

**MANUAL OF TEACHING METHODS FOR USE
IN AGROFORESTRY INTENSIVE SHORT COURSES**

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C. I. D. R. A.
Turrialba, Costa Rica

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INTRODUCTION

In 1982, the Tropical Agricultural Research and Training Center (CATIE) and the United States Agency for International Development (USAID) signed a cooperative agreement to conduct a series of four international agroforestry short courses. The series had two basic purposes: 1) to train USAID and host-country personnel in the state-of-the-art agroforestry methodologies and techniques for field implementation and research, and 2) to increase the agroforestry training capability of the Center specifically within its Renewable Natural Resources Department.

All four courses have been offered on the CATIE campus in Turrialba, Costa Rica. The first course was held between 16 - 25 March 1982 and was delivered in English. The two subsequent courses were taught in Spanish from 11 - 24 January and 8 - 18 November 1983. The fourth course took place from 24 April to 4 May 1984 and was delivered in English.

After each course, the participants evaluated the content and quality of instruction. In general, each course was reviewed favorably; however, it was agreed that the quality of instruction could be improved.

The objective of this manual is to provide practical guidance for the selection and use of common methods of instruction that are especially well-suited to short courses in agroforestry and related fields. It is designed to assist agroforestry trainers in the identification of methods that will best accomplish their instructional objectives. Although the examples used are based on CATIE's own experience in agroforestry teaching, the use of the manual need not be limited either to conditions similar to those of CATIE, or to agroforestry training.

It is important to note that this manual is designed for the teaching of intensive short courses. CATIE's four courses had a duration of ten days and included 8-10 hours of theoretical and practical instruction per day. Unless careful consideration is given to varying the teaching methods, students may quickly reach a saturation point. In more formal types of education (e.g., university courses) the instruction is not as intense and, therefore the careful choice and frequent variation of teaching methods is usually not as critical.

We will try to eliminate the confusion surrounding the definition of the term agroforestry by adopting the one used by CATIE's Agroforestry Program:

"Agroforestry is the production and deliberate utilization of trees combined with agricultural crops and/or animals, either in some form of spatial mixture or in sequence that includes a significant ecological and/or economical interaction between the components".

Although often known under different names, agroforestry is a very old practice. Scientific, educational, and technical assistance organizations are focusing upon agroforestry in terms of the development, validation and transfer of appropriate technologies for the benefit of rural populations in developing countries.

The following teaching techniques and suggestions, based on actual experience, should be considered as guidelines to provide options for the various available techniques which are best suited to the different needs and audiences.

This text is the result of team effort. The original draft was prepared by Michael Major a Consultant to CATIE, who coordinated the 4th Agroforestry Short Course, offered in English to AID personnel at CATIE. The draft incorporated numerous comments by CATIE's agroforestry staff members and later it was considerably modified by Gerardo Budowski, Head of CATIE's Department of Natural Renewable Resources who acted as the director of all four courses involved in the contract. Further additions were made by Rolain Borel, Head of the Agroforestry Program of the Department. The order which the names of the authors appear in the title page reflects their respective involvement in the work.

Any criticism for improvement or suggestions for addition of experience related to the theme are most welcome and should be addressed to:

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CASE STUDY: ANALYSIS OF A DAY'S PRESENTATIONS

Before discussing various instructional methods, let's look at what may be a typical day of lecture presentations in many agroforestry short courses. In the following hypothetical case is base on practical experiences during the four CATIE agroforestry courses. The instructors had information of great interest to the course participants, but had difficulties conveying their message adequately. The participants of the course were foresters and agriculturalists with little or none experience in agroforestry.

Lecture presentations comprised the first day of a threeday training "module" that focused on farming systems research (FSR) methodology applied to problems of agroforestry. Previously, the participants had received general background information on the definition, classification and variety of agroforestry systems, including discussion groups.

The module as a whole was very well received by the participants. Nevertheless, the first day's lectures concentrating on the theoretical background were poorly received. Evaluations show that, in this case, a presenting the information in a series of lectures was not the most advisable method. Let's analyze the activities together with some of the participants' comments in order to determine why the presentations were received with little enthusiasm.

The day's presentations followed this program:

- 7:30 a.m. Introduction to Farming Systems Research (FSR) Exercises
- 8:30 Conceptual Bases of Applying Farming Systems Methodology in Agroforestry
- 9:30 Coffe Break
- 9:45 Agroforestry - a Production Agroecosystem of the Small Farm (A Diagramatic Description)
- 10:45 Characterization of Areas for Farming Systems Research The Case of Honduras
- 11:45 Lunch
- 1:00 pm Validation of Technologies - Evaluating the Appropriateness of Alternative Technologies
- 2:00 Organization of Working Groups for Field Exercises
- 2:30 Interactive Group Process: Project Elaboration and Job Descriptions for FSR Projects
- 5:00 Conclusion

The objectives of the day's presentations were a) to introduce the concept of farming systems and b) to prepare course participants for the farming systems research field exercise. Two researches taught this module. To monitor the effectiveness of the instruction, the course organizers asked each student to fill out an evaluation form for each activity.

During the first activity -the introduction to the FSR module- the instructors stated the objectives of the module and the activities that would follow. Afterward, the instructors asked each participant to cite their experience and background in farming systems research. This activity was quite positive and it oriented the students to the module as well as provided instructors with background information about the student.

The second activity involved a lecture on the conceptual basis for applying farming systems methodology in agroforestry. During the lecture, Instructor A. communicated his ideas directly to the audience. Several transparencies were projected with the use of an overhead projector. At the end of the lecture the instructor answered questions from the students.

Although the course participants were interested in the subject matter and the information presented, some -usually the most outspoken- did not like formal lecture presentation. Here's what they said: "The paper presented was self-explanatory and could have been distributed for reading beforehand, then small groups could discuss it and later present their findings to the rest of the students" "If you are going to lecture, breaks should be shorter and more frequent, and you should also try to incorporate more discussion, more sharing of experiences from the participants"; "Make the presentation shorter and more to the point, and illustrate the concepts, with examples"; "Use case studies of development work"; "Too much straight reading from papers"; "I would have liked to have read the paper then had a question-and-answer period"; "Use slides to isolate components"; "More discussion needed, formal talks can be a bit boring"; "Needs to be tightened up".

After a coffee break, students returned to the classroom for a lecture on diagramming farms which was delivered by Instructor B. A complete diagram was projected using an overhead projector. After the hour-long lecture, the instructor responded to students' questions. Again, the lecture overall was not well received by some of the students who found it complicated and confusing. Their remarks were: "A bit more discussion and feedback is needed"; "A simple diagram-marking practical exercise might be useful"; "Simplify diagrams"; "I suggest going through the process of diagramming on the blackboard, so the whole group arrives at the end product/diagram together"; "The transparencies were confussing, it would have been easier to have diagrams on paper in front of us, as well as the transparencies"; "Too detailed for first exposure". "State the goals of the presentation clearly at the beginning"; "Formal talk was too dry and lacked clarity"; "Much of the information on the transparencies was not visible"; "Use concrete examples"; "Show the merit of the systems"; "Boil it down to a conceptual framework and put the participants into the field at the same time to allow them to experiment immediately"; "Needs to be tightened up; modelling is nice but it got to the point of mental masturbation; Could cut this section in half", and "It was too academic, not applicable enough".

Immediately following the diagramming talk, Instructor A gave a formal lecture on characterizing areas using Honduras as an example. The instructor read a paper that he had prepared.

Again, participants reacted strongly against the use of the lecture method to present the information: "Needs to be more cohesive"; "Presentation would have been much better if it had been limited to 10 minutes"; "Clearly state major themes and goals of presentation at the beginning"; "Should have had more input or involvement by the audience". "Use larger print on transparencies; "Simplify Flow charts - 3 or 4 items". My attention span is something like 7-10 minutes without a "break" of some sort (not a coffee break, but a change of pace)", and "The information was useful but we could almost do better by reading the article".

After an hour and a half lunch break, the participants regrouped for a lecture on validating technologies and evaluating the "appropriateness" of alternative technologies. Like the morning's presentation, the after-lunch lecture proved to be disappointing. It received poor evaluations by most because many students were tired of passively sitting and listening, especially in the afternoon after lunch. Students' reactions to this lecture were similar to those of the previous lectures: "More discussion"; "More graphics and harder statistics needed"; "It was a little tedious"; "The paper was self-explanatory and did not need to be read so thoroughly"; "More how to"; and "Presentation was typical of the day: too long, too dry, too vague and purpose and main points were not clearly communicated to listeners".

The remaining of the afternoon was spent organizing and planning the field exercise for the following morning.

A general conclusion from these evaluations is that the repeated use of lectures was not effective continuously throughout the day's activities. Students quickly reached a saturation point during each lecture and lost part of their motivation to learn. Although lectures do have a distinct use in instruction, they should be combined with other instructional methods to assure that the objectives are achieved; and of course, the lectures should not be too long.

Another conclusion is the need for simple visual aids. When overhead transparencies are used, they should be simple and easy to understand. Slides should be incorporated into the lectures to reinforce them and to add those elements which are difficult to convey orally.

Finally, as the evaluations clearly indicate, most students in short courses prefer the kind of instructional activities that involve the participants. Many people do not like to be lectured to and prefer to share their own experiences or to be personally involved in some practical exercises.

It becomes apparent through the analysis of these presentations that effective instruction in short courses occurs only after the audience has been clearly identified and the teaching methods carefully chosen. Planning for instruction takes time. Effective learning does not occur automatically. The worst case is when instructors hastily throw their data into a document and then read it to the participants. Although this is seldom the case, it does occur. But even the better presentations can be further improved. For instance, each individual presentation should be carefully coordinated with the rest of the course activities. In the case we analyzed, the instructors were capable of providing very good instruction but simply lacked the time, and often knowledge of the techniques, to develop instructional activities.

This manual will provide instructors with a series of choices for methods and techniques to improve teaching, all of them considered to be much more effective than a long series of lectures. Later we will return to the farming systems research presentations focused above and, using these methods, will suggest better ways of presenting the information.

DEFINING OBJECTIVES

Objectives should be made clear in terms of 1) levels and kinds of learning to be achieved by the end of the activity and 2) kinds of behavior to be exhibited after activity completion.

The purpose of formulating objectives is to provide clear guidance that permits an orderly presentation of the contents. Objectives should be spelled out so that 1) learning experiences can be developed to satisfy each objective and 2) performance measurements can be designed to assess the level of learning obtained.

Three criteria to evaluate good objectives are:

- 1) Have you identified who the learner is? What are his of her perceptions and expectations as to what is to be offered?
- 2) Have you described the behavior the learner will demonstrate as evidence that she/he has achieved the performance task? Is the action measurable?
- 3) Have you stated the conditions you will impose upon the learner when she/he is demonstrating her/his mastery of the performance task?

