. You've recognized this for some time, yet have been at a loss as to what to do about it.

It's clear that your country is undergoing rapid change. The nation's pace of development is quickening, with the overall standard of living of many people increasing, and with growing numbers of rural people (particularly the people with the most education) migrating to urban areas in search of better paying jobs. At the same time, populations are increasing both in rural and urban areas due to high fertility rates and lower mortality rates. Almost all the available prime agricultural land is already farmed using traditional methods, with associated high erosion rates and declining productivity. Forested areas protected by law are being encroached upon by landless farmers looking for a means to generate their own livelihood. The government, in cooperation with bilateral and multilateral aid agencies, are building roads into previously inaccessible forested areas, opening vast new areas to logging interests, and subsequent settlement by small farmers. Thus, forests are under increasing pressures everywhere from the forest products industries, government-sponsored economic development and resettlement schemes, demand for agricultural land, and increasing human populations. On the other hand, forests are being increasingly viewed by top policy makers as resources deserving protection due to their vital contribution to the nation's economic and ecological health.

As research manager of the nation's forestry research organization, you recognize that it is imperative that your organization work as efficiently and effectively as possible to help resolve these serious issues affecting the future development of your country's forest resources, and the overall development of the nation. Yet, your organizational long-range plan has been overwhelmed by these rapid changes.

Please answer the following questions as a step towards determining this organization's external environment. What are the trends and forces (i.e., political, economic, social, technological, environmental, etc.) external to this organization that may affect its operations and activities.

STUDY UNIT ACTIVITIES

Activity 1



List and briefly explain the external opportunities available to this research organization.

- a. _____

- b. _____

- c. _____

- d. _____

- e. _____

STUDY UNIT ACTIVITIES

Activity 2



List and briefly explain the external factors which are beyond the control of this organization that may hinder the accomplishment of its research objectives.

- a. _____

- b. _____

- c. _____

- d. _____

- e. _____



Comment 1

The national situation described above is common to many developing countries. Many of these rapidly changing social, environmental, developmental, demographic, and economic trends can be viewed as either threats to the current orientation and agenda of the research organization, or as opportunities for future research that will be useful and relevant to the nation. We encourage you to look at the majority of these rapid and sometimes dizzying changes as opportunities for research to address newly emerging issues. Once identified as opportunities, responses can then be formulated that will effectively address the important issues, and thus positively enhance the importance of the forestry research organization in achieving national development goals and objectives.

For example, the increased attention to forests by top policy makers is clearly an opportunity for the organization to secure greater support for forestry research. Other opportunities might include:

- improved standard of living for many people with less land-intensive lifestyles provides options and diminishes population pressure on land;
- conversion of traditional farming practices to agroforestry practices to generate greater supplies of tree products onfarm, and to relieve the pressure on intact forests to meet local wood supplies; and
- a realization that policies affecting or encouraging road placement and internal migration have resulted in negative consequences to forests, providing an opportunity to lobby for policy change and reduce the pressure on remaining forests.



Comment 2

Sometimes, external events over which the research organization has no control can hamper the effectiveness of the organization. Identifying these issues and planning in advance of their arrival (whenever possible) can help to reduce their impact on the organization's activities. Budget shortfalls, privatization of research, or a serious shortage of trained personnel to address the increasing demand for research services can be serious impediments to the successful implementation of forestry research programs that contribute to meeting the growing needs of developing countries. Addressing these issues early in the planning process can help to mitigate or even avoid these problems altogether.

Reread the description of the research organization depicted above, but this time with a eye towards its internal environment. What are the strengths and weaknesses within this organization that may help or hinder it in carrying out its mission. When done, answer the following questions:

STUDY UNIT ACTIVITIES

Activity 3



List and briefly explain the internal strengths of this organization which will help to contribute to the successful implementation of its research program.

- a. _____

- b. _____

- c. _____

- d. _____

- e. _____

STUDY UNIT ACTIVITIES

Activity 4



List and briefly explain the internal weaknesses of this organization which may hinder the successful implementation of its research program.

- a. _____

- b. _____

- c. _____

- d. _____

- e. _____



Comment 3

Some of the strengths you might have listed include long-term institutional experience in forestry research, the generation of relevant research that addresses real problems in the field, a well-trained staff, motivated field staff who are determined to solve their problems, a competent research manager. Other strengths include a well-trained technical support staff, adequate support facilities, sufficient long-term core funding support from the national government, bilateral and multilateral support for special research programs, an excellent reputation for quality research both nationally and internationally, etc.



Comment 4

Some weaknesses of this organization include:

- a long-range plan which lacks relevance to the rapidly changing world;
- the lack of a strategic plan;
- increasingly inadequate resources (physical, financial, human);
- lack of research experience or expertise in newly emerging issues that will nevertheless require extensive research;
- lack of leadership to address these emerging issues;
- an ad hoc (instead of planned) approach to dealing with emerging research issues; and
- lack of control over the changing external environment.

Before you continue with the following exercises, review the comments to activities 1 to 4 to be sure you understand how to assess the internal and external environments affecting research organizations. Once you've done so, proceed by considering your own research organization's situation.

STUDY UNIT ACTIVITIES

Activity 5



List and briefly explain the external opportunities available to your research organization.

- a. _____

- b. _____

- c. _____

- d. _____

- e. _____

STUDY UNIT ACTIVITIES

Activity 6



List and briefly explain the external factors which are beyond the control of your organization that may make it difficult for it to accomplish its research objectives.

- a. _____

- b. _____

- c. _____

- d. _____

- e. _____



Comments
5 to 8

Your responses to these questions will address your own organization's conditions and situation, something we cannot anticipate in advance. In any case, we hope that by thoroughly examining your own circumstances, you arrived at a better understanding of the status of the internal and external environments of your organization, and how they affect its research program.

Now, consider your own research organization with an emphasis on its internal environment, then answer the following questions. What are the strengths and weaknesses within your organization that may help or hinder it in carrying out its mission.

STUDY UNIT ACTIVITIES

Activity 7



List and briefly explain the internal **strengths** of **your** organization which will help to contribute to the successful implementation of its research program.

- a. _____

- b. _____

- c. _____

- d. _____

- e. _____

STUDY UNIT ACTIVITIES

Activity 8



List and briefly explain the internal **weaknesses** of **your** organization which may hinder the successful implementation of its research program.

- a. _____

- b. _____

- c. _____

- d. _____

- e. _____

Summary

Strategic planning requires that research managers consider the external and internal environments that may affect their research programs. Managers and strategic planning teams should identify the external factors that are likely to impede the successful implementation of their organization's program. It is equally important to identify any external opportunities for new research program activities that may appear. Further, the strategic planning team should candidly assess their organization's own internal environment to identify its strengths and weaknesses. Such a candid appraisal also provides an opportunity to identify potential institutional-building needs of their organization.

Scanning and assessing the external and internal environments should be a continual activity in a forestry research organization so that relevant information is always available to key decision makers.

If you would like more information about monitoring and assessing external and internal organizational environments, we encourage you to obtain and review the interesting articles identified in the literature cited and other references listed at the end of the module. Two key articles directly related to the topics covered in the module, and cited in the text, are reprinted for your use in the section on readings at the end of the module.

Identifying Emerging Issues Related to Natural Resources and Forestry

Objectives

When you have completed this study unit you should be better able to:

- describe why the identification of emerging issues in forestry is an important step in developing your organization's strategic plan for research; and
- use a structured procedure (the Delphi System) to identify emerging issues that can be used as a basis for specifying research needs relevant to your organization.

Forestry research organizations must take the lead in helping to identify critical issues that will be affecting the world's forests in the coming years. Once these emerging forestry issues have been identified, and their importance confirmed by the natural resource sector, research organizations have the responsibility to develop research agendas to resolve these critical issues. Unfortunately, research organizations do not always adapt rapidly enough to shifting priorities and changing natural resources conditions, resulting in somewhat irrelevant research agendas with low impact on societal problems.

As a manager of a forestry research organization, it is critically important for you to ensure that your organization will keep abreast of the rapid changes affecting forests, and that your research agenda remains relevant to your client's needs. In this unit, you'll come to appreciate the importance of staying at the forefront of forestry research. You'll also work through a procedure that will help your organization better identify the emerging research needs of its clients, and translate these needs into dynamic, relevant programs of forestry research.

Importance of Identifying Emerging Issues in Planning Natural Resources and Forestry Research

Forestry and natural resources researchers would like to believe that the results produced by their organization's research programs will be useful to field practitioners. However, field

practitioners frequently complain that:

- research takes too long to provide answers to the immediate problems faced by those working in the field; and
- the research being undertaken often is not directly relevant to the operational problems in the field, and/or cannot be applied directly or easily adopted for field use.

These criticisms often are justified. For some types of forestry research, such as growth and yield studies or hydrologic studies of watersheds, it may take several years to develop plans and research proposals, obtain funding, construct special facilities, and prepare sites required for research, install the experiment, observe the responses, analyze the data, and publish the results. In these situations, research may not be able to respond promptly to requests for information that can only be obtained by lengthy research. Such research may require lead times of several years before it can be effective in providing answers. Initiating such studies implicitly assumes that when the results ultimately become available, they will be useful to clients at that time. Lengthy applied research must anticipate usefulness.

If forestry research is to be used, it must produce results that can be applied to field problems. Unfortunately, not all forestry research produces results that can be applied in practice. Research may be driven more by the interests and career aspirations of scientists conducting the research than those of field practitioners. Some research may be driven more by the scientist's perception of the problem, than by the actual needs of field personnel. Limitations of funding or scientific skills may restrict the type, quality, breadth, or depth of the research, and provide only partial or incomplete responses to immediate needs for practical information. The results may not be disseminated so as to reach those who need and could apply them. For these and other reasons forestry research may produce results and information that are not put into practice.

It is essential that forestry research programs are focused on problems that are relevant to forest managers and users, and that will provide useful information in time to be helpful to them. Research managers need to develop a strategy to identify potential research problems in advance of the time the results will be needed, and to focus on designing research to solve problems that are relevant to those who will use the results. In developing forestry research programs, it would be helpful to identify important problems related to forestry and natural resources that managers and users are likely to be facing five, ten, or fifteen years from now. If problems could be foreseen well in advance, it may be possible to determine what research might be undertaken now to produce results that might be useful in resolving these problems in the future, and to undertake that research in time to provide useful results when they are needed.

Box 3.4.1 gives an example of issues and trends identified by the Pacific Northwest Forest and Range Experiment Station, one of

the regional experiment stations of the United States Department of Agriculture Forest Service, as part of their strategic planning process.

Box 3.4.1. Examples of key issues and trends that would most significantly affect forestry research and development activities in the future at the Pacific Northwest Research Station, United States Department of Agriculture Forest Service (Moeller 1992):

- *increasing damage to regional and global environments by human activity;*
- *rising population, predicted to reach 10 billion worldwide by 2050, which will increase pressure on natural and managed ecosystems;*
- *continued growth in worldwide demand for wood products;*
- *growing democratization resulting in broader-based participation in natural resource and environmental decisions;*
- *melding of worldwide philosophies on the relationship between society and natural resources, thereby creating a new environmental ethic;*
- *growing shortage of basic scientific knowledge;*
- *rapidly rising values of commodities and amenities obtained from natural resources on both public and private lands;*
- *extinction and endangerment of many wildlife and plant species;*
- *worldwide reduction in biological diversity;*
- *water shortages and controversies over its allocation and quality;*
- *growing interest in reallocation of public and private lands, especially for ecosystem protection; and*
- *need to increase productivity of lands that remain dedicated to commodity production.*

In the discussion that follows, we outline an approach that can be used for identifying emerging issues in the management and use of forests as a means of identifying potential research problems far enough in advance to undertake research programs to address these problems. This process seeks to involve both researchers and the clients for research results in identifying research topics far enough in advance that research programs can be developed to provide the information by the time it is likely to be needed.

Using the Delphi System to Identify Emerging Issues Relevant to Natural Resources and Forestry Research

One can never be sure what problems are likely to emerge and be of particular importance in the future. The future is essentially unknowable. However, it is possible to pool the general knowledge and information in the minds of experienced people who are familiar with past and existing situations to obtain estimates of possible future trends and issues that are likely to emerge as events unfold. The process for eliciting and refining the opinions of informed people about future events has been called the Delphi process, named after the oracle of Apollo at Delphi in ancient Greece who provided answers to questions about the future.

The basic approach used in the Delphi system is to obtain independent estimates of the desired information from each person in a group of knowledgeable peers participating in the process; summarize these estimates and make the results available to each participant; ask participants to reconsider their initial responses in light of the responses given by the other participants and make any changes they may wish to make to their initial response; continue this process until a consensus is reached, if possible; and obtain additional information as needed based upon the responses received. In essence, the Delphi process is a means of obtaining informed estimates about things or events for which no reliable information exists.

There is no fixed procedure to be followed in the Delphi system, but in general the approach involves the following steps (see figure 3.4.1 for an overview of the Delphi process):

1. clearly define the information required, and develop questionnaires and other means to obtain the desired information from knowledgeable people;
2. select a group of knowledgeable people who are willing and able to participate in the Delphi process, who are likely to be familiar with existing data, information, and knowledge, to provide desired estimates based on their personal knowledge;
3. obtain preliminary independent individual estimates of future events or conditions from the group of Delphi participants, usually without an exchange of information among the participants, using questionnaires or other means of acquiring the information;
4. analyze and summarize the individual responses received, consolidating and perhaps summarizing and rephrasing the replies. Prepare a new questionnaire based upon the results of the first;
5. present the results of the first round of questionnaires to the participants with the request to reconsider their first response in light of the responses from the other participants, and to provide additional input if necessary; and
6. continue with additional rounds of questionnaires or other means to obtain a consensus among the participants regarding the needed information.

The above approach is general, and several variations have been used to develop a consensus regarding a problem or issue, or to obtain estimates of information that otherwise might not be readily quantifiable. For example, Shafer et al. (1974) used the Delphi technique in formulating policies to deal with future environmental problems. Gunderman (1978) used it to study forest road standards in the Federal Republic of Germany. Baughman and Ellefson (1983) used it to study options for county forest land

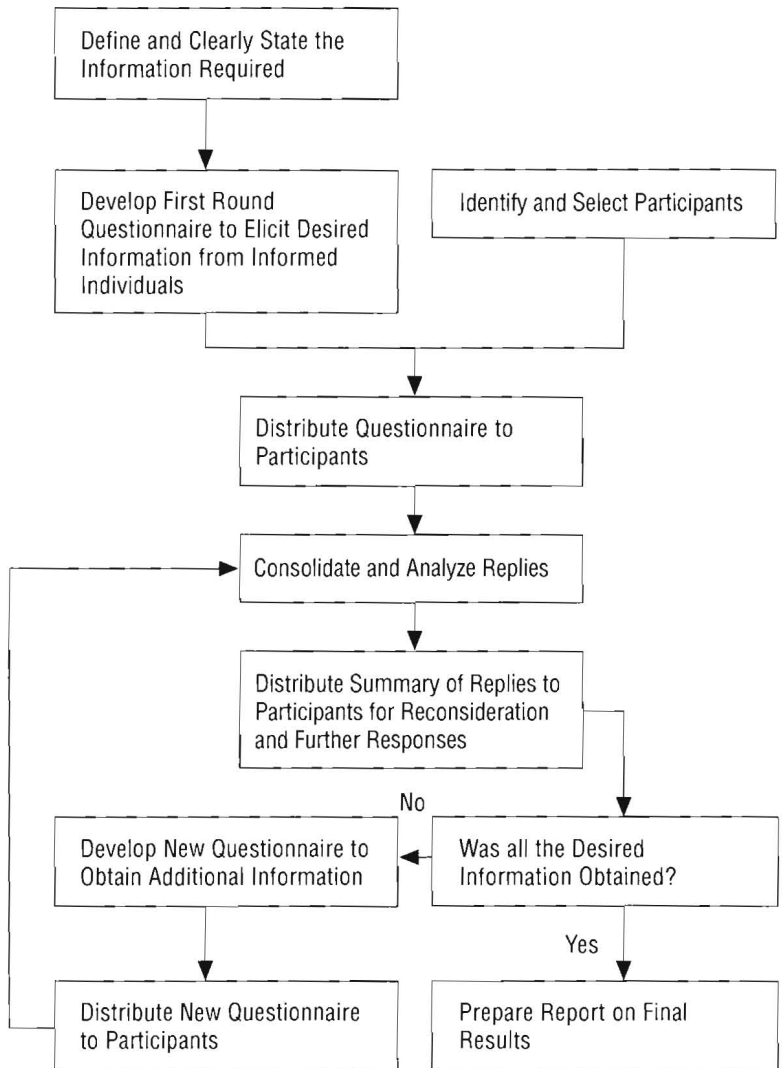


Figure 3.4.1. A generalized Delphi process to elicit information from knowledgeable experts.

policies in Minnesota. Schuster et al. (1985) used this approach in a study of elk habitat quality. Phillips et al. (1986) used the technique to determine forest economics research needs for west central Canada.

Gregersen et al. (1989) used the Delphi technique to identify emerging issues in the management and use of the national forests of the United States as a tool for research planning. A series of three questionnaires were used in a nationwide survey of forest supervisors and district rangers of the U.S. Department of

Agriculture-Forest Service and selected researchers to determine their views on which issues in national forest management and use will be most important over the next 10 to 15 years, and possible barriers to resolving these issues. The study found that there was widespread agreement among national forest land managers at all levels in identifying and setting priorities on 11 emerging issues to be faced in the near future. Few of the key issues related to the lack of technical knowledge regarding forest management and use. Most related to people problems, including perceived conflicts among various user groups. The study concluded that if research were to provide information needed in resolving these emerging issues, more attention would have to be paid to research in social, behavioral, and managerial sciences (Jakes et al. 1990).

If research is to help forest managers and users resolve their problems, then research must anticipate research needs far enough in advance so that the needed research can be completed and disseminated in time to be useful. The Delphi process can help identify emerging problems for which research may be needed. Thus, it is an important tool in developing an effective research strategy for a research unit. However, if the Delphi process is to be used as a basis for identifying potential problems for forestry research, then it is important that the participants in the process include not only researchers, but also practitioners and potential users of research results. Every effort must be made to ensure that the clients' problems have been correctly identified, and that the research defined addresses the actual problems faced by the clients. Research problem identification is too important to be left to researchers alone, but must incorporate the views of those who ultimately will use and apply the results.

Incorporating Emerging Issues into the Strategic Plan for Forestry Research

If forestry researchers and their potential clients are able to reach a consensus on what critical issues are likely to emerge during the next decade or so, then the first step towards incorporating these issues into the strategic plan for forestry research is to determine whether research can contribute to the resolution of those issues. Answering the following questions about each issue can help make that determination:

- What data, information, knowledge, new technologies, and other research outputs are needed to deal with this issue?
- What part of the data, information, knowledge, and technologies needed to resolve this issue is already available, and what part could be contributed by forestry research?
- Is forestry research a critical component in resolving the issue?
- If so, what specific research programs would be needed to provide the necessary output?