Let's analyze a poorly written instructional objective:

"Students will understand the amount of biomass produced in live fence posts".

What's wrong with this objective? First the objective is not measurable. How can we determine when the learner has achieved the objective? We cannot. The objective does not state how the learner will demonstrate what has been learned. A common problem of most objectives is the use of vague terms. The following terms should be avoided when stating objectives: enjoy, appreciate, understand, know, and grasp.

Second, the objective is confusing because it can be interpreted in many ways. For instance, in relation to fences posts, the following queries may arise: The biomass of what? The entire fence length? The leaves? The branches? In what period of time? Live fence posts of what species?

The instructor could improve the objective by writing: "Using various measuring devices, students will measure the length and basal diameter of branches of all the fence posts of Gliricidia sepium over a lineal distance of 10 m, and will calculate the green weight of both the forage and firewood produced over a nine month period since the time of last pruning. They will use production tables provided to them with a double entry (diameter in centimeters and decimals and length in meters and half meters).

This objective is not only measurable but also excludes the greatest number of possible alternative paths to the defined goal. Other examples of good instructional objectives are:

- After listening to the lecture, the student will be able to list five desirable characteristics for perennial crop shade trees.
- By working in small groups, students will formulate what they consider should be the most important ingredients in a definition of agroforestry.
- By interpreting the roles of extension agents and farmers, students will apply and test interviewing skills that are useful in obtaining information from farmers.

SELECTION AND USE OF TEACHING METHODS

After deciding on the instructional objectives, the teacher selects the subject matter content and general teaching approach. It is essential that methods be selected and used with the instructional objective clearly in mind. Although the final responsibility for learning must rest with the individual student, the fundamental goal of every instructor is to create conditions around the students that will be most conducive to learning.

The following should be considered when selecting teaching methods:

- 1) In order to teach the concepts and terminology of agroforestry, a lecture is preferable when large group of university students is involved, whereas small group discussion may be more effective for professionals.
- 2) Select strategies suitable for the subject matter or skill being taught. Can techniques for pruning live fence posts best be taught in the classroom or in the field practicum? Can the results of an experiment be presented as effectively in the field as it can be presented in a lecture using visual aids? Or should it be a combination of both (in proper sequence)?
- 3) Consider the situation, the time involved, and the physical facilities and equipment needed. Is there time for a group discussion on the classification of agroforestry systems or is there only enough time for a lecture? Can the room be adequately darkened and is there equipment available for your slide-talk presentation on the diversity of agroforestry systems of the world?
- 4) Consider that the personal teaching style of some lecturers may not be compatible with certain methods. If the lecturer is not a good public speaker perhaps the group exercise method could be used, instead of the lecture method.
- 5) Remember also that course participants have a learning style that may not be compatible with the teaching method. Many individuals or groups of participants prefer being lectured to, while others dislike it. It is difficult to satisfy everyone.
- 6) Students want to know why they are engaged in a certain activity. Instructors should related the activity to the course goal or objective. What is the reason for students to be taken on a field visit to see windbreaks? Of what value is this to the students? Where does it fit into the flow of the course?
- 7) Consider the factors that influence learning. The instructor who is knowledgeable of both the subject matter and sound learning principles will be more competent in selecting appropriate teaching strategies. These factors are described in the following chapter.

THE LECTURE METHOD

Characteristics

In this traditional approach to learning, the instructor communicates directly to the students his understanding and interpretation of the subject or materials. Its primary use is to communicate ideas and data. Unless the lecturer has unusual skills, generally this method is rarely effective in changing attitudes and behavior. It may however stimulate the students' own efforts to further investigate the subject matter by different methods such as literature search, discussions with others, or simply asking questions to the lecturer.

When to Use

Whereas its use could be justified in formal university courses, it should be minimized in agroforestry short courses. There are however occasions when a lecture may be the most effective method. These are when:

- A large audience (i.e. more than 30) does not permit group discussions.
- A theme or concept is being introduced as a preamble to field activities.

Merits

In comparison to other teaching methods, the lecture is easy and not time consuming to prepare. When presenting a new theme, the lecture is effective because it permits the instructor to present a large quantity of information in a systematic manner.

Limitations

Some of the reasons for the poor reception of lectures are:

- It is a passive means of communication. Thus, it has only limited value in terms of development of skills which require practice.
- Sitting and listening to various lecturers can be tedious and tiring for the participant. Attention spans are very short during a lecture.
- Lectures do not necessarily force the participant to think.
- The level of retention of information can be very low.

- Lectures may have little influence in changing attitudes or behavior.
- Lectures depend greatly on the public speaking abilities of the instructor.
- Unless the participants raise questions about issues which are unclear to them, the instructor may gain a false impression of their level of understanding.

Planning a lecture

Before organizing a lecture there are a number of considerations that must be taken into account:

- 1) Who is the audience? Is it uniform or mixed in background, motivation, field experience, etc.?
- 2) What is the lecture supposed to achieve? Are concepts or data to be presented; is it a requisite for a future field exercise?
- 3) How much time is available for the lecture? How can the lecture period best combine questions and answers?
- 4) How many themes can be addressed without overloading the audience's capacity for assimilation?

Who is the audience

A good lecturer will be aware of the expectations, interest, and education and experience levels of his audience. The lecture must be carefully tailored to each group by taking these factors into account. Particular care must be exercised to address them at their educational level. Talking at a level below them may result in loss of attention while talking above will fare even worse.

What is the lecture supposed to achieve?

Nothing improves the organization of the talk better than a well-stated objective. The lecturer should keep in mind the probable outcome of the talk and the information gained by the course participants. For example, for a lecture dealing with the subject of shade trees in perennial crops the objective could be stated: "at the end of the lecture, the student should be able to list five possible advantages and five disadvantages of using shade trees in perennial crops".

If the lecture is part of a strategy that involves discussions or field exercises, it should point out the significant aspects that are

likely to be examined in these activities.

How much time is available for the lecture?

Briefness is essential. After 15 to 20 minutes the audience will probably begin to drift away. It is better to prepare a short, stimulating and thought-provoking talk that briefly introduces the theme than to drag the lecture on the point where participants become bored. If more time is available, consideration should be given to other teaching methods that can convey the messages more effectively.

How many themes can be addressed without overloading the audience's capacity for assimilation?

Poor choice of subject or lack of knowledge about it may severely limit the usefulness of a lecture. It is important that the instructor speak from his own knowledge and experience, but at the same time the topic and approach must be relevant to the needs and interest of the audience. Whether the topic is selected by a lecturer or is part of a request, the scope of the presentation should be limited. It may be useful to pick a segment of the general subject to develop in a field where the lecturer is most familiar and comfortable. For example, in the shade tree talk, he may choose 5-6 topics from the checklist of advantages and disadvantages and elaborate on them using examples. It is essential not to saturate the audience with too many themes or different ideas. A few subjects well developed are better than an array of topics that have difficulties of "sinking in" and overloading the audience's capacity for retention, let alone, assimilation.

Organizing your lecture

Now that the audience has been analyzed, the objectives defined and the scope of the lecture limited, it is time to prepare it. A good beginning is to summarize the lecture in one paragraph. For example,

"A number of interactions that can occur in a permanent association of trees with perennial crops are presented. Based on these examples, agroforesters will have a checklist from which they can identify limiting factors. Coffee and cacao with shade trees are used as examples since they are well-studied".

Everything in the lecture will relate to these statements. At this stage an outline is most useful. An outline will give the lecture a planned structure of development and will result in a smooth, logical sequence of events. The outline is a good indicator of the unity and cohesiveness of the talk.

Most talks have three parts: introduction, body and conclusion. Often, the introduction and conclusion can be planned after

the body of the talk has been developed. The following guideline is very much "a propos":

"Tell them what you'll tell them,
Tell them,
Tell them what you told them"

The introduction must set the stage of the lecture and attract the listener's attention. It is possible that if the introduction does not capture the attention of the audience, the rest of the talk won't either. The initial statement should be strong and able to command immediate interest. A personal experience, a story, an anecdote, a problem or a pertinent question, can all serve this purpose.

Now that the interest has been awoken and the theme introduced is the moment to expand on the body and develop the substance of the talk using examples and presenting concepts and data (not too many, though; the assimilation capacity should not be overtaxed).

The conclusion is probably the most important part of the talk and perhaps the hardest to prepare. The best opportunity to leave a lasting impression with the audience occurs during the last minute of the talk. It is essential not to let the talk just fade away. The conclusion may be a recapitulation or a brief summary of the points established. It should tie those facts together in such a way as to point to the purpose of the talk and its objectives. It may refer back to the introductory statement. It may, in addition, with skill and awareness on the part of the speaker, assume an inspirational tone, such as a challenge that remains for the audience to master by further study.

Reinforcing the lecture

There are a number of techniques that can be used to make the lecture more interesting, better organized and smoother.

Use of notes

Most instructors will need some kind of notes or written outline to follow. These notes -using cards or paper sheets- should be easily read, widely spaced, and sequentially numbered and highlighted. Notes should be notes and not a complete text. Although, certain concepts and certainly most definitions should be carefully written down. An additional prepared text can be handed out before or after the lecture to cover additional points. Much time can be saved by simply handing out such text to students to be read on their own.

The use of comparisons and examples

To help students to understand an unfamiliar concept or idea the use of understandable comparisons and examples is a most useful tool. This will relate the theoretical to the practical.

Public speaking principles

There are several points concerning personal mannerisms and vocabulary that must be considered.

-It is convenient for the lecturer to change the pace and volume of the voice to avoid monotony. The tone of the voice can be used to convey confidence, emotion, emphasis, and indignation. Pauses can be manipulated to emphasize a point or create suspense for what is to follow.

-Annoying mannerisms such as putting hands in the pockets, playing with the hair, chewing gum or pacing, should best be avoided.

-Eye contact should be maintained. Continually looking at notes or out the window is undesirable. Eyes should be shifted to include all the audience, not just a segment. When writing on the blackboard, an effort should be made in turning the head to the audience when speaking. Failure to do so may result in lack of attention and, of course, poor communication or difficulty to grasp the sound of your voice.

The use of visual aids

Various teaching aids may be employed to make the lecture more interesting and more easily assimilated by engaging the student's sense of sight. A chapter on visual aids will be found in later pages.

The use of questions

Questioning involves the audience and makes them think. There are many ways of questioning including such techniques as challenges, requests to relate personal experiences (when knowledge of such is certain), or provocative statements such as those beginning with "why is it not possible that...?"