Please reread the Situation Analysis presented in Study Unit 3.3. Referring to this situation, please answer the following questions by circling all responses which you feel are correct.

Activities

STUDY UNIT ACTIVITIES

Activity 1



What is motivating field professionals to design and implement their own field research studies in this situation?

- a. The research agenda is not relevant to the clients' needs.
- b. The research institution is not looking far enough ahead into the future to properly identify the emerging research issues.
- c. The research institution is attempting to solve today's problems via formal, time-consuming research programs.
- d. There really isn't a problem with the research institution. The problem lies with the field professionals that want to assume more responsibilities, in the hope of attracting more funding to their programs.



Comment 1

- a. While you may feel that this organization is implementing research that was requested by its field practitioners, it is clear that the research is not meeting their needs, particularly in terms of promptness. Field people are usually very busy dealing with today's problems, and thus have difficulty looking ahead to identify problems just now on the horizon. Perhaps the research is focusing on relatively simple problems that might be better dealt with by using less rigorous onfarm or onforest experimentation. Sometimes a thorough survey (i.e., using the Delphi procedure or a modified Rapid Rural Appraisal approach) of the myriad of responses to a particular problem by a large number of people (whether farmers or forest users) can provide adequate information to construct an overall solution, without long-term, extensive, and formal research.
- b. It should be clear that this research organization has not yet considered the many research needs just on the horizon. But you as research manager have taken the most important first step by recognizing the need for such an analysis.
- c. Any forward-looking research institution should have significant efforts already underway to seek resolutions to problems before they become serious. All too often, by the time a problem is recognized by the research organization as serious, and because of the time lag between problem identification and solution generation, the problem has grown in complexity which defies easy solution, and many opportunities have already been lost.
- d. Sorry! We would suggest that is the responsibility of the research institution to look ahead and identify the research issues just now on the horizon. If the implementation branch of an organization is actively building its own research capacity, then most likely the research institution is not meeting the needs of field practitioners.

Activity 2



What are some critical research needs that this forest research institution should begin to address now?

- a. Develop sustainable agroforestry systems to enable the intensification of food and wood production on currently settled lands.
- b. Examine the current market structure for eucalyptus poles in rural and urban pole markets.
- c. Conduct basic soil/site productivity surveys in areas which are targeted for road building and settlement schemes to determine their suitability for permanent agriculture/agroforestry.
- d. Study the impact of a bark beetle currently causing significant damage to newly planted *Casuarina* trees.
- e. Conduct basic research on species of trees of the native forest that are not currently being utilized for forest products to improve production efficiencies and reduce the need for further forest clearing.
- f. Investigate new methods for transferring or extending new agroforestry technologies to farmers living on the forest fringe to improve their own production of agricultural and wood products, and thus relieve some of the pressure on the remaining intact forests.



Comment 2

- a. Since land suitable for agriculture is limited, an intensive effort needs to be made to help farmers improve their production of food and forest products on the land they currently have. To meet the need for more intensive cultivation of tree and crop species, sustainable agroforestry systems must be developed that are tailored to the particular conditions existing in the country. Thus, this topic is appropriate for research which addresses emerging needs.
- b. While this may be a current question, we fail to see how this merits classification as an emerging research issue. Perhaps a better issue to examine is a projection of national pole production and the effects of increased production on markets, prices, and subsequent production as affected by price changes, should a large number of farmers institute agroforestry practices on their lands.
- c. Policy setters should be aware of the implications of settlement schemes and road building on lands that may not be suitable for settlement and crop production. If soils in a forested area scheduled for road building or settlement cannot support agriculture, then policy makers need to know this so they can adjust their plans.
- d. We hope you didn't choose this as an emerging issue! While this problem is important to the owners of *Casuarina* trees, it hardly merits the status of an emerging issue. This is a current problem that probably could be handled easily by a quick survey by an entomologist.
- e. As more pressure is placed on the remaining forests for wood products used to fuel national economic development, forests will need to be used at greater efficiencies. Many species are not currently used, representing tremendous losses in the efficient use of the forest resource, and driving the need to continue harvesting activities into undisturbed forests. Good job if you choose this as an emerging issue!
- f. As farmers and people living near protected, undisturbed forests shift to a more permanent agriculture, they will need to intensify their production of food and wood products from their own lands to meet their own needs. While many agroforestry technical packages are available and may be appropriate for use in these areas, methodologies need to be developed to communicate these techniques to the end user. This may involve sociological or anthropological studies to determine the best means to implement the extension program, studies that take time and which should be started before the problems become acute.

Activity 3



How would you as research manager go about conducting a systematic assessment of the emerging research issues in your country?

- a. Hold meetings with your research staff and discuss the subject.
- b. Organize meetings with a wide range of specialists from a variety of fields to extrapolate from present trends to predict future issues, particularly as they relate to forestry research.
- c. Read reports from other nations' forestry research programs to determine what emerging issues have been identified as important in other countries.
- d. Conduct a survey of all related forestry agencies and research organizations, both national and international, that are active in your country to determine the important issues currently on the horizon that will be important in the future.
- e. Utilize the Delphi procedure to systematically identify future forestry issues which will require research.



Comment 3

- a. While this is a good start, your source of input is rather limited. You would most likely miss a number of important emerging issues as a result of surveying such a limited sample of people.
- b. Congratulations if you selected this choice! Holding idea-generating meetings with groups representing a broad range of fields relevant to forests and their use is an excellent approach, and will help you to identify a wide range of issues that may contribute to forest related problems in the future. Be sure to include persons and organizations that are active or are responsible for programs in other areas besides forestry and related fields (for instance, people from the national office of transportation, public works, settlement programs, etc.).
- c. Another good choice! Assembling information reported from other countries can help to identify issues which may have eluded your institution's scrutiny, and can expedite the process by avoiding re-inventing the wheel.
- d. This is yet another valid way to determine emerging research issues. People in these forestry organizations may have already been thinking or writing about these issues, and may be able to contribute considerably to your efforts to clarify your predictions of the future.
- e. The Delphi process for obtaining information from informed people has proved to be a useful way to develop informed estimates based on collective experience and judgement. Although it is not infallible, it nevertheless provides a structured way to pool the knowledge of many people and arrive at a consensus regarding emerging issues that may be relevant to the research program of your organization.

STUDY UNIT ACTIVITIES

Activity 4



Outline in the space below the steps you would follow in using the Delphi procedure to identify the important emerging issues related to the management and use of your country's forests and related resources.

STUDY UNIT ACTIVITIES

Activity 5



What groups of people in your country might you wish to include as participants in the Delphi study described in the previous question? *Write your response in the space below.*



Comment 4

Steps to follow when using the Delphi procedure to elicit and refine the opinions of informed people about future events in order to identify important emerging issues related to forestry might include:

1. clearly define the information required, and develop questionnaires and survey instruments to obtain the desired information from knowledgeable people;
2. select a group of knowledgeable people who are willing and able to participate in the Delphi process, and who are likely to be familiar with existing data, information, and knowledge;
3. obtain preliminary individual independent estimates of future events or conditions from the group of Delphi participants, usually without an exchange of information among the participants, using questionnaires or survey instruments;
4. analyze and summarize the individual responses received; consolidate, summarize, and rephrase the replies, and prepare a new questionnaire based upon the results of the first;
5. present the results of the first round of questionnaires to the participants with the request to reconsider their first response in light of the responses from the other participants, and to provide additional input if necessary; and
6. continue with additional rounds of questionnaires or other means to obtain a consensus among the participants regarding the needed information.



Comment 5

An important aspect of using the Delphi process is to identify people who are experienced in the field being reviewed, who are familiar with past and existing situations, who are quite knowledgeable of the topic at hand, and who are willing to participate in the procedure. The point of this procedure is to pool the general knowledge and information in the minds of these people to generate a picture of future trends and issues that are likely to emerge.

Summary

Forestry research organizations must take the lead in identifying the emerging issues that will be of great importance. While it is difficult to look into the future and accurately predict trends, managers of forestry research can utilize a number of methods to construct a plausible picture of the future. Once identified, these issues must be translated into specific research ideas to be included in strategic planning and the research agenda. Forestry research organizations who do not attempt to identify emerging issues run the risk of having an increasingly irrelevant research agenda which does not address the needs of key stakeholders or the nation.

If you would like more information about emerging issues in forestry, we encourage you to obtain and review the interesting articles identified in the literature cited and other references listed at the end of the module. Two key articles directly related to the topics covered in the module, and cited in the text, are reprinted for your use in the section on readings at the end of the module.

Determining Strategic Issues and Setting Research Priorities

Objectives

When you have completed this study unit you should be better able to:

- *outline a process for identifying strategic issues for research;*
- *explain the differences between basic, strategic, applied, and adaptive research;*
- *develop a set of criteria that would be appropriate for your research organization to use in judging potential research programs and projects; and*
- *apply these criteria in setting broad research priorities for your organization in the context of your strategic research plan.*

Setting research priorities in forestry research organizations is a difficult and complex task. There are many research needs, and limited human, physical, and funding resources to meet those needs. Setting research priorities and periodically updating them is essential in today's rapidly changing world.

But how do research organizations review newly proposed and ongoing research in a consistent and thorough manner? Unfortunately, many do not. This can result in a portfolio of research activities that does not fully address national forestry research needs, that makes inefficient use of scarce resources, and that produces marginally useful research results.

This unit directly addresses this issue. It begins by discussing the need to identify strategic issues that are relevant to the research organization. Next, it briefly explores the distinctions between different types of research, important knowledge to use in determining what kind of research your organization should be conducting. It then suggests some general, but useful, criteria for evaluating research projects and programs and for setting research priorities. It also reviews several methods proposed for setting research priorities. In the activities section you'll learn a relatively straightforward procedure to help you evaluate and prioritize proposed or ongoing forestry research. By utilizing this procedure when weighing possible research strategies, you'll be in a better position to develop realistic strategies that address important emerging forestry issues that require research.

Identifying Strategic Issues

A critical step in strategic planning is to identify key strategic issues that are likely to

affect your research organization and its program of research during the coming years. Bryson (1988) defines a strategic issue as a fundamental policy choice facing an

organization. For research organizations, strategic issues affect or call for a reexamination of the organization's mandates, missions, and values, and the kinds, level, and mix of research services provided. Strategic issues usually arise when: (1) external events beyond the control of the organization make or will make it difficult to accomplish objectives given the resources available; (2) choices for achieving organizational objectives change, or are expected to change (e.g., changes in technology, financing, staffing, or management); or (3) new research opportunities arise (Bryson et al. 1985).

In identifying strategic issues, particular attention should be given to potential major discontinuities which might have a major impact on the organization (Hanna 1985). Examples of strategic issues that a research organization might face include an increasing rate of deforestation, increasing conflicts among groups that utilize forests (Jakes et al. 1989), long-term decline in real research budgets or civil service salaries (Bengston 1989), and privatization of research (Theron 1989).

The process of identifying strategic issues involves first reviewing the mandates, mission, external threats and opportunities, and internal strengths and weaknesses. A review of existing documents relating to the organization's previous research strategies, priorities, and plans can provide useful input into the process. Each member of the planning team is asked to individually identify emerging issues that are likely to affect the research capabilities and programs of the organization. Members are then asked to answer the following three questions for each issue they identified:

1. What is the issue? The issue should be described succinctly in a single paragraph and should be framed as a question that the organization can address.
2. What factors make the issue a fundamental policy question? (How does the issue affect mandates, mission, internal strengths and weaknesses, etc.?)
3. What are the consequences for the organization of not addressing the issue? If there are no consequences, it is not a strategic issue; if the organization will be significantly affected by failure to address an issue or will miss an important opportunity, the issue is highly strategic and should receive high priority.

Planning team members will need time to reflect on these questions. At least a week should be devoted to individual identification of strategic issues. The entire planning team then convenes and develops tentative agreement on what the issues are. Each issue should be summarized on a single page, addressing

each of the three questions posed above. Strategic issues are then prioritized to aid in developing strategies to deal with the issues.

The strategic issues identified by this process should then be considered in setting priorities for the proposed program of research.

Types of Forestry Research

In developing research priorities, it is well to recognize that research organizations carry out different kinds or types of research, depending upon the types of problems they are attempting solve and the intended audience for the research results. Attempts to classify forestry research by such categories as basic and applied, often encounter difficulty in reaching widespread agreement as to the definition of basic and applied research. Sullivan and Mohai (1977) suggest that one simple and useful way to distinguish between basic and applied research is on the basis of who uses the results of the research:

“If we must categorize research, I prefer to do it on the basis of identifying the primary user of the results. If scientists are the primary users of the results of a particular piece of research, I am perfectly willing to call that piece of research, ‘basic.’ If the user is a practitioner of forestry and not a scientist, I would regard that research as ‘applied.’”

Four types of research are often distinguished (see box 3.5.1 for examples):

Basic research. Basic research tends to be oriented towards solving problems of science within a particular scientific discipline. Basic research is intended to contribute to scientific understanding of a problem, not necessarily to the solution of some immediate problem faced by society. Results of basic research are used primarily by other research scientists for further scientific research or as a basis for applied research. The results of basic research can only be judged by the scientist’s peers.

This type of research is not the primary aim of forestry research organizations. However, individual scientists within the organization may, on occasion, contribute to solving problems of science, and gain recognition from their scientific peers for that contribution. Although often of concern to scientists, and high on their list of research priorities, this type of research is unlikely to generate the support desired from the political constituencies for forestry research.

Strategic research. Strategic research tends to be oriented towards solving difficult problems of importance to society.

Strategic research is research that is aimed at removing critical obstacles that stand in the way of achieving a practical goal, but is not necessarily sufficient by itself to achieve that goal. It is directed at solving key parts of a practical problem, which are part of the overall solution to the problem. As Contant and Bottomley (1988) have observed:

“Strategic research is aimed at understanding specific but difficult problems or mechanisms which stand in the way of achieving a practically oriented goal ...”

Results of strategic research are used in part by other research scientists and in part by practitioners. The results of strategic research may be judged in part by scientific peers, and in part by practitioners and other members of society.

Such research may have a high payoff, but it also may be complex and difficult, with highly uncertain results and a high risk of failure. If the problem is exceptionally difficult, such research may require a substantial commitment of resources over a fairly long time period. Small research organizations are unlikely to have the resources to support this type of research. Generally it would be undertaken by larger research establishments, such as regional or international centers.

Applied research. Applied research is oriented primarily towards solving immediate practical problems of society through the development of new technologies and new materials. Results are intended for use primarily by practitioners, but may be used as the basis for further research. Further adaptive research may be required before the results of applied research can be actually applied in specific situations. Although the technical competence of the research may be judged by scientific peers, the results of applied research are best judged by the intended users.

Much of the research within a forestry research organization can be best categorized as applied research. That is, it is intended to contribute to the solution of society's problems, and the results are intended to be used to change the way in which things are done in the real world. If research managers can demonstrate that their research results are adopted and applied in practice, and are helping to solve important social, economic, or environmental problems, they may be able to develop considerable political support from their user groups.

Adaptive research. Adaptive research is oriented towards adapting existing research results and technologies, which may have come from outside the research organization, for direct application to specific local on-the-ground situations. It may involve some development and pilot testing in particular situations

to adapt specific technologies to those technologies already in use and to specific economic and social situations before being acceptable by the intended users. Results are intended for direct adoption and use by specific groups of people in specific situations. Results of adaptive research are best judged by those who actually adopt and apply the end results.

Adaptive research may be done by forestry research organizations in situations where they have developed close working relations with research users and field practitioners. In some cases, it is carried out by extension groups, social action groups, and field practitioners themselves as part of the process of adopting and adapting promising findings of applied research to their specific problems. Although adaptive research can make substantial contributions to economic development, a forestry research organization that concentrates too much on adaptive research, and neglects applied research, may find itself serving more as a problem-solving staff for user groups than an independent research organization.

Box 3.5.1. Types of forestry research.

Basic research is oriented towards solving problems of science, usually within a particular scientific discipline, to improve our understanding of physical, biological, or human systems. An example of basic research might be a study to determine the population structure and dynamics of major tree species in an important forest ecosystem that could provide basic information for a later research program to develop management recommendations for that type of ecosystem.

Strategic research is aimed at solving difficult problems of importance to society, typically undertaken by larger national, regional, or international research centers. Strategic research seeks to remove critical obstacles that impede the solution to important problems. It may involve scientists from several different disciplines. An example of strategic research might be a program of research to devise effective means of reforesting degraded and deforested lands in an arid region suffering from an acute fuelwood deficit.

Applied research is oriented towards solving immediate practical problems in society to improve the way in which things are done. It typically involves the development of a new technology (a new way of doing things) that can be applied in practice by specific people, groups, firms, or organizations. An example of applied research might be a study to develop general recommendations for thinning plantations of a widely planted tree species to achieve maximum yields of timber or other forest products.

Adaptive research is oriented towards adapting existing research results and technologies to fit a particular specific local situation. For example, a special research study might be initiated to modify a general thinning regime recommended for Teak (*T. grandis*) plantations as the result of a program of applied research, so as to produce a particular size or grade of stem wood to better meet the needs of a particular industrial firm.

Unfortunately, forestry research seldom fits neatly into any one particular type of research. It is better characterized as a spectrum of research activities that may range from pure basic research of immediate importance and interest only to science, through to research that seeks to adapt existing research and technologies to specific operational situations. Forestry research projects and programs often span a range of research activities over time that may include some initial research that tends towards the basic end of the spectrum and seeks to fill in some gaps in our knowledge and understanding, and later research that is far more directly applied.

Nevertheless, although it is recognized that the boundaries of research categories are difficult to define and describe with precision, such categories are useful in designating broad types of research that differ in several fundamental respects, including the broad types of problems they address, the actual users of the results, and the group of people best qualified to evaluate the output of the research.

Evaluating the Relevance of Proposed or Current Research

In forestry research, as in other fields of science, we are forced to make choices of what research projects or programs on which to work. We must set priorities on what, how, when, and where to conduct research. In setting research priorities the difficult job is to select important problems that can be done with the human resources and facilities available, within a reasonable time, and within an allowable budget. There is a seemingly endless array of potential problems that could be in a research program. Only some of them are really important to solving key problems in science or society.

Forestry research results should have the potential to help resolve an issue or solve a problem. If the research meets this simple criterion, it is then necessary to determine whether or not the research should be included in the research unit's strategic plan. Answering the following questions will help make that decision:

- **Does the proposed research fit the research unit's mission?**
Would it help the unit achieve its goals?
Would it be acceptable to those who fund the research?
- **Could the needed research be done successfully?**
Are the skills and resources available to do the research in time to be of use?
Is there a reasonable chance of success?
If not, are the potential gains large enough to offset the risk of failure?