References: 3, 6, 7, 8, 12

THE DISCUSSION METHOD

Characteristics

The discussion method involves one, or often more, carefully planned meetings in which students pool ideas in order to solve collective or individual problems. The instructor does not present theory, principles, doctrine or ways of handling problems. Rather, the group is presented with a topic or a problem and members draw upon their own experience and opinions for possible ways of handling it. Therefore, if the method is to be used successfully, group members must have a background of experience or information pertinent to the topic or problem. In discussion, the instructor encourages students to interact with each other. The instructor does not supply answers or information, but helps the group to define problems and develop solutions by guiding the discussion. Ideas and solutions evolve from the experience and thinking of group members and not the leader.

Discussion is often confused with recitation. Recitation is a sequence of "rapid-fire" questioning which the instructor initiates and controls. In discussion, the instructor is a moderator and does not control each interaction. Recitation also focuses on students' recall and reciting of subject matter content. In contrast, discussion tends to focus on higher cognitive objectives.

When to use

The best opportunities to use discussion are when:

- The group size is from 7-25 people
- The students already have been introduced to the theme and have a strong background on the subject to be discussed.

Merits

The discussion method is effective in:

- Utilizing the resources of group members
- stimulating critical thinking
- assisting students in formulating and becoming aware of problems
- developing motivation for further learning
- allowing students to apply previously-learned principles
- providing students with the opportunity to express their ideas and explore their own and the others' belief.
- giving instructor feedback on how well objectives are being met.
- helping students analyze and evaluate opinions
- helping students articulate their views

Limitations

Although the discussion method is remarkably versatile and effective, it has a few limitations which cause instructors to be reluctant to use it:

- many students clam up when invited to participate in a discussion. Some participants feel unable to say what they mean and are afraid of being wrong if they contribute. Others are intimidated by the dominant participants.
- the discussion moves slowly and is easily sidetracked.
- When different discussion groups are formed, large and embarrassing differences may result when groups are requested to present their findings.

Effective discussion techniques

Seating Arrangement. The traditional classroom seating arrangement students in rows facing the instructor severely restricts participation in a discussion. A circular arrangement, where instructor and students can see each other, is much more effective. Members of the group are more likely to interact with other members of the group if they can see as well as hear the others. The instructors should sit in the circle same as the students.

Initiating the discussion. There are several techniques for starting a discussion. An open-ended question, carefully phrased, is more likely to elicit responses than are questions of fact. Questions which have no "right" or "wrong" answers are often successful cues to initiate discussion. Presenting a common experience often puts people at ease, an important consideration for group interaction. Role-playing, case studies, and audio-visuals provide a common experience to draw from.

Let's look at an example of initiating a discussion. We'll assume that the discussion follows a brief lecture on the applicability of agroforestry systems and that the course participants have already had considerable exposure to agroforestry systems and monocultures.

"After hearing about the applicability of agroforestry systems, let's now discuss the advantages and disadvantages of agroforestry systems as compared with monocultures of the same crops or pastures. It will not be easy to compare the systems since often the monocultures have no parallel in agroforestry or vice versa; or if they exist, they may not be found side by side under comparable conditions. Such comparison is also complicated by various short and long term economic projections and by the appraisal of social and cultural factors. Scientific data are still scarce to evaluate many agroforestry practices. But based on our own experiences let's discuss amongst ourselves the advantages and disadvantages of the biological, economical, and social aspects of a well known agroforestry practice such as...., when compared to monocultures of the crop component. Let's start with the biological aspects. What are some

biological advantages of agroforestry systems?". The ideas and contributions of the participants are then transcribed in telegram style on the blackboard or on sheets of paper with marking pencils, that can if necessary be pegged against the wall for future consultation.

Stimulating Participation. Many students are reticent during discussion. During these situations, the instructor must create an expectation of participation and develop positive attitudes regarding the values of participation. Positive reinforcement or encouragement in the form of a nod, a smile, or an acknowledgement, may help allay some fear. The instructor must exercise a high degree of support of students when their ideas are incongruent and must help them formulate more appropriate responses. The instructor's failure to be supportive and helpful when inaccurate or inappropriate ideas are offered might cause students to alienate themselves and reduce or eliminate their participation. Differences of opinions, for instance: "should a certain factor be included or not", may result and may be favored... to a point. Such discussions should not degenerate or consume too much time. A concluding statement to stop a futile discussion may be in order.

Keeping the Discussion on Track. Too often discussion are sidetracked to different themes. It is the responsibility of the instructor to keep the discussion focused. The issue should be clearly stated at the beginning of the discussion, and during key points within the discussion. Students' contributions should be monitored to relate each new bit of information to the whole problem while, at the same time, helping the class to discard those ideas which are irrelevant or inaccurate.

Maintaining impartiality. One tendency to guard against is exposing the instructor's personal opinion on the subject prematurely; he should avoid performing too much of the analysis. When students ask any questions the should be directed back to the group. The purpose is of course to formulate questions and probe the responses of students, not to verify the instructor's authority by giving the "final word" on each issue.

Analysing the problem. The first consideration in making the analysis is to define the terms and limits of the problem. Then, the class members can begin to identify each of the issues connected with the problem. Discussion should elucidate each of these factors. It is imperative that the basic assumptions which are associated with each consideration be identified and their validity checked. Our example of agroforestry vs. monoculture is a good illustration: The terms and limits of the problem are established at the beginning. Then class members begin to identify each issue (advantages and disadvantages) and elaborate on the issue. When possible, the students and instructor can validate their assumptions through personal experiences or research, or cite literature.

Reaching a consensus. Because it is sometimes desirable to reach a consensus, it is necessary that criteria for making judgements be evolved in the discussion process before conclusions are reached. Frequently, a decision cannot be reached by the group because the advantages and disadvantages weight evenly against one another. In order to avoid this, it may be useful to establish criteria in terms of priority. Then the solution which best satisfies prior criteria can be selected with less difficulty.

References: 3, 4, 7, 8, 9, 11

GROUP EXERCISE METHOD

Characteristics

In this method, real or hypothetical problems are assigned to small groups of students who work together toward a single, final group product. This method stresses joint effort and collective decision making in group problem solving and research. Problems that are assigned may be completed in one class session or in several days. The groups are normally required to make a presentation of their findings. This requires that they participate actively and strive to do a good job. The method is used to parallel or to illustrate ongoing instruction. At CATIE, this method has been successfully used in a series of activities involving either discussions of the same theme by different groups (allowing comparisons and lively discussions) or division of the general theme in supplementary subthemes that allow a broad and comprehensive coverage (see "suggested uses" further below).

When to Use it

The group exercise method works best when there is ample time and the main group is large enough (more than 20) to be subdivided. It should only be used when participants already have some experience or knowledge of the theme. It can be used with three purposes: 1) to train groups of individuals who must work together on a daily basis, 2) to train students to solve problems relevant to a particular content area, and 3) to expose students to information and information sources.

Merits

The major strength of this method is that it gives course participants an opportunity to work together on a meaningful problem. It is a highly active learning environment requiring direct involvement of course participants. The method invites students to participate in an environment where they feel free and confident.

The participants contribute their own experiences and learn from each other. Some members of the group stimulate others to think and produce a chain reaction of thoughts. Participants learn to work toward a common goal and look for solutions by themselves. Their learnings, therefore, become more valuable than information merely told to them.

Finally, group exercises are quite effective in motivating students and raising their interest levels.

Limitations

Group exercises normally require an extensive time commitment. Much of this time may be devoted to group organization. Also, the value of the learning process is determined, to a very large extent, by the nature and quality of the problem and by the way in which the group organizes itself and the way it functions. Furthermore, the instructor plays a relatively limited role in the process -providing only organizational and directional assistance- and has only indirect control over the learning environment. This makes it far from easy to ensure that the important points of the exercise are being absorbed by all the participants. Moreover some participants may assume a particularly dominant role overpowering other more timid members of the group.

Techniques for Using the Group Exercise Method

Selection of theme. Consider these factors before selecting a theme:

- 1) Is the theme relevant to the needs of the participants? The learning process will be enhanced if the theme is related to the participants' daily working conditions.
- 2) Is it feasible? Will the group be able to reach a conclusion within the set time?
- 3) Does the group have all the necessary information or can it be easily obtained?
- 4) Will the theme keep all the members of the group occupied?

Orientation of Group. It is of extreme importance to state the objectives of the exercise carefully and delineate the theme. Offer suggestions to structure the group's time. It should be made very clear what the expectations for their presentation to the class are. A one or two page handout which states this information should be given to students (see example at the end of this chapter).

Division of Groups. Our experience at CATIE shows that rather than allowing participants to break into groups that they select, the course organizers should themselves form the groups. After carefully studying the list of participants, divide them into groups with an equal share of different experiences and disciplines, i.e. foresters are mixed with agriculturalists, and technicians with many years of experience with novices -the latter are explicitly requested to participate actively, regardless of their "green" condition. Five to seven people seem to be the optimal size for small groups.

Consolidation of Groups. After the groups have had sufficient time to discuss the issue, they should be called back to the classroom to the to present their findings.

Procedure for Using Group Exercises

- 1) Introduce the method, describe objectives, expectations for presentations (time limits, required visual format, etc.), and procedures for its implementation.
- 2) Assign students to groups.
- 3) Assign a problem or topic to each group. If comprehensive coverage of a theme is desired, assign a different problem to each group. If the focus is upon problem-solving skills and quality of group results, assign the same problem to all groups to facilitate later comparisons.
- 4) Hand out information sources and written guidelines.
- 5) Assign groups to work areas.
- 6) Alert each group before end of work period (this may be done twice at reasonable intervals).
- 7) Recall groups and reassemble class.
- 8) Collect group reports, if written, or require the group's recorder to briefly summarize his group's work.
- 9) As instructor lead class discussion of findings and of problems encountered during group deliberations.

Note: Some flexibility may be necessary in certain cases, particularly concerning the time allowed for each group during discussion. A coffee break between group discussion and reassembling into room may be handy to allow some groups a few more minutes to finish.

Use of the Group Exercise Method in Agroforestry

The group exercise method can be used to:

- Discuss terminology, classification and concepts of agroforestry.
- Analyze case studies of agroforestry projects.
- Discuss advantages and drawbacks of selected techniques (as compared with alternative land use schemes).
- Divide general theme in subthemes to bring out a comprehensive picture (for instance to discuss the a) biological, b) social, and c) economic features of certain agroforestry practices).

- Develop project work plans.
- Discuss proposals for experimental design.
- Develop criteria for planning and evaluating agroforestry projects.

An example of a well-written guide for a group exercise is presented here. Note that the guide clearly indicates the following points:

- .Relation of exercise to course
- .Value of exercise
- .Structure of groups
- .Expectations for presentations
- .Outline for plan preparation.

FINAL EXERCISE FOR AGROFORESTRY FOR THE HUMID TROPICS
SHORT COURSE: DEVELOPMENT OF WORK PLAN

As a final exercise in the agroforestry short course, we would like to develop a work plan following the Farming System Research (FSR) approach, which deals explicitly with ongoing projects. Throughout this short course, you have been presented with agroforestry systems currently in use and with research as to their improvement. Nevertheless, this information is not useful unless it can be utilized; the focus on Farming Systems Research (FSR) in this course is intended to address this problem. As an integrated research and implementation strategy for development technologies, the FSR methodologies and techniques reviewed in this course should provide a basic framework for deciding whether or not to incorporate, agroforestry techniques in ongoing projects.

This will be a group activity, since it will be time consuming to complete all the separate parts. The time requirements must be calculated and responsibilities divided to complete the work plan. Group activity will be focused on an ongoing project: if there is an entire group from a single project, they obviously will want to look at how to incorporate FSR research on agroforestry systems into their project. For projects which are represented by one, or few people, several options are available. Individuals who are not associated with specific projects can be incorporated into the group, although they must be briefed on the relevant conditions of the project on which they will focus. Another option is to consolidate several projects which operate in similar circumstances, either in terms of project structure, climate or geographical region. The resulting plan obviously will be a general strategy, rather than a specific work plan, although some effort should be made to specifically address questions such as institutional support, etc., for each project involved.

Approximately three hours will be allowed to develop your plan and 30 minutes to make a brief, schematic presentation directed to a hypothetical agency; the objective will be to present the logistics of incorporating FSR in an existing project, or to get additional funds for FSR activities. The presentation should be accompanied by graphic information especially regarding institutional connections, sketches of project areas, flow charts and chronograms, budget, etc., which will help in comprehension. The presentation will be followed by a 20 minutes discussion period. Members of an other group will be the review board of the hypothetical agency. This situation is not as artificial as it may seem; a number of individuals participating in this course in fact are members of agency review boards; review boards often are relatively uniform with regard to the specific conditions under which projects must be carried out, so the task of presentation is one of educating board members and the logical drawing of conclusions.

Work plan preparation should follow the outlines of FSR presented in the introduction to the FSR activities of the course "Conceptual Bases for Applying Farming Systems Methodology in Agroforestry". Several basic

points are mentioned below, although others can and should be included as the project situation warrants:

1. Area selection

- 1.1 Target population
- 1.2 Homogeneity of target population
- 1.3 Problems perceived by national institutions and by target population.

2. Characterization

- 2.1 Existing data (climate, slope, soils, land use, land tenure, etc.).
- 2.2 Cooperating or implementing institutions
- 2.3 Area selection for initial definition of regional characteristics and existing agroforestry systems.

3. Design of alternatives

- 3.1 Incorporation of agroforestry systems observed during course.
 - 3.1.1 Specify and justify which systems are likely to be applicable.
- 3.2 Collection of existing technical data to determine the biological appropriateness of potentially introduced technologies (on AF systems) in target area.
- 3.3 National institutions available to do FSR research in "notional" technology research or for adaptation of agroforestry models.
 - 3.3.1 Biological research
 - 3.3.2 Socioeconomic research

4. Validation and/or evaluation

- 4.1 Choice of validation or evaluation strategy
- 4.2 National institutions with capabilities or interest.
- 4.3 Financial and logistical support necessary.

5. Recommendation

- 5.1 Availability of national institutions with interest in extension/research in agroforestry.
- 5.2 Compatibility of national institution goals and FRS agroforestry focus.

References: 3, 7, 8, 9

THE CASE METHOD

Characteristics

The case method involves a group discussion of a printed case which describes a real-life situation, together with all surrounding facts, contributing factors, and incidental conditions. Cases are presented to students for analysis, open discussion, and final decision as to the action which should be taken. Normally cases are relatively lengthy and sometimes complex, and should be assigned for reading and analysis prior to class or small group discussion. The instructor plays an active but non-directive role in stimulating discussion and encouraging mature analysis. Unlike the lecture, the case method is not normally used to communicate ideas but allows students to synthesize and to develop analytical, managerial, and decision-making abilities and possibly to alter attitudes. Although single-case discussion sessions may be beneficial, maximum learning occurs from repeated exposure to analysis and discussion of a variety of cases.

When to Use

You can use the method to:

- 1) Lend reality to indirect experience. The case method provides an excellent way to learn from the experience of others. Through it, we are able to examine previous similar situations and analyse the solutions reached. These evaluations can lead to a solution of our own problem.
- 2) Focus on concrete problems. Students are constantly looking at abstractions and trying to put them into their own frame of reference. By providing cases which are similar to a problem the students are trying to solve the instructor facilitates this referencing process.
- 3) Develop decision-making skills. By participating in a case study, the student learns to analyze real situations and search for complete information before making a decision.
- 4) Broaden the students' experience. Students start out with a simple problem, but before it is solved they have expanded its aspects in order to gain a more thorough understanding of all the complexities inherent to the solution.
- 5) Help assure that students see varying points of view. The case method involves a process in which all sides of a problem are examined before a solution is reached. This involves looking at issues which might otherwise be overlooked or quickly discarded. Learners are taught to search for solutions with open minds, minds which are receptive to views different from their own initial reactions. They are taught to discriminate between merits and fallacies when they hear different opinions. It is through this process that they are able to arrive at supportive or non supportive data for the solution they are considering.

Merits

In comparison with the lecture and even some types of discussion, the study of cases permits the student to participate actively in a setting not far removed from actual experience. Working on case studies generally motivates students to learn more. Students begin to see the usefulness of information presented to them in lectures as they are the applicability of such information.

Limitations

Some of the case method's limitations are inherent; others result from incorrect usage. The case method is less efficient than the lecture in covering a range of material. A great deal of time is needed for developing the issues and solutions to the problem and then discussing them. The case method could be a less orderly process than other methods, especially when group work and role playing are used.

The method may be more difficult to use by both the instructor and the student. Clearly, the instructor should be directly familiar with the case. The instructor may have to work harder to develop, guide, and follow-up cases than to prepare and give a lecture. It may be impossible to gather all relevant data concerning climate, soils, socio-economic patterns, etc. and it may be necessary to either assume some data or leave section incomplete. Some instructors find it difficult to accept the student's conclusions and solutions when these are at odds with their own beliefs. Students see the case method as more difficult and threatening, particularly when this learning experience is first introduced. Many students feel uncomfortable when they have to draw conclusions regarding data they know little about.

Developing a Case Study

Although many case studies have been developed for use as teaching materials and can be purchased in published form, there are still very few related to agroforestry. Therefore, most likely you will have to prepare your own.

The quality of the printed case is critical to this method. A teaching case is a carefully designed description of a problem situation, written specifically for the purpose of provoking systematic analysis and discussion. As such, it does not necessarily represent a complete description of all facts and events. The case must be composed with the objective of creating a challenging problem for the student and the outcome is not revealed. The case is brought to a point requiring decision and action, then it stops the success of the method requires the cases to be structured so as to challenge mature analysis and stimulate discussion.

Writing an effective teaching case is not easy. It usually takes a great deal of time. Considerable planning must go into any case development. But once the case has been developed, it should become a highly effective teaching vehicle that focuses directly on the needs of the agroforestry course. It could also serve as a model for other case studies under different conditions.

The following five steps may be useful in developing a case study:

- 1) Select the type of problem and the organization from which the material will be obtained.

The type of case required will normally determine the kind of organization (e.g. AID, Agricultural Research Station, Extension Agency) in which to seek the material. It may be preferable to select a project and/or organization already known and accepted. Students should feel relatively familiar with the conditions described. Often with an heterogeneous group, it is not possible to present a case study that fits each person, but extremes should be avoided. For instance it would be a blunder to present a case study from a temperate country with affluent farmers to students working in tropical regions.

- 2) Observe and collect data

By the time you start collecting data, you should have established the objectives of the study. The facts, situations and recorded objectively and as completely as the situation warrants. They must not be forced to fit your anticipations.

A good case is well documented and contains all the information which is available. Accordingly, you must make detailed notes and collect statistics, operation statements and other exhibits containing information about the project you are studying.

- 3) Write the case

The following guidelines should be used when writing the case:

A) Select the detail

The data revealed may have modified the original viewpoints or presumptions. Therefore before writing:

- clarify the objectives of the teaching case
- decide whether materials have actually been obtained for two or more cases, each having different applications. Failure to separate out such cases clearly may result in presenting a confused picture

that produces no clearcut training result. In some training situations, a series of cases all drawn from one organizations allows the participants to progress quickly from one aspect of management to another without wasting time absorbing new material.

B) Set the scene quickly

The first few sentences should enable the student to conceptualize the situation and the type of problem involved. This should ensure that, as each new fact is absorbed, the student can start adding this detail to the right part of the picture.

C) Write in the past tense

If you do not put a time frame on your case, it can be used over a long period.

D) Decide on disguises

Some project managers may be reluctant to have others analyze the mistakes that they and their colleagues made. It may be necessary to disguise the case chosen. For ease in writing, however, it is usually better to develop it to the final draft stage using the real names, places and figures.

Alterations made in the interest of disguise must not alter the basic facts and relations.

4) Clear the case

Using true names and figures, review the final draft with the project manager and finalize the question of disguise. If necessary, obtain permission from the project manager to release the case.

5) Confirm the usefulness of the case as a teaching material

Before using the case in a short course, a trial session with colleagues may be useful. The trial should be observed carefully for:

- Correct visualization of the broad picture and understanding of the details by participants,
- data which need to be omitted without reducing effective teaching or data which should be added,
- subject matter which should be discussed prior to of following the case,

-improved methods of conducting the case such as more or less time in preparation or discussion, the desirability of group work, or the need for visual aids.

Conducting the case study

Unless the case is very short (less than five pages double space) it is normally unrealistic to expect the course participants to effectively analyze the situation on the spot. In a short course, case materials should be given at least one day before the proposed discussion or adequate time should be given for the students to read the case in class. Along with the case, students should be given instructions on the amount of time they should spend on case analysis and some insights as to how it should be analyzed. Many course participants underestimate the amount of time needed for an effective case analysis. For example, a 30-page case -a typical length- would take an hour to read it. A preliminary analysis would take another hour and, depending on the complexity of the case, the detailed analysis and preparation would take from one to three hours.