- **If the research were carried out successfully, are the results likely to be applied in resolving the issue?**
 Could the results be used by the people for whom they are intended?
 Could the results be used by others?
 Are the results likely to be used?
- **If the results were used, would the resulting benefits offset the costs of the research?**
 Would the expected benefits of the proposed research justify the costs?
 What difference would it make if the research results were not available or not used?
 What would be the impacts of applying the results? How much, where, and when?
 What would be affected, and to what extent by the application of the research results?
 Who would be affected by the research, to what extent, and when?

The above questions are useful in deciding whether or not to fund individual research proposals, and also in setting priorities among several proposals. Answering these questions does not provide any set formula for determining which forestry research programs should be included in the strategic plan, or for setting research priorities. However, the research manager who reflects on these questions when weighing possible research strategies will be in a better position to develop more realistic strategies that better address important emerging forestry issues. Such strategies are likely to generate more support for research programs among potential user groups than a research strategy developed internally within the organization.

Determining the Level of Research Effort Required

In order to make effective use of limited resources, the manager of an applied field of research such as forestry has the problem of determining not only what research is needed to solve a particular problem, but also determining what intensity of research effort is appropriate to each situation. This is more of an art than a science. Yet, this is possibly one of the most important actions in developing a research strategy. It is a fundamental problem facing managers of forestry research that has no clearcut answers.

The term *research* can encompass a wide range of activities, from a relatively simple assembling of existing information into a more systematic and useful format, to an intensive long-term series of complex experiments; from providing rough approximations of an answer, to providing detailed and precise information about a

question. In some cases, all that may be needed to help solve a critical problem is a reasonably good rough approximation of the desired information. This may take only a few hours or a few days for an experienced scientist. At other times, in order to provide the information needed it may be necessary to conduct a series of sophisticated studies, utilizing a team of scientists over a period of several months or years.

The intensity of research effort required in any situation depends to a considerable degree on the quality of information that would be desirable or acceptable to potential users. It can best be determined by working closely with potential users of research results to identify an acceptable level of precision necessary for resolving the problem. One can begin by asking:

Just how much research is really needed in order to produce enough information (or other research outputs) to make intelligent decisions or to solve the problem?

At times, in planning research it may be well to ask the questions:

How little information is required to avoid making big mistakes?

What is the minimum amount of research needed to provide an acceptable level of information on this topic?

In such cases, it is assumed that the research is justified only in terms of the usefulness of the information and other outputs it produces.

Criteria For Setting Research Priorities

General research priorities and guidelines often are developed at several levels. Three levels will be considered here: (1) high policy and administrative level; (2) research organization level; and (3) research unit level. The criteria used for judging research desirability and setting research priorities vary from level to level.

Policy and administrative level

At the highest policy and administrative level, decisions are made regarding the establishment and support of a forestry research organization, and the broad kinds of research that are to be undertaken. At this level, which may involve both the administrative and legislative branches of a national government, decisions may be made as to the structure and administrative functioning of the organization, and the establishment and location of regional and/or local research centers within the country.

Entering into this decision may be potential conflicts and complementarities with research programs of other public and private organizations. Broad program priorities may be suggested or established, and funding levels set. Outside funding sources also set broad program areas they wish to support, which limit the types of research for which their funds are available. The main factors influencing choices of research program activity at this level are economic, social, and political (Contant and Bottomley 1988). Decisions made at this level set broad constraints on the types of research that can be undertaken by a research organization, and provide a general framework within which research planning takes place.

Research organization level

At the research organization level, longer term research priorities may be implied by the way in which the research is organized and funded, and by budget and other funding constraints imposed by those funding the research program. Decisions to establish and support field stations with special facilities to conduct specific types of research (e.g., genetic improvement of certain tree species, watershed and hydrology research in a particular geographic area, ecology and management of mangroves, etc.) are, in effect, establishing broad research priorities. Such field stations and facilities often are expensive to establish and maintain, and require long-term commitment of core funds if they are to be productive. Changes in research priorities that may require the abandonment of such facilities, or conversion to some other line of research, are not easily made. The main factors influencing research priorities at this level are economic, social, political, and technical.

Some of the criteria used in selecting broad research programs at this level include (not necessarily in order of importance):

- relevance to the mission of the organization;
- potential contributions to regional and national economic development;
- research programs of other public and private organizations;
- political support for the program areas;
- availability of long-term funding; and
- potential for successful accomplishment.

Research unit level

At the research unit level, considerably more attention is given to assessing the potential contributions of specific research programs, projects, and studies. At this level, all of the criteria stated above may be considered in establishing research priorities. However, special emphasis would be given to technical and operational

considerations (Contant and Bottomley 1988). Additional criteria of particular importance at this level include:

- availability of personnel, time, and funds to successfully complete the proposed research;
- the capabilities, personal interests, and incentives of research scientists to conduct the proposed research;
- the potential contribution of the proposed research to science and/or society;
- potential usefulness of the expected research results to specific potential users;
- likelihood of successful adoption and utilization by intended users; and
- the anticipated benefits and costs to various groups in society from the use and application of the research results.

At each level, the research priorities set constrain the research choices available to the lower levels of decision making, and influence the priority-setting process.

Methods For Setting Research Priorities

A number of methods have been suggested and tested for setting research priorities in agriculture (Contant and Bottomley 1988). These include: (1) congruence, (2) checklists, (3) scoring, (4) domestic resource cost ratios, (5) benefit/cost analysis, (6) mathematical programming, and (7) systems and simulation analysis. However, few of these formal methods have ever been widely adopted in practice for setting research priorities. Most are recognized as being very difficult to apply in programs involving noncommodity research, such as problems involving the natural resource base and social and economic factors (Contant and Bottomley 1988). Of the formal methods for setting research priorities listed above, the most practical for setting priorities in forestry research are likely to be checklists and scoring.

Checklists are simply lists of research criteria, such as those listed in the previous section, which can be reviewed by the research manager as a reminder of the important questions to be asked of each research program, project, or proposal to be evaluated. There is no standard set of questions that must be included in such a checklist. Each research manager should make up a list of questions that is relevant to his or her situation. The purpose of developing such a checklist of questions is to ensure that the same set of questions is used in judging each research program or project being considered. By itself, such a list does not automatically determine priorities. Ultimately, priorities are determined by the research manager, after carefully comparing answers to all of the questions and criteria on the checklist for each research proposal.

The scoring method of setting research priorities essentially utilizes a checklist of criteria or questions as described above, but imposes on this checklist a predetermined set of numerical values or weights to be assigned to each set of criteria or questions. A scheme must be devised for assigning a numerical weight to the answer given to each set of questions. Then, this numerical rating is multiplied by the weighting value assigned to that set of questions, and summed up for all the questions in order to determine the overall score. Although this method has the appearance of objectivity, the weakness of this approach lies in the subjective methods used in assigning the weights and scores to the various questions. As Contant and Bottomley (1988) point out, "There is always the possibility that the personal judgements which lie behind the determination of weights and scores may result in misleading conclusions..."

It is desirable to have a systematic approach to evaluating potential research programs, projects, and proposals, one that is understandable and considered reasonable by outside observers. However, it is not necessary, or even desirable, to attempt to implement a complex formal analytical system for setting research priorities. A simple checklist of questions that include some of the key criteria that are important to your research organization in judging research programs, such as were suggested above, is likely to be a far more practical and useful approach to setting research priorities. An exercise demonstrating how such a checklist can be used to set priorities among several research proposals is given in the following activities.

Activities

The following exercises will demonstrate how you can use a checklist of questions to systematically assess the suitability of research proposals for your research organization, and to establish priorities among several competing proposals. By completing these exercises, you'll become more skillful in evaluating alternative research programs and projects within your own organization.

STUDY UNIT ACTIVITIES

Activity 1**Step One: Identifying the Proposed Research Topics.**

In the space below, list as many research proposals (programs, projects, studies) you can think of that were proposed or initiated during the past year in your own research organization.

- A. _____

- B. _____

- C. _____

- D. _____

- E. _____

- F. _____

- G. _____

- H. _____



Comment 1

For the purposes of this exercise, we hope you tried to be thorough when you answered this question, listing all the research proposals that were proposed or initiated by your organization during the past year. Remember, this procedure is not only limited to setting priorities on new proposals, but also can be used to evaluate recently initiated and ongoing research programs.

Activity 2



Step Two: Preliminary Screening of Proposed Research.

Use the table below to evaluate the proposals or initiated research projects you listed above. Each of the following questions in the table is fundamentally important to any proposed research. For each research proposal you listed in the previous activity (above), answer the questions in sequence. If your response to the question is "yes," then write yes in the proper box and proceed to the next question; if your response to the question is "no," then write no in the box. If any of the questions are answered "no," then the proposal would be rejected or placed on hold for reconsideration.

Questions	Research Proposals							
	A	B	C	D	E	F	G	H
Does it fit the Unit's overall mission?								
Does it help to achieve your organization's goals?								
Would it be acceptable to funders?								
Are the skills and resources available to do the research?								
Is the research likely to be accomplished successfully?								
Do you think the expected benefits would justify the costs?								

More than likely some of your research proposals did not pass this initial screening.

Below, list all the research proposals that did meet all of the above criteria (that is, those with "yes" responses for all the questions).



Comment 2

This step is to determine whether scarce resources should be committed to a proposed program of forestry research. These basic questions are meant to quickly help you decide whether the proposed research is appropriate and relevant. Those research proposals that do not positively meet all of these initial requirements should not be considered for implementation in their current form, and need to be restructured or ultimately rejected.