The following is a general set of instructions which can be given to course participants to help them with case analyses:

- Read the case through quickly to get a first impression of what it is about or what the basic issues may be. Then, reread it more slowly and begin to note down the facts supplied and their relationship.
- Once the data has been itemized, determine the major as well as the secondary issues.
- Examine the background environment in which the project operates and the events and circumstances leading to the points at issue.
- As the analysis proceeds, several possible courses of action may become apparent. Each of these should be examined, retained or rejected as the analysis proceeds.
- Take note of both the strengths and weaknesses of each point. Few, if any, situations are totally correct or incorrect.
- Like the institute director in his office, you should try to realize when you need more data and what information you need as well as what assumptions you have to make.
- Once all this has been done, it should be feasible to arrive at one or more decisions for the solution to its problems. You should remember that there are many possible solutions, or approaches to them, all of them correct or at least plausible, and that other people may read entirely different solution or approach from yours.

The case method works particularly well when combined with the small group discussion method. Additional insights, ideas and perspectives will be brought out in these discussions.

Role of the Instructor

The role of the instructor in a case discussion is to guide and direct. He is basically a facilitator rather than a source. The instructor should be experienced enough to know what types of cases are best suited for the group. The instructor must provide a suitable introduction to the case in order to motivate students.

During the discussion, the instructor must make sure that all points of view are brought out and proper attention is placed on the important ideas. To be effective as an instructor the following guidelines should be observed:

- Be flexible. Do not try to force the discussion along predetermined lines.
- Ask questions, when necessary, but ask as few as possible.
- Never become emotionally involved in the case discussion.
- Do not be put in the position of being for or against an idea.
- At the end try to summarize. Leave time to pull together the key points of the cases.

Examples of case study uses in Agroforestry teaching

Let's look at two practical uses of the case methods in agroforestry short courses:

An agroforester is asked by a farmer to implement an agroforestry system in pasture. The case presents all the necessary background information such as farmer's needs, and perceptions, climate, soil, and environmental conditions, as well as socio-economic situation. The students then design an appropriate system. Later the system that was finally selected is stated and the advantages and drawbacks are analyzed and planed in two columns for a discussion and evaluation.

An international agency sponsors a project to study traditional agroforestry systems in a certain country or section within a country. Six months after the project has started, the researchers have collected some data but are confronted with an unforeseen problem: There is a sudden serious economic crisis which in turn triggers a series of changes by the farmers, and their traditional patterns, all of which require a reappraisal of the original goals and methods. The case study presents the

background of the project and the new problems confronted.

The students analyze the new scenario and present suggestions. A lively discussion should follow and guidelines to present (or accept) projects may be an additional bonus for the group.

References: 3, 5.

ROLE PLAYING

Characteristics

Role playing is a method of portraying human interaction in situations, in such a manner that realistic behavior is elicited. A situation is presented to the group and some members are asked to assume roles and to enact the situation toward some resolution. Other students observe the behavior of the actors. The scene may be carried to a resolution or the instructor may stop at some critical point in the action. Following the scene, observations of the audience, as well as thoughts and feelings of the actors, are reported and discussed by the group. In this way, faulty diagnoses and actions can be identified. Alternative ways of handling the situation may be tried by replaying the scene. Role playing is an exceptionally flexible method which can be used for a variety of purposes under many different conditions.

Uses

The objective of role playing is to give the participants insights into human relationships and problems, which, when they return to their normal lives, will be reflected in their behavior. It offers an opportunity to experience behavior from a point of view that they might not otherwise experience. It is a technique designed to change attitudes and influence behavior rather than to communicate ideas by concepts. Role playing may be used to:

- Provide insights on why individuals, organizations and nations behave as they do.
- Provide experience in diagnosing interpersonal behavior.
- Test different alternative strategies for managing a situation and provide a manner to improve methods and techniques used in interpersonal relations.
- Learn what behavior is effective in dealing with other people.

Merits

The principal benefits of role playing derive from its highly participative nature.

- It allows individuals to practice different roles and experience different behavior without the risks normally inherent in real life. Mistakes can be tolerated.
- It enables individuals to react to conflict or stress situations without the fear that their actions may have adverse results.

- Role playing puts students in the shoes of others which permits individuals to guess how others will behave in different situations and to appreciate and understand their point of view.
- It provides the group with a common experience to base discussion. In most discussions, much time is lost when students speak and think of their own experience. After participating in role playing, students can focus their comments on what occurred in the dramatization.
- Finally, role playing is fun. It is a pleasant yet educational break from the routine classroom activities.

Limitations

There are several criticisms of the technique. Some observers feel that it is often too artificial, resulting in little transfer of behavior change to real situations and that the very theatricality that makes it engrossing for participants may lead them to forget the problem with which they are dealing. Others consider the technique to be too time-consuming. They argue that role playing can only focus on a relatively limited number of issues and thus students have a tendency to find it boring.

Conducting a role-playing demonstration

Although role playing is often most effective when it occurs spontaneously, the following steps should be followed:

- 1) Select a situation that relates well to the interest, needs, experience and knowledge of the participants. The more relevant the situation is to the participants, the more they will learn.
- 2) Describe the objectives of the activity, the reason for using role playing to attain the objectives, the situation and the roles of each character. If you are using role playing for the first time in the course you should carefully describe it. As an example of an introduction to a spontaneous or impromptu dramatization you could say: "In our discussion this morning, we talked about the various socio-cultural aspects of dealing with small farmers in the implementation of agroforestry alternatives. We suggested a number of techniques to overcome these socio-cultural barriers. Nevertheless, we often, learn something and forget it before applying it. Therefore in order to complete our discussion on this theme we are going to practice some of these techniques so that you can apply them better. Rather than go out to the field and talking to farmers we are going to simulate the action here in the classroom in a dramatization. In this way we can test our new strategies without the fear of saying something wrong as well as analyze the behavior of both the agroforester and the farmer. It will also illustrate some common problems encountered in dealing with small farmers which we will discuss afterward. Let's see what happens in this scene.

Mr. Ted Poroski, an agroforester from an agricultural center, has come to the farm of Mr. Manuel Tristán, to discuss the possibility of introducing leguminous trees in his pasture. Although Mr. Poroski has data that clearly shows better profit margin by using leguminous trees, Mr. Tristán is extremely reluctant based on his lack of faith in experiments and on the fact that he has always raised cattle with good results without leguminous trees.

Let's have two volunteers to play the roles of Mr. Poroski and Mr. Tristán. Act and say what comes naturally to you and the rest of us will observe. And remember the objective of this dramatization is to gain new insights, so please, do not feel hesitant to try new techniques.

Another scenario could be a coffee farmer and a fertilizer salesman. The latter will of course convince the farmer to buy fertilizers for the coffee although the farmer tries to convince the salesman that his shade trees which he prunes regularly every six months, have kept up productivity over many years.

3) Choose your actors with caution. Different organizations have had different experiences in terms of composition of the role-playing groups. Some have found that bringing together people of different levels in an organization, (i. e. a heterogeneous group) tends to reduce the effectiveness of role playing. On the other hand, this could be an effective way of sensitizing both levels to the problems of the other. Role playing is probably most effective when individuals of a similar level, but from different organizations are brought together, since it enables them to see how other individuals and departments tackle the sort of problems with which they are faced.

Many students who are normally shy will feel hesitant or reluctant to participate. Rather than forcing these students into an uncomfortable situation, it is preferable to use volunteers.

4) In dramatizations which are less spontaneous, give participants 10-15 minutes to prepare their act. Prepare cards which detail the role of each character and give them to the actors.

5) While the actors are preparing the dramatization invite the audience to participate by asking them to select a character and study it to see if they are in agreement with the interpretation of the role. You can assign a particular detail to each observer.

6) Commence the dramatization.

7) Continue the action until the different characters have had an adequate opportunity to develop their role. Normally you will have to

cut the action before it drags on.

8) Follow the dramatization with a discussion and analysis of what occurred. It is generally better to allow the actors to discuss the situation before the audience. Some possible questions for discussion would be:

-Did the actors play within their roles? In what other way could they have interpreted their roles?

Did they miss some classic points or arguments?

-Why did certain characters behave as they did?

-How did the actors feel when reacting to the situation?

-How would the audience feel in such a situation?

-What principles of human relations can be deduced from the conduct that was observed?

-Which of the alternative methods demonstrated worked best? Why?

-Did underisable responses occur and why?

-What could have been done to avoid such problems?

Or should they be accepted as "normal" risks?

9) In some cases, the dramatization can be repeated after discussion. Often role playing incidents bring out the wrong way of doing things. After discussion, during which correct principles are suggested, a new group of actors can try to show the group the right way the incident should have been handled.

Role of the Instructor

In role playing the role of the instructor is very similar to his role in a case study discussion, i.e. of a moderator or conductor. Once the individual roles have been clearly delineated no more active participation is warranted. Involvement of the instructor in the discussion is only justified if for instance:

-the discussion appears to be going off track or getting out of hand, e.g. tempers become heated;

-certain premises are being introduced which do not match factual information or could lead to unproductive discussions not clearly

related to the exercise, such as political or certain land tenure aspects;

-key points or concepts are not being clearly or appropriately identified and discussed;

-there is a need for an external analysis either of the participant's behavior or of the key points arising during the discussion.

Suggested Uses in Agroforestry

The role playing method is used when there is an element of interpersonal relations. Some themes which could be strengthened by using role playing are:

-introducing agroforestry alternatives to small farmers

-testing agroforestry alternatives with agronomists (including animal husbandry), and forest production oriented specialists, who may have a certain inherent resistance to accept the multidisciplinary aspects.

-conducting surveys

-interviewing farmers

-arguing with conventional "extensionists" on the validity of "traditional systems" or conversely the introduction of novel agroforestry practices.

-selling a project proposal to your boss or funding agency

-Trying to involve researchers to test certain agroforestry practices (i. e. arguing over plot sizes, statistical methods or yard sticks against which to compare the practices).

References: 1, 2, 3, 7, 8, 9

FIELD TRIPS AND PRACTICA

Characteristics

A field trip is a carefully planned educational tour to a point outside the classroom in which a group visits an object or place of interest for first-hand observation and study. Unlike a field practicum, the field trip is primarily a matter of observation rather than doing. It offers an excellent bridge from the theoretical material presented in the classroom to the actual practice.

Field trips have always ranked as the best received learning experience during CATIE's agroforestry short courses. But they are also perhaps the most misused activity.

Like field trips, field practica take the students out to the farms or sites of interest. In practica, students actually perform some task such as characterizing a farm, measuring biomass or interviewing farmers. The practica is indispensable in agroforestry training and the result of all the agroforestry courses held by CATIE Turrialba, or other places as a base, have decisively shown their high value and acceptability by students.

Merits

-Rounds out learning and provides new and additional insights. Classroom activities can cover only a small part of the total experience.

Full and well-rounded learning occurs when action takes place beyond the classroom walls.

-Teaches observations skills. The successful field trip is something more than a passively accepted journey from place to place; it is an active exploratory experience. A meaningful field trip will become an occasion for taking notes, taking photos, for sketching and for other activities that sharpen our ability to observe and visualize.

-Lends reality to the theoretical. Seeing and doing is believing. Field trips and practica put the students in contact with reality and teaches them to recognize the multiple and varied problems that are presented daily in field work. Also it usually generates valuable discussions for instance in the bus ride home after the trip.

Limitations

Field trips away from a safe and easily controlled classroom atmosphere, nearby complementary facilities (lodging, food) always involve a certain amount of risks, but, as experiences in agroforestry teaching have shown, the benefits usually are considerable and the feeling is that it is certainly worthwhile to take these risks.

Time. Most field trips require a large amount of time. Depending on the distance; more time may be spent in transportation than in actually visiting the site or measuring certain parameters.

Logistical arrangements. Adequate transportation is needed, food and drinks may have to be assured or even be provided, and certain additional costs must be foreseen.

Value. At times field trips can be a waste of time when they are not adding sufficient relevant insight.

Group discipline timing. Careful controls must be established.

Weather. The rain could could modify (rescheduling, rerouting), hamper, or even halt a field visit.

Planning a Field Trip

It is much too easy to say "let's make a field trip to a farm and visit a successful agroforestry system". You contact the farmer, and arrive. Such a tour will provide your students with an enjoyable break from the classroom but is unlikely to effectively contribute to the goals of the course. A good amount of thought and planning is required. Before planning a field trip it must be clearly established that this is by far the most effective learning experience and it is worthwhile to take certain risks as outlined above.

-Will it awaken a genuine interest in the students?

-Does it relate clearly to the goals of the course?

-Does it provide observation experiences that can not be accomplished by other means?

Once it has been determined that a field trip or practica is the appropriate learning experience, the following steps may be useful:

1) Objectives should be clearly stated.

- 2) The site should be studied beforehand. On private lands, the permission and cooperation of the landowner should be secured. The trail should be cleared and gates should be open, if necessary. An irritating amount of time may be lost to locate "the person who has the keys". A written guide or at least some background information to the trip or practicum should be prepared and begin by stating the activities' objectives. In the case of a field trip the guide should present a series of concise facts relating to the site and the past history. Practica should include the step-by-step procedure that will be followed. Some examples of the guidesheets for field trips and the instructions for a practicum will be found at the end of this chapter.
- 3) Logistical arrangements (transportation, food, equipment, local participation of farmers, etc.) should be settled with as little as possible last minute improvisation. The date and time of day to go to the field and the weather patterns should be selected for the most comfortable temperature and least chance of rain. In many situations a backup vehicle may be necessary in case of breakdowns of the bus or any other vehicle, or for unforeseen errands such as warranted by necessary changes due to weather or road conditions. The equipment necessary for the practicum should be packed and checked well in advance; a first aid supplies will be handy. Good communication with someone at the base station is most desirable. Maximum use should be made of past mistakes. At CATIE for instance one early mistake was the use of a noisy bus with insufficient leg space (at least for tall Americans as compared with average "Latinos"). It was good enough for transportation of passengers for short distances but most inconvenient for longer trips and painful when rapid explanations by the guide were requested while the bus was moving. Under the circumstances it is highly desirable to rent a first class bus. Even if expensive, it is only a small fraction of the whole course cost.
- 4) The day before the field visit, the activities that will be performed should be introduced. If possible, slides or a movie of the sites or related themes, should be shown in order to motivate the students and "wet their appetite". Students should be requested to study the guide sheet before leaving for the field in order to formulate any questions. And they should bring the guide sheet with them.
- 5) Conducting of the field work. Most important is to avoid delays. The people requested to take the students to the plots should be ready and there should be no need to fetch them. If different groups are made for practicals, they should finish simultaneously so that the waiting time for the last group to finish is reduced to a minimum.

- 6) To sharpen students' observations skills during field visits, it might be desirable to ask them to prepare a report or, better yet, an evaluation to the site visited.
- 7) It is handy to plan ahead for alternatives in case the well planned original trip fails because of a last moment inconvenience (road cut, farmer's non participation because of family problems, heavy rain- all of this did happen at CATIE's courses).

Examples of Guidesheets

The following guidesheets could be used in field trips and practica. The first two guidesheets show two different ways of presenting information on a field trip. The third example presents the instructions for a field practicum.

Field trip Guidesheet # 1

COMBINED GRAZING AND FORESTRY IN THE UPPER CENTRAL VALLEY

OF COSTA RICA, FINCA LAS ESMERALDAS

(Based on a guidesheet prepared by
M. González, H. Martínez, N. Gewald)

Introduction

The use of windbreaks or shelterbreaks is traditional in certain parts of the upper Central Valley of Costa Rica. One farm which has used this system most successfully is "Las Esmeraldas", close to San José de la Montaña, which belongs to the Steinvorth family. A summary of the activities on this farm follows.

The farm was first used in the decade of the twenties for raising dairy cattle and crops, particularly maize. Maize yields, however, dropped with time. When the Steinvorth family purchased the farm, the first experiments consisted of the search for species appropriate to the area and which could be used in shelterbelts. The following species were tested for this purpose: Eucalyptus sp., Cedrela odorata, Fraxinus sp., (Cupressus lusitanica) and alder (Alnus acuminata). The best responses among the species tested were those of alder and cypress. However, since alder is an attractive browsing source for the cattle, it was not considered for further plantations.

The windbreaks were planted in strips of three to eight tree rows as indicated by Alfredo Anderson*

Up to the mid-forties, the only silvicultural practice employed was some pruning. From 1950-1974, plantations and pruning operations were abandoned. The trees were allowed to grow freely. Some pastures were invaded by regenerating cypress or by the growth of large side-branches from the outer rows of the windbreaks.

Since 1974 to date, a professional forester has been hired, and alder and cypress were planted for commercial purposes; the plantations were thinned; the old shelterbreaks were gradually harvested and managed, and clearing was done in the pastures invaded by trees. The average diameter of a thirty year old tree was about 60 cm.

*Alfredo Anderson, a Norwegian forester who did excellent work in forestry in Costa Rica.

In late 1978, a modern sawmill was installed to process the wood produced on the farm. Its capacity was 2000 "inches"/day (one "Tica"* inch equals 11/12 of a "board foot").

One curious bit of information is that the original seed for the cypress plantation come from a few trees still growing in the Central Park of San José**.

Description of the area

The "Las Esmeraldas" farm is located in the district of San Jose de la Montaña, Canton Barva, Heredia, at an average elevation of 1700-2000 m. It lies 20 km northwest of San José on the slopes of volcan Barva.

Data from the Barva meteorological station (7 km from the site at lower elevation) give a mean annual temperature of 18°C and a mean annual rainfall of 2460 mm. There is a dry season with mean rainfall under 50 mm/month from February to April. The area is swept by strong winds throughout most of the year. Fogs are common and may add rainfall by "horizontal precipitation".

The farm is located in the ecological formation Lower Montane Wet Forest according to the Holdridge classification of life zones. The soils from deep volcanic ash (1.5 - 2 m), well drained, pH approx. 6.0 but there is considerable variation as to their fertility and may different site indexes have been identified. The topography varies, with slopes ranging from 5-50 percent and more. The farms covers a total area of 270 ha, which are approximately distributed as follows: 207 ha of pasture, 43 ha of windbreaks (80 in all), 16.5 ha of five cypress and alder groves and 3.5 ha of infrastructure.

Forestry Data

In 1954, Goitia*** took measurements on three plots located in "Las Esmeraldas". The data are given in the following table.

* Nickname for Costa Rican

** Jorge Steinvorth, personal communication.

***Goitia, D. Comportamiento del Cupressus lusitanica Benth. en Costa Rica. Tesis Mag. Agr. Turrialba, Costa Rica. Instituto Interamericano de Ciencias Agrícolas, 1954. pp.

Plot	Spacing	Age in years	N tree/ha	d (cm)	dom...h m	G m ² /ha	MAI m ³ /ha/yr
0	1 x 1	7	6797	6.35	8.2	23.65	14.7
A	2 x 2	20	2153	19.05	15.25	63.73	38.84
0	2 x 2	20	2153	18.3	15.25	63.41	38.63

N= number; d= diameter; dom= dominant; h= height; G= basal area
MAI - mean annual increment; com= commercial

In 1978, Manuel González the forester in charge of the forest resources of the farm, took an inventory which produced the following data*:

Site	Plot	d (cm)	tot. h	h com ^{1/}
La Loma	Stand 2	37.5	28.5	23.5
	Shelterbelts 1+2+4+5+6+7+9	38.7	25.0	16.8
	Shelterbelt 3	48.4	24.0	16.8
	Shelterbelt 8	40.3	20.0	13.4
	Shelterbelts 10 + 11	40.3	22.0	16.8
	Shelterbelt 12	32.3	25.0	16.8
	Shelterbelt 13 + 14	38.7	23.0	16.8
	Shelterbelts 15+16+17+18	43.6	20.0	13.4
Paso Llano	Shelterbelt 1	43.6	20.0	13.4
	Shelterbelt 2	41.9	24.0	13.4
	Shelterbelts 3+4+5+6+7	40.3	23.0	13.4
	Shelterbelt Northeast	38.7	22.0	10.8
	Shelterbelt Northwest	41.9	26.9	16.8

^{1/} Up to a minimum diameter of 10 cm.

The forest sector now contributes one-third of the revenues brought in by the farm**.

*MANUEL GONZALEZ, Personal Communication
**JORGE STEINVORTH, Personal Communication

Field trip Guidesheet #2

SILVO-PASTORIL LAND USE IN THE HIGHLANDS OF THE
CENTRAL VALLEY OF COSTA RICA, THE FARM "LAS ESMERALDAS"
(1982)

J. Combe, L. Espinoza, R. Kastl,
R. Vetter

Location

The farm "Las Esmeraldas" is in the district of "San Jose de la Montaña" in Cantón Barva of the Province of Heredia, 20 km northwest of San José.

Population density

Of the San Jose district: 63 persons/km²

Structure of agriculture

.Average farm size in Canton Barva: Pasture land 61 %, arable land 6 % and permanent crops 33 %.

.Size of the farm visited: 270 ha

.Land use in the farm visited: pasture land, 207 ha= 77 %, wind protection strips, 34 ha= 16 %; reforestation area, 16.5 ha= 6 %; and infrastructure, 3.5 ha - 1= 1 %.

.Accessibility: Good (all year transport by car).

.Marketing: In the near vicinity of the capital, San Jose.