But if a proposal is rejected or put on hold, examine the reason carefully! Perhaps the problem lies not with the proposed research program but instead with the judgement criteria. For instance, if the proposed research does not address the unit's overall mission, is this because the proposal is not relevant to your organization's mandates? Or is it because your unit's mission statement needs some updating to make it more sensitive to the changing external environment?

Step Three: Developing Priorities for Proposed Research Implementation.

Activity 3



You're now ready to develop priorities for the research proposals that did meet these fundamental requirements.

The table on the next page lists several questions or evaluation criteria that are useful in establishing research priorities. Please read these directions carefully before proceeding, as the process, while not difficult, can be a little complicated. To the right of the questions, several blank columns have been provided, one for each of those research proposals that passed the preliminary screening and are being considered as eligible research proposals.

At the heading of each blank column, enter the letter for those research proposals you wish to evaluate further. Use as many columns as you need for the proposals that passed the preliminary screening.

For each question, compare all of the research proposals you have listed, then mentally rank each proposal against the others according to how well they address that particular question. Enter the rank of each proposal in their respective boxes to the right of the question. In ranking, use a scale of 1 to whatever number of proposals you are ranking, with 1 being the most desirable.

For example, if you were considering 5 proposals, rank them from 1 to 5 for each question, with 1 being the most desirable proposal, and 5 being the least desirable proposal. As an example, for the first question and for 5 hypothetical projects, you might enter their ranking as shown below:

Questions (Evaluation Criteria)	Research Proposals						
	A	C	D	F	G		
Are the potential gains large enough to offset the risk of possible failure?	5	4	1	3	2		

For this question, in this example, proposal "D" ranks the highest, and proposal "A" ranks the lowest. After ranking all of the proposals for the first question, go on to the second question, and again rank the proposals based on that criteria. Continue ranking the proposals for each question in turn until you have completed them all. When you are finished, total the scores for all of the questions under each proposal and compare totals. The proposal with the lowest score has the highest priority, and the proposal with the highest score, the lowest priority.

(We've left extra spaces at the bottom of the table for you to add any additional questions you feel are important to use in evaluating research proposals in your organization.)

Follow the directions on the previous page to complete this table.

Questions (Evaluation Criteria)	Research Proposals						
Are the potential gains large enough to offset the risk of possible failure?							
Are the results likely to be used by targeted users? (or, to what degree are the results likely to be utilized?)							
Could the results be used by nontargeted users?							
Can the research be accomplished within an acceptable time frame?							
Will the results make a difference? That is, how important is this proposed research?							
Is the proposed research cost efficient in reaching the stated goal?							
Column (Proposal) Totals							



STUDY UNIT ACTIVITIES

Comment 3

We hope this procedure helped you to roughly determine the relative importance of your set of proposed research projects. Feel free to adapt this format to your own particular needs and circumstances.

Activity 4



Step Four: Applying Personal Judgement to Priority Setting

You may have found that some proposals were clear “winners” with a superior rank and a high priority. They may have ranked high for every question (criteria). Others may have been of a lower priority, ranking near the bottom for every question. Proposals that are clearly of the highest or of the lowest priority are relatively easy to identify. However, deciding how to allocate scarce resources to implement proposals of moderate priority is considerably more difficult, and requires judgement. For example, some of the criteria may be more important than others in your own particular circumstances. The following additional questions may help sort out the importance of those proposals of moderate priority.

- What would be the impacts (ecological, social, economic, cultural, political, etc.) of applying the results? Where and when would the impacts occur?

- What would be affected, and to what extent by the application of the research results?

- Who would be affected by the research, to what extent, and when?



Comment 4

This step is a rather gray area in the prioritization process, as it requires a fair amount of personal or group judgement. For those proposals that fall in the middle priority range, it sometimes can be difficult to determine their relative importance. Thus, these questions (and any others which you may think of), can help you better understand the impacts and ramifications of the proposed research. With a more complete understanding, you and your staff can better decide on the proposal's relative merits.

Activity 5



Step 5: Final Prioritizing of Research Proposals

The last step is to rank your research proposals in order of priority. Using your findings from the previous self-assessment activities (1 to 4), list your research projects in priority order below (with 1 being top priority, 2 being the next, and so on).

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

Congratulations! You have now established priorities among your list of research proposals!

This, or a similar procedure of your own devising, can be used as a guide when you wish to establish priorities for research proposals in a systematic manner.



Comment 5

Congratulations for taking the time to work through this process for research project prioritization! We hope you found this procedure useful and flexible enough for future use in your own research organization. By weighing proposed research strategies, you will be in a better position to develop realistic strategies that include research aimed at important emerging forestry issues.

The priority-setting process outlined here is not intended to be used as a mechanical routine means of setting research priorities. Rather, it should be viewed as a way to assist you in making informed judgements, based on a systematic consideration of criteria that you believe are important for judging your organization's research program. We realize that in practice it may be difficult to assign definite priorities among diverse research proposals and ongoing projects that cover many different fields of science. However, it is possible to use this, or a similar process, to screen broad program areas of research, and then use the same process to set priorities within each broad program area. In the end, the priorities set must reflect the collective judgement of you and your staff, which can never be fully captured in a formal analytical evaluation method.

Summary

Research managers are often required to determine whether or not proposed research should be included in the research unit's strategic plan. This unit presented a relatively straightforward procedure to help you systematically evaluate and prioritize proposed or ongoing forestry research. Four main questions are available to test the research:

1. Does the proposed research fit the research unit's mission?
2. Could the needed research be done successfully?
3. If the research were carried out successfully, are the results likely to be applied to resolve the problem?
4. If the results were applied, would the benefits justify the costs of the research?

By reflecting on these questions when weighing possible research strategies, you will be in a better position to develop realistic strategies that include research aimed at important emerging forestry issues. One potential advantage of the resulting relevant, targeted research agenda would be the generation of greater support for the research among potential user groups.

If you would like more information about determining strategic issues and setting research priorities, we encourage you to obtain and review the interesting articles identified in the literature cited and other references listed at the end of the module. Two key articles directly related to the topics covered in the module, and cited in the text, are reprinted for your use in the section on readings at the end of the module.

Skill & Knowledge Assessment

Module 3 - Identifying Key Issues for Forestry Research



Below are listed a number of skill and knowledge statements derived from the objectives of the study units in module 3. These are identical to those listed in the initial skill and knowledge assessment at the beginning of the module. Now that you have completed module 3, please read each statement carefully and indicate with a checkmark the level that best describes your current skill or knowledge, from 1 to 5, using the following descriptions:

- 1 I cannot perform this skill, or I have not been exposed to the information.
- 2 I cannot perform this skill, but have observed the skill or have been exposed to the information.
- 3 I can perform the skill or express the knowledge with assistance from others.
- 4 I can perform the skill or express the knowledge without assistance from others.
- 5 I can perform the skill or express the knowledge well enough to instruct others.

Skill or Knowledge Statement	Your Level of Skill or Knowledge				
	1	2	3	4	5
a) Describe the general differences between research users and scientists in their perceptions of research needs.					
b) Distinguish between information needs and research needs.					
c) Identify and assess potential issues, problems, and opportunities external to your organization, but related to its forestry research activities.					
d) Identify and assess the internal strengths and weaknesses of your organization in relation to potential programs of forestry research.					
e) Describe why the identification of emerging issues in forestry is an important step in developing an organization's strategic plan for research.					
f) Use a structured procedure (the Delphi System) to identify emerging issues that can be used as a basis for specifying research needs relevant to your organization.					
g) Explain the differences between basic, strategic, applied, and adaptive research.					
h) Develop a set of criteria appropriate for judging potential research programs and projects and setting broad research priorities for your organization.					

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READINGS FOR MODULE 3

The following readings have been selected to provide you with additional information related to the material covered in module 3. We hope you will find them of interest.

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**RESEARCH NEEDS, ASSESSMENT, AND EVALUATION:
IDENTIFYING EMERGING ISSUES AS A KEY TO
FORESTRY RESEARCH PLANNING**

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INTRODUCTION

It seems at times that planning is something everyone talks about but no one does. But studies have found that research managers spend a significant portion of their administrative time planning research programs. A survey of IUFRO research managers found that they spend one-third of their time on planning projects and programs (Gregersen, 1984). USDA Forest Service research managers spend a similar proportion of their administrative time on developing research programs (Jakes, 1988).

Despite the effort that goes into planning research programs, there is little literature on how public research organizations decide which research projects or programs they will undertake. Forest Service research managers rated the desire to solve problems and the need to respond to requests from users as the most important factors in determining the direction or content of their research programs (Jakes, 1988). The desire to solve problems is the critical factor for selecting research projects in both developed and less developed countries (Gregersen, 1984).

The question for research managers and for researchers is, How are these problems identified? Or from another point of view, How do users ensure that their research needs are heard and considered? During the life of a Forest Service research work unit users are contacted several times for input to the research program. The Forest Service's National Forest System, a principal client of Forest Service Research, identifies its research needs when it writes a forest plan, outlining planned management activities for a National Forest. However, a recent evaluation of the competitiveness of Forest Service Research shows a need to reexamine the adequacy of the Forest Service Research effort to identify research needs and their relative priority among its clientele (Chapman and Milliken, 1988). The report further found that Forest Service Research needs to improve its methods for soliciting the advice and assistance of outside experts in identifying priority research areas. This finding should come as no surprise to research

managers. In recent studies, research managers in developed and less developed countries have indicated a need for better techniques or methods for selecting research studies (Gregersen, 1984; Jakes, 1988).