Height above sea level

1700 - 2000 m

Climate and vegetation zone (according to HOLDRIDGE)

Data from the meteorological station Barva (7 km away), annual temperature: 18°C, rainfall: 2460 mm with a dry season from February to April (rainfall less than 50 mm/month). There are frequent low clouds (mist).

The region is subject to strong winds for practically the entire year. The farm is in the vegetation zone of the lower montane wet forest (sensu Holdridge).

Soils

The deep, well-drained soils of the region (1.5-2) have developed from relatively recent volcanic ash. The pH value is 6.0. The relief is variable, but usually rather steep with slopes of 5-50 % and more.

Agroforestry forms of cultivation

From 1920 to 1930 the farm concentrated on dairy and arable farming (especially maize), but the yields decreased over time. Therefore, the subsequent owners established wind protection with lines of various trees: Eucalyptus spp., Cedrela odorata, Fraxinus sp., Cupresus lusitanica, Alnus acuminata, the latter are N fixing species.

Of these species Cupresus and Alnus proved to be the best suited as wind breaks. But because the cattle were fond of the alders and fencing was expensive, no more of these were planted. The wind break consisted of 3 to eight rows of trees that were laid according to the instructions of the Swedish Forester Alfredo Anderson, who acted as consultant.

Treatments of the plantations

Until 1945, pruning was the only forestry technique used. From 1950 to 1974 no planting or pruning took place, so that the cypresses developed without any tending. Natural regeneration by the cypresses occurred on the neighboring open lands. After 1974, plantations of alders and cypresses were established and the older trees thinned. At the time of tending the windbreaks, the nearby, formerly naturally regenerated plots were cleared (average age of windbreaks: 30 years; diameter in some cases more than 60 cm).

Results

At present the forestry sector produces one-third of the farm's income but this is increasing.

Problems

Root rot in some localized areas; poor form of trees (fluted trunks).

Remarks

Annual total increments of $38 \text{ m}^3/\text{ha}$ were calculated in one site for 20 years old stands of Cupressus lusitanica, which is considerable and was attributed to the good volcanic soils at that site.

Sources

1. GONZALEZ, M., MARTINEZ, H. and GEWALD, N. "El uso de prácticas silvopastoriles en las partes altas del Valle Central de Costa Rica; Finca Las Esmeraldas". ACTAS, Taller Sistemas Agroforestales en América Latina, CATIE, March 1979. pp.

Field trip Guidesheet # 3

AGROFORESTRY PRACTICUM: CHARACTERIZATION
OF SHADED COFFEE PLANTATIONS

John Beer (1984)

Introduction

This short course has been designed to demonstrate the application of a "System Analysis" approach to the study of traditional agroforestry practices. When quantitative data is needed a division of each farm into production subsystems is often advisable. In this exercise quantitative assessment of an agroforestry subsystem, "a shaded coffee plantation", will be performed. (In the short time available only a few of the many possible measurements will be taken). Obviously influences from outside the subsystem under study must be taken into account. Each group should prepare and present profile diagrams, as well as a list of preferred shade tree species with their respective advantages and disadvantages.

General objectives

1. To test a set of measuring techniques that can be used for the characterization of coffee-shade tree combinations. (Suggestions and constructive criticism are welcome).
2. To seek recommendations on preferable shade tree species for the Puriscal area.
3. To contrast different coffee management techniques (e. g. no shade, mono specific shade, multi-species homogeneous shade, multi-species heterogeneous shade, .

Instructions (Field)

1. Each group will assess the coffee plantations on one farm. The owner and a CATIE staff member will accompany each group as local contacts.
2. To obtain a general idea of the structure and species composition, the group will make a 30-60 minute (no longer) reconnaissance of the plantation. The local contacts should be questioned for background data. Estimate the total area (approximately; do not try to measure it by compass and tape) of the plantation and the percentages managed: (a) without shade; (b) shade of one species; (c) mixed shade; etc. (Some groups will not encounter all of these).

3. Choose the location of a circular plot (Radius 10 m, measure the average plot slope and make a subsequent correction in the calculation of plot area) which contains a representative range of shade tree species. All trees whose trunk center falls on or inside the boundary are in the plot.
4. Within the plot, measure the following (2-3 hours);
 - a) Single or forked stem shade tree species: Total height (m) and height to base or crown, D.B.H. (cm), crown radii (the projection of the largest 3 or 4 branches should be measured along with their compass bearing), and location on plot map.
 - b) Multi-stemmed shade species (e. g. Musa spp.): Species, height of tallest stem (m) (height to base of combined crown), crown radius of combined stems, location on plot map.
 - c) Coffee: Variety, spacings (intra and inter-row), and height (m).
5. Record information on the following (personal observations and/or answers from local contacts).
 - a) General
Plot aspect and slope, external physical influences (e.g. adjacent stream; footpath through plot, etc.), land use history (what preceded the coffee; did the naturally regenerated trees germinate in the coffee or under preceding conditions, etc.), marketing possibilities for coffee and tree products, labor availability (e. g. harvest shortages; excess at other times?).
 - b) Management
Fertilizer application (timing; quantities); erosion control techniques, coffee pruning (why; how; when); coffee disease incidents (species; control; correlation with degree of shade); soil conditions (existence of a mulch and any correlation with the overhead shade; evidence of deficiencies in the coffee and any correlation with the shade species); weed control (how; when and effect of shade upon weeds); appearance of coffee below different shade overstory species; evidence of sheet erosion beneath different shade species (e. g. 'pedastals', root exposure); suitability of different coffee varieties to shade/no shade management; estimated coffee yields of the plantation.
 - c) Shade trees
Pruned (why; how; use of products including estimated value of wood, fruit, etc.); use of secondary products (firewood, medicines, etc.); origin (forest residuals, natural regeneration, vegetative propagation, transplanted natural seedlings, etc.); homogeneity of shade species (randomly mixed or managed in small mono-specific groups; existence of naturally regenerated seedlings; owner's

opinions on advantages/disadvantages of shade desirable characteristics of preferred species.

Instructions (Classroom)

6. Analysis (2 hours) and Presentation (2 hours)

- a) Each group will receive a file of supplementary data on 'their' farm.
- b) Shade tree dimensions and locations should be used to prepare semi-idealized vertical (use supplementary data) and horizontal profile diagrams.
- c) Prepare summaries of species frequency and description of the coffee (variety, spacing, estimated yield).
- d) List observations (e. g. coffee disease incidence, production limitations such as labor shortages, advantages and disadvantages of different shade tree species).
- e) Make recommendations on preferable shade tree species and management techniques (mixed shade, no shade, etc.).
- f) Suggest further measurements or follow-up experiments.
- g) Return all original data, analysis sheets, diagrams, observation summaries, conclusions, etc. to the course coordinator.

CASE STUDY REVISITED: USING VARIOUS TEACHING METHODS IN
A DAY'S PRESENTATION

Let's return to the case study that was presented earlier and see how it can be improved by using a variety of teaching methods. We are assuming that the course participants have had exposure to agroforestry and some of them are familiar with or have worked with farming systems research.

The day's presentations is the first day of a three-day module on farming systems research methodology. The first day provides the theoretical bases; the second day, involves a visit to a farm to characterize it using Farming Systems Research (FSR) methodology; and the third day involves analyzing a case study on a FSR problem or developing a work plan.

The objectives of the first day's presentations are:

In order to prepare students to successfully characterize a small farm they will participate in a number of learning activities. After completing these activities they should be able to:

- Distinguish the FSR methodology from traditional agricultural research methodologies.
- Describe the five phases of the research process in FSR.
- Perform an interview with a small farmer.
- Diagram a small farm using standardized symbols.

A revised program could be:

7:30 a.m.	Introduction to the Farming Systems Research Methodology Module.
8:00	Lecture: Farming Systems Methodology
8:30	Lecture: The Research Process in FSR
9:00	Slide-talk show: The Farm of don Juan Moreno
9:15	COFFEE BREAK
9:30	Lecture: Interviewing Skills
9:45	Role Playing: Interviewing Small Farmers
10:30	Lecture: Diagramming
11:00	Small Group Exercise: Diagramming
11:30	Group Discussion: Diagramming
12:00	LUNCH
2:00	Slide-talk show: Notional technologies
2:30	Group Discussion: Summary
3:00	Small Group Exercise: Developing a Work Plan
5:00	CONCLUSION

Introduction to the Farming System Research Methodology Module.

- Objective: to inform the student of the day's activities.

This was done in our case study presented earlier with success. The instructor instructs hands out a detailed program of the activities that state the activity what will be done and why will it be done. He orally reviews the program with the group.

The instructor then asks the participants if any of them have had any experience in Farming Systems Research Methodology. This aids the instructors in establishing the level of instruction, i.e. if none of the participants have had experience then the level of instruction must be basic. It also permits the instructors to draw upon the experience of the participants at appropriate times.

Lecture: Farming Systems Methodology

Objective: After listening to the lecture, the student should be able to distinguish the farming systems research methodology from traditional agricultural research methodologies.

This short, 15-minute lecture will focus on why FSR is considered a superior research methodology to other methodologies. It will state various examples that apply to agroforestry. The lecture will serve particularly well to motivate the participants by illustrating that FSR is viable and of great value in agroforestry. After the lecture, publications that supplement the theme will be handed out.

Lecture: The Research Process in FSR

Objective: After listening to the lecture, the student should be able to describe the five phases of the research process in FSR.

During the lecture the instructor will briefly cover the main objectives and procedures of each of the five phases. To aid the participants in understanding the process, simple transparencies will be used. One transparency will contain short 5-word titles of each phase which will be revealed as each phase is introduced. Another transparency will be a simplified flow chart which will be reviewed after all components have been introduced. Students will be given a detailed flow chart that they can review while the instructor uses the simplified transparency.

Slide-talk presentation: The Farm of don Juan Moreno

Objective: After viewing the slide-show, the student should be able to sketch the various agroecosystems that comprise the farm of don Juan Moreno.

Once the theoretical bases of the farming systems methodology have been presented, the instructors will illustrate its applicability by reviewing the research process using an actual farm. The slide show will

not only describe the case farm but also introduce the participants to the various agroecosystems found in the study area. The farm will serve as a basis for examples used throughout the subsequent activities and will lend reality to the theoretical.

Lecture: Interviewing Skills

Objective: After listening to this lecture, the student should be able to list a number of effective communication skills for use while interviewing small farmers.

Using the farmer don Juan Moreno as an example, the lecturer will identify some of the major barriers to obtaining information from farmers and techniques the agroforester can use to overcome them.