We conducted a study to develop a tool for identifying emerging forestry issues (Gregersen *et al.* in press). Notice we did not say forestry **research** issues. Other studies have outlined similar methods for identifying and prioritizing research needs (Milne, 1989; Phillips *et al.*, 1986). The difference between these approaches and ours is that we asked clients and researchers to list the most important emerging forestry issues. We did not directly ask respondents to identify research issues or needs. We were concerned that when individuals are asked to identify research needs, they are likely to respond with technical research topics dealing with genetics, forest management, forest utilization, *etc.* Because we were ultimately trying to identify the role of research in addressing emerging issues, we wanted to break away from the traditional responses. Once issues were identified, we asked clients and researchers to identify barriers to addressing the issues. Once barriers are identified, actions (including research) to resolve issues can be planned.

METHOD

A modified Delphi Exercise was used to identify emerging forestry issues from National Forest managers, National Forest users, and forest economics researchers. The Delphi has been characterized as a method of structured communication that allows a group of individuals to deal with a complex problem (Linstone and Turoff, 1975). There are generally three steps in a Delphi Exercise:

(1) Design a questionnaire. Our first questionnaire consisted of one open-ended question:

From your point of view, what are the most important emerging forestry issues that national forest managers and national forest users will face over the next 10-15 years?

(2) Develop a second summary questionnaire to focus results. The first questionnaire was returned and the results were summarized. Using these results, we designed a new questionnaire. On the second questionnaire, respondents to the first questionnaire were asked to consider the results, to change or reevaluate their first response, and to provide further input to help focus the results. For our second questionnaire, we presented participants with 11 issues summarizing their responses to the first questionnaire and asked them to rate the relative importance of the issues and to indicate any critical issues we missed in our synthesis.

(3) Use additional rounds of questionnaires until some desired level of consensus is achieved or it becomes evident that no further consensus is possible. We used a third questionnaire to determine the key barriers to addressing the 11 issues. We asked respondents to indicate the importance of four barriers—inadequate knowledge, inadequate resources, inadequate incentives, and inadequate institutional support—in resolving the issues.

Because we had decided to focus on U.S. National Forest management and use, we surveyed the line officers responsible for managing the National Forests—all Forest Service regional foresters and forest supervisors, and a random sample of district rangers (at least one per forest). We also identified 60 organizations and corporations that use National Forest outputs and included them in our Delphi Exercise. Because our ultimate goal in identifying emerging issues is to develop timely research programs, we also sent the Delphi to a group of researchers. Due to budget and time constraints, we limited our researchers to Forest Service and academic forestry economics researchers. The number of persons participating in each stage of the Delphi Exercise for each respondent group is shown in Table 1. Our response rate from Regional Foresters and National Forest users was not adequate for statistical testing. We combined the two groups of researchers to have a sufficient number of respondents.

Phases of the Delphi Exercise	Regional forester	Forest supervisor	District ranger	Clients	Researchers
Original mailing	9	120	120	60	140
Respondents to:					
First questionnaire	6	63	62	14	60
Second questionnaire	5	55	58	9	55
Third questionnaire	5	34	28	7	37

Table 1.—Number of respondents in each phase of the Delphi Exercise by respondent group

FINDINGS

Participants responded to the first questionnaire with phrases, sentences, and paragraphs. From the hundreds of pages of text, 11 issues surfaced that summarized most of the concerns raised (Table 2). In the second questionnaire respondents rated the relative importance of each

Rank	Issue
1	Increased use of legal and political processes to challenge decisions and forest plans. [Legal and political challenges to decisions] ¹ Range = 19-186 Mean = 102 Standard deviation = 31
2	Increasing conflicts and polarization among various user groups (recreationists, hunters, loggers, etc.) of uses of the National Forests. [Conflicts among user groups] Range = 0 Mean = 100 Standard deviation = 0 ²
3	Increasing conflicts between local and national interests and priorities. [Conflicts between local and national interests] Range = 25-200 Mean = 97 Standard deviation = 28
4	Inconsistencies between priorities established in the planning process and those in the budgeting/appropriations process. [Inconsistencies in priorities established during the planning and budgeting processes] Range = 19-200 Mean = 93 Standard deviation = 34
5	Increasing constraints on planning and management activities due to environmental/conservation concerns expressed in laws or regulations (e.g., threatened and endangered species, herbicides). [Constraints imposed by laws or regulations] Range = 25-178 Mean = 92 Standard deviation = 28
6	Declining budgets to manage the National Forests. [Declining budgets] Range 13-175 Mean = 91 Standard deviation = 35
7	Effectiveness and cost of forest planning process. [Forest planning process] Range = 8-188 Mean = 84 Standard deviation = 35
8	Making user fees commensurate with costs (e.g., below cost timber sales, recreation). [User fees commensurate with costs] Range = 0-185 Mean = 82 Standard deviation = 33
9	Increasing role of the National Forests in watershed and water management. [Watershed and water management] Range = 6-150 Mean = 78 Standard deviation = 33
10	Increasing problems associated with the wildland/residential/urban interface. [Wildland/residential/urban interface] Range = 0-154 Mean = 74 Standard deviation = 32
11	Increasing adverse impacts on the National Forests due to certain uses (e.g. off-road vehicles, marijuana growing). [Adverse impacts due to certain uses] Range = 5-161 Mean = 72 Standard deviation = 27

¹ Phrases in brackets indicate how issues are referenced in the text.

² Because all the values were normalized around the value assigned to "conflicts among user groups," there is no standard deviation or range for that issue.

Table 2.—Emerging issues in the management and use of National Forests in the United States

issue, and to indicate any critical issues we missed in our synthesis. Very few new issues were mentioned on the second questionnaire, and no new issue was mentioned by more than two respondents. Thus, we felt fairly certain we had captured the major concerns in our 11 summary issues.

Two points stand out with regard to the ranking. First, there was remarkable agreement among the three respondent groups on the importance of the 11 issues—the mean importance values for issues do not vary widely. Because the issues in the second questionnaire were developed from participant responses to the first questionnaire, it is not surprising that all 11 issues were considered important.

Second, the range in values for each issue is large, with standard deviations near 30 for almost all issues. Opinions differed about the relative importance of any one issue, even though the average or mean opinions are fairly close. We found a significant difference between rankings given by Forest Service managers (forest supervisors and district rangers) and those given by researchers to several issues. Researchers felt that the issue "User fees commensurate with costs" was much more important than National Forest managers did, while National Forest managers ranked the issue "Legal and political challenges to decisions" as more important than researchers did.

Regarding barriers to resolving issues, for all issues and all respondents, inadequate institutional support was considered to be the most important barrier to resolving emerging issues. Inadequate knowledge was considered the least important barrier.

DISCUSSION

We can draw some general conclusions from this study.

First, a Delphi Exercise can be used to identify emerging forestry issues, the relative importance of issues, and barriers to resolving the issues. Once issues and barriers have been identified, it becomes the task of forestry policy and decision makers to develop programs to address the issues. But it should be the task of researchers and research managers to develop specific research projects that offer the greatest potential for resolving the issue.

Second, the agreement of National Forest managers on the importance of the 11 issues was striking. Eighty-one percent of the forest supervisors and 86 percent of the district rangers gave the top ranking to the same five issues (the first 5 issues shown in Table 2). It's interesting to note that 4 out of 5 of these most important issues deal with conflict resolution. There is a need to evaluate the significant body of literature dealing with conflict management in other fields, and to explore possibilities for establishing a

natural resources research program in conflict management. There was also close agreement on the importance of the four barriers in resolving issues.

Third, we were able to demonstrate that researchers and national forest managers do not always agree on the importance of issues, nor on the barriers to resolving issues. However these differences are important only if they hinder research programs in solving important resource problems.

Finally, the research required to resolve the issues is primarily social science research. But natural resource managers seldom identify social science research as a priority when asked to identify research needs. The traditional response to requests for research needs focuses on technical management information. Although research in these fields is essential to efficient production and management of natural resources, this technical information does little to resolve day-to-day issues faced by managers.

The method and issues developed in this study should aid in the management of research and natural resources in the Forest Service. With continued research on research, we can help ensure that the forestry problems addressed are not only interesting problems, but also important.

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Socio-economic issues in planning forestry research programs and projects

A.L. Lundgren

Introduction

As foresters, we tend to think in long-range terms, in decades rather than years. Many forest trees live for decades, or even centuries. Following disturbance, many forest ecosystems take decades to pass through various successional stages to reach a more stable condition. Traditionally, we have been concerned with sustaining the yield of wood or other products or services from forests, which means developing and maintaining a forest ecosystem that can sustain the harvesting of trees and/or the use of their products over an indefinitely long period of time.

Recently, we have been hearing the term "sustainable development" used. Basically it refers to development geared to the long-term sustained use of natural resources to satisfy the needs of people today, without impairing the potential of the resource base to satisfy the needs of the future. To those of us in forestry, this term has a familiar sound. It sounds a lot like that familiar goal of forest management, achieving sustained yield.

Achieving a long-term sustainable production of desired goods and services from a natural resource base is one of the important factors in achieving sustainable development. But sustainable development goes beyond the bio-physical resource base to include sustainability from the standpoint of human activities. Human institutional, cultural, and economic sustainability is every bit as important to sustainable development as is resource sustainability. Just as a pair of scissors requires two blades to be effective, so too does sustainable development. Sustainable development is achievable only if both resource and human factors are considered simultaneously.

Forestry research has the potential for producing and disseminating knowledge that would contribute towards a more sustainable development of the world's forest resources that are undergoing intensive developmental pressures. But in planning research programs that will contribute to the sustainable development of a nation's forest and related resources, it is important to recognize that sustainable development involves two major interacting systems - the natural resource system and the human system. Thus, forestry research that aims to support sustainable development programs must have research programs in two distinctly different domains of science: (1) the physical-biological sciences, and (2) the social

Table 1.
Distribution of scientist years among various program areas in
1985 for 23 forestry research organizations in the Asia-Pacific region
(Lundgren, Hamilton, Vergara 1986).

Research Program Area	Scientist years	Percent of Total
Management of Natural Forests	73	8.0
Management of Man-made Forests	218	23.6
Protection	80	8.6
Watershed Management, Hydrology, Soils	122	13.2
Basic Biological Sciences	121	13.1
Environment, Wildlife, Recreation	46	5
Resource Inventories, Mensuration, Remote Sensing	30	3.3
Agroforestry, Social Forestry, Fuelwood Production	37	4.0
Forest Products	141	15.3
Economics, Business, Other Social Science	30	3.2
Other	25	2.7
Total:	924	100.0

(A scientist year is defined as the equivalent of a full-time person working for normal work year as a research scientist.)

sciences. Both types of science are needed in developing solutions to the critical natural resource problems that arise when humans interact with natural resources.

The physical-biological sciences in forestry provide knowledge about the physical-biological processes that shape the growth and development of forest and related ecosystems. From such research we learn how plants, animals, and other components of ecosystems interact and develop under the wide range of site, climatic, and resource conditions encountered, including those altered by the activities of people. Such knowledge is essential in developing recommendations for the management of forest and related resources.

But we cannot lose sight of the fact that it is people who use these natural resources to meet their needs, and who are creating many of the resource management problems. And it is people whose needs we are trying to meet in managing these resources. The social sciences can provide knowledge about how the social, economic, cultural and political institutions in human societies affect how people use natural resources, and how these institutions can be used and modified to change the way in which people use the resources. This knowledge is essential to implementing the knowledge about forestry gained through the more biologically-oriented forestry research.

Traditionally, much of forestry research has been devoted to developing an improved understanding of the physical-biological processes that affect forests and related resources, and to produce information to improve their management and use.

For example, reports by 23 forestry research organizations in the Asia-Pacific region (Lundgren, Hamilton, Vergara 1986), showed that in 1985 most of the scientists' years were devoted to research related to the physical-biological sciences (Table 1).

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In these forestry research institutions, only three percent of scientist years were devoted to economics, business, and other social sciences. Although this survey of forestry research institutions in the Asia-Pacific regions was far from complete, and did not attempt to canvas forest products research institutions, it did include many of the forestry research institutions in the region and should reflect the program emphasis of forestry research organizations in the region even though forest products research is undoubtedly under-represented. What seems to emerge from this and other surveys of forestry research institutions around the world is that up until now, most of the research has emphasized improving our knowledge and understanding of the physical-biological processes related to the management and use of forest and related resources. Relatively little attention has been given to research on the equally important socio-economic factors that govern the use of these resources and affect the adoption and utilization of new technologies developed by forestry research.

Foresters involved in development often comment that they have adequate technology to meet their immediate needs, and know how to establish, protect and manage forests. No doubt there is a need for more and better knowledge adapted to local conditions to improve the management and use of forests and related resources. But the major problem foresters often face is getting new practices accepted and used by local people. Frequently, they lack an understanding of how to go about doing this.

Forestry research can support the long-term sustainable development of forest resources to provide the goods and services needed to improve the welfare of people, while protecting the resource and the environment. In order to do this, research results have to be adopted by people and put into use. Research in the social sciences can help evaluate management alternatives from a socio-economic perspective, improve our understanding of how to resolve conflicts among competing uses, develop incentive mechanisms to motivate people to adopt new technologies, and remove institutional barriers to the adoption of improved technologies for resource management and use.

Greater consideration of social science research on the socio-economic issues that affect forestry, forestry research, and the dissemination and utilization of research findings could ultimately make the research we do more effective.

What are some of the socio-economic issues that should be considered in planning forestry research projects? The list seems endless. For purposes of this discussion I have picked out several socio-economic issues that address three important goals that have been suggested for forestry research management. These research management goals are to:

- Goal 1. Insure that forestry research programmes are relevant to national development goals and strategies;**
- Goal 2. Strengthen political support for forestry research; and**
- Goal 3. Improve the processes by which forestry research results are produced, disseminated, and utilized.**

These goals are not listed in any particular order of priority. Nor are they the only important goals of research management. They are used simply as a means of organizing this discussion of socio-economic issues to show how such issues relate to the management of forestry research. My purpose here is to stimulate discussion about the relevance and importance of socio-economic issues in planning forestry research.

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management and administration began their careers as scientists within forestry research organizations, often as physical or biological scientists. Some may feel uncomfortable dealing in the political area. Others may enjoy it. Regardless, forestry researchers must become more aware of the political agenda-setting, decision-making processes within their societies. Socio-economic research can improve understanding of these processes and suggest how forestry can become more effective in influencing resource programs and policies.

Publicizing contributions of forestry research to national goals. It isn't enough to know how forestry research and forestry can contribute to sustainable development, and how the political process works. People have to understand what it is that forestry research can contribute to economic development. Forestry research administrators and managers must make policy makers and political leaders more aware of forestry's role in sustainable development and convince them of the importance of forestry research and its potential contributions to the sustainable economic development of the nations. They also must be able to generate widespread public support for forestry programs and activities. Generating public support may require considerably more effort in widely publicising forestry activities and their contributions throughout society, rather than concentrating primarily on scientific publications.

Goal. 3: Improve Production , Dissemination, Adoption, and Utilization of Research Results

Several socio-economic issues should be considered in developing strategies to improve the production, dissemination, adoption, and utilization of research results.

Improving career paths and rewards for scientists. Laws, regulations, and policies, both within and outside of research organizations, influence career ladders for research scientists. In many countries, existing policies on career advancement discourage well-qualified people from entering or remaining in research. Often, the only way to secure a promotion is to leave research for a career in administration. In order to attract and retain well-qualified scientists there is a need to develop career paths and reward systems to motivate scientists in a research career.

Improving the educational system of forestry scientists. With expanding research programs anticipated, including many areas that traditionally have not been included in forestry research organizations, more scientists will be needed. This need for an increased number of scientists should be considered in research planning. It takes years to educate scientists and it takes teachers and facilities. Those planning for the expansion of forestry research cannot neglect considering the educational programs that will produce the additional number of scientists needed to staff these expanded programs. Thus, forestry research administrators and scientists must work with educators to determine what knowledge and skills are needed by them, and to plan for the necessary changes in the educational system to produce the needed scientists. Some questions to be considered are:

- How many scientists of what kind will be needed to staff planned expansions in forestry research?
- What level of training, in what disciplines, will be needed?
- How long will it take to produce the required number of scientists?
- Can national educational systems in developed and developing countries actually meet the growing need for scientists?

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- What role should international donor agencies play in forecasting needs and enhancing national educational systems to educate and train forestry-related scientists?

Improving the research, development, dissemination, adoption and utilization process. As societies evolve, they develop economic, social and political institutions to organize human activities. These economic, social and political institutions greatly affect the development, dissemination, and adoption of technology within a society. As conditions change, such institutions can act as barriers to the adoption of new technology, and inhibit the introduction of new practices among different social groups. For example, the lack of clear rights to land and the products from the land by rural people can lead to a reluctance to join projects that seek to improve rural living conditions through improvements in the resource base. Research that is not adopted is ineffectual, regardless of how well conceived and well done it is. Research is needed to improve understanding how the new technologies developed by forestry research can be more effectively disseminated, adopted, and utilized.

Coordination and cooperation among research institutions. Much research related to forestry is being conducted by scientists in organizations that are not primarily forestry research organizations. Forestry Research could be enhanced by effectively utilizing the skills available in these organizations. In order to capitalize on expertise in many disciplines lacking a forestry research organization, particularly the social sciences, forestry research will have to develop closer linkages with other research organizations that are closely related to forestry, including anthropology, rural sociology, political science, ecology, soils, hydrology, climatology, agronomy, animal husbandry and many others.

Increasing need for interdisciplinary research. There is a growing need for an interdisciplinary research to address some of the complex problems being encountered in the management and use of forests and other natural resources. All of these involve socio-economic problems to at least some extent. It is humans interacting with natural resource systems that create resource problems, and humans must be involved in solving those problems. Almost any resource management problem involving research will have a human element to it. However, interdisciplinary research is difficult to achieve with the current organization of science into disciplines, with discipline-oriented funding, and with scientist reward systems skewed strongly towards basic research. Mechanisms need to be developed that will remove some of the existing barriers to interdisciplinary cooperation among research scientists in tackling some of the complex problems that resource managers and users face.

A final word.

The job of the forestry research manager and administrator will become increasingly complex in the years to come, as new resource programs emerge which demand the joint consideration of both physical-biological and human factors. I have reviewed some of the socio-economic issues that are having an impact on forestry and forestry research and that should be considered in planning forestry research projects and programs. Undoubtedly, many other issues could be added. The issues I have discussed here are only meant to suggest the broad scope of socio-economic issues that are likely to influence forestry in the future. You know better than I what issues are likely to be most pertinent to your own situation.

The important point to note here is that socio-economic considerations will play an increasingly important role in forestry research in the years to come. To effectively deal with

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these issues, social science research will have to be expanded within forestry research organizations, or others will be given the responsibility for developing information for planning sustainable development, and forestry research will be in danger of losing its influence in resource planning and management. I am hopeful that closer cooperation and coordination between bio-physical and social scientists within forestry research organizations can be achieved to produce research results that can contribute towards a more sustainable development.

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