Role playing: Interviewing small farmers

Objective: By testing, practicing and analyzing various interviewing techniques, students should be able to perform quality interviews. Role playing will give students the opportunity to test interviewing skills which were introduced in the lecture. The instructor should follow the guidelines as stated in the role playing chapter. Characters should follow the guidelines as stated in the role playing chapter. Characters should include the farmer, playing the role of the case farmer don Juan, and possibly his wife, and four agroforester each representing a different discipline. After discussing the dramatization, the instructor will repeat it using different actors.

Lecture: Farm Diagramming

Objective: After listening to the lecture, the student will construct a farm diagram.

In this brief 15-minute lecture, the instructor will explain the applicability of farm diagramming and the significance of the various symbols used. A transparency illustrating the individual symbols will be used.

Group exercise: Diagramming a farm

Objective: By working in small groups, students will diagram a case farm using standardized symbols.

Present each work group with the task of diagramming don Juan's farm. Each group should be given a fact sheet about the farm, a written and illustrated explanation of the symbols and a completed diagram of a sample farm. This activity will give the students guided practice in diagramming.

Group discussion: Farm Diagramming

Objective: Working in a large group, students will accurately diagram a farm.

After the small groups have diagramed their farms, the instructor will call them back to review the diagrams. Rather than having the instructor correctly diagram the farm, the discussion method will be used. The diagram will be built up in stages on the chalkboard. The instructor should select a student to do the diagram as other students explain to him. The instructor should only interact when the diagram-building process unorganized or if there arises sharp differences of diagrams between each group.

Illustrated talk: Notional Technologies

Objective: After viewing the illustrated talk, the student will be able to identify various notional technologies and list the criteria for evaluating them.

After characterizing don Juan's farm the students will begin to design alternative technologies that will serve don Juan's needs. The illustrated talk, 10-15 minutes, will identify some of these technologies and what criteria should be used in their selection.

Group Discussion: Summary

Objective: Students will be able to generalize on the basic themes presented during the day.

Using the techniques as stated in the discussion method chapter, the instructor will ask the students to recapitulate the major themes of the day and to raise any questions they have to other course participants.

Small group exercise: Developing a work plan

Objective: By working in small groups, students will develop a work plan that can be used when characterizing a small farm.

The instructor will divide the large group into various smaller groups of 4-6 students. The groups will be carefully chosen so each contains a fair mixing of disciplines represented, amount of work experience and, depending on the case, language ability. Each group will be assigned a farm and given some background information on that farm. They will develop work plan than will be utilized the following day when they actually visit the farm.

Although this program would have to be refined considerably before actually using it, it serves well to illustrate the fact that with careful planning and consideration of various teaching methods, instructors can escape from the routine of giving formal lectures and even provide students with effective and dynamic teaching.

REFERENCES

1. BABBAR, L. Curso Corto Intensivo: Prácticas Agroforestales con Énfasis en la Medición y Evaluación de Parámetros Biológicos y Socioeconómicos, Turrialba, Costa Rica, 11-21 de enero, 1983. Informe Final. Turrialba, Costa Rica, CATIE, 1983. 20 p.
2. BABBAR, L., comp. Curso Corto Intensivo: Prácticas Agroforestales con énfasis en la Medición y Evaluación de Parámetros Biológicos y Socioeconómicos, Turrialba, Costa Rica, 11-21 enero, 1983. Contribuciones de los Participantes. Turrialba, Costa Rica, CATIE, 1983. 256 p. (p. ineg.) (mimeogr.)
3. BABBAR, L., comp. Curso Corto Intensivo sobre Técnicas Agroforestales, Turrialba, Costa Rica, 8-18 nov., 1983. Contribuciones de los Participantes. Turrialba, Costa Rica, CATIE, 1983. 316 p. (p. ineg.) (Mimeogr.).
4. BABBAR, L. Curso Corto Intensivo sobre Técnicas Agroforestales, Turrialba, Costa Rica, 8-18 nov., 1983. Informe Final. Turrialba, Costa Rica, 1983. 18 p.
5. BROWN, J. W.; LEWIS, R. B. y HARCLEOAD, F. F. Instrucción audiovisual; tecnología, medios y métodos. Trad. por R. Venós Cruz López. México, D. F., Trillas, 1975. 581 p.
6. DALE, E. Audiovisual Methods in Teaching. Rev. ed. New York, Dryden, 1954. 504 p.
7. DENVER RESEARCH INSTITUTE. Handbook on management development workshops for applied research institutes. Washington, D. C., Agency for International Development, 1978. 98 p.
8. GALL, M. D. and MAXWELL, G. The discussion. Method in classroom teaching. Theory into Practice. Vol. 19(2):98-103. 1981.
9. GRAHAM, P., CLINE, T., and CLINE, P. C. The case method: A basic teaching approach. Theory into practice. Vol. 19(2):112-116. 1981.
10. HORN, E. Talk tips. U. S. Department of Agriculture. Forest Service. 21 p. s.f.
11. INSTITUTO INTERAMERICANO DE CIENCIAS AGRICOLAS. Metodología de la Enseñanza de las ciencias Agrícolas. Guatemala, 1968. 2 v. (IICA. Publicación Miscelánea N° 56).
12. MAJOR, M. Fourth International Short Course Agroforestry for the Humid Tropics, 24 April-4 May, 1984; Final Report. Turrialba, Costa Rica, CATIE, 1984. 113 p.

13. McKEACHIE, W. J. Teaching T. PS: A Guidebook for the beginning College Teacher. Boston, D. C., Heath, 1969.
14. McKEACHIE, W. J. Métodos de Enseñanza: Guía para el profesor. 5a. ed. México, D. F. Herrero, 1970. 235 p.
15. OLNSTEAD, G. A. Handbook of small-group methods of instruction, Alexandria, VA, Human Resources Research Organization, 1972. 71 p.
16. PRICE, N. Agroforestry for the Humid Tropics Short Course, Turrialba, Costa Rica, 16-25 March 1982. Final Report. Turrialba, Costa Rica, CATIE, 1982. 39 p.
17. PRICE, N., comp. Agroforestry for the Humid Tropics. Short Course, USAID/CATIE, Turrialba, Costa Rica, 1982. Contributions of Participants. Turrialba, Costa Rica, CATIE, 1982. 392 p.
18. RING, A. E. and SHELLY, W. J. Learning with the overhead projector. San Francisco, Chandler, 1969.
19. RING, A. E. y SHELLY, W. J. Aprendizaje mediante el retroproyector. México, D. F., Trillas, 1973. 139. p.
20. SMITH, I. K. "Teaching with discussion: a review". Educational Technology, 18:40-43. 1978.
21. STAGNER, H. and THOMPSON JUNIOR, D. D. Talks. U. S. Department of the Interior, National Park Service, 1968. 20 p.
22. WEAVER, G. G. and BOLLINGER, E. W. Visual aids: their construction and use. New York; D. Van Nostrand, 1949. 398 p.

APPENDIX A

FACTORS WHICH INFLUENCE LEARNING*

Once the objectives to be achieved have been defined a review of the factors that influence learning before selecting the teaching methods appears desirable at this point.

Motivation

This is the key to learning. The most important and persistently basic tasks of teaching are to release, instigate and increase such motivational processes and forces as the interest, need and desire to learn. A number of studies suggests that little learning takes place in the absence of motivation.

No two persons are motivated by the same factors. Some people are motivated to learn by the interest or challenge of a task. Others need an anticipated reward or punishment. Others are motivated by a need of recognition or status. Most, if not all, share a distinct hope of applying the knowledge acquired, or conveniently adapt it, to enable them to perform a better task when they return to their old, or new job.

While preparing different instructional activities, correct identification of what will motivate the course participants to play an active and involved role in the activity, becomes an essential task.

Reinforcement and Reward

Motivation alone may not produce learning. However motivated the student may be, he is unlikely to learn unless the learning process rewards and reinforces the desired behavior by reinforcing the desired responses.

Feedback

Feedback ties in directly with reward and reinforcement. In order to learn effectively, the participant needs to know if he has been successful. If feedback is delayed, it is more difficult for a learner

*Adapted from Handbook on Management Development Workshops for Applied Research Institutes, 1978.

to determine which of his actions led to a given outcome. If no feedback is provided, the participant may become confused or even angry. In most formal training situations i.e. schools and universities, feedback is most often obtained through exams. Giving exams is not practical in short courses. Therefore students must be orally given feedback as soon as possible. The instructor must state if the student has adequately performed the task.

Participation and Practice

People learn more rapidly if they are personally involved in the tasks or situations being presented, i.e. if they play an active as opposed to a passive role. If they can perform the task in the course environment, they are more likely to continue to do so in their every day situation. However, a single correct performance of a task is rarely sufficient to ensure continuing performance. It is important, therefore, that a follow-up review be scheduled with the participant.

Applicability of Materials

Learning is easier and more acceptable when the learner sees the relevance or applicability of the material to his own situation. Wherever possible, there should be a close relationship between the content of the activity and the work the learner will actually perform in his day-to-day situation.

It is quite important to know your course participants quite well in order to structure your activities so the instruction is relevant to them. This has been particularly difficult in CATIE's courses since the participants have varied backgrounds and working conditions. It therefore becomes the responsibility of the course coordinators to assure a homogeneity of the group especially in respect to their type of work.

Presentation of Materials

The manner and order in which materials are presented to students greatly affect their ability to absorb and understand the material. There are many points to be considered which will be referred to throughout this manual.

APPENDIX B

VISUAL AIDS

Characteristics

A visual aid is any specifically prepared drawing, map, illustration, model, movie, film strip, slide show, graph, chart or photograph that will expedite and facilitate learning through the sense of vision. Although audiovisuals (movies, slide-tape show, television, etc.) are technically visual aids, their use is different than non-audio aids and will be covered in another chapter. This chapter will deal only with using the overhead projector and slides which are the visual aids most commonly used in agroforestry short courses.

Merits of visual aids

Attract and hold attention. A verbal explanation supplemented by a visual aid is far more effective in attracting attention and creating interest. This type of presentation adds variety and breaks the monotony of the ordinary instruction.

Aid retention of information and visual images. The things what students see with make a more lasting impression and help recall the information considerably less difficulty.

Assist in forming correct images. Students perceive things based on their own background of experience; consequently it is possible and quite probable for a group of learners to form entirely different ideas about the same thing as a result of a verbal description. For example, describing the Taungya system verbally can lead to many different perceptions, but projecting a series of slides taken at different phases will clarify the concept.

Limitations

Some of the limitations of using aids are:

- They increase teacher dependency on equipment and materials.
- If not carefully selected and designed, they may actually distract attention from the speaker.
- They can make the session painfully longer, especially if the teacher does exceed the time allotted or spends excessive time on some slide or transparency.

The Overhead Projector (OHP)

Almost all instructors are familiar with the overhead projector. Nevertheless, many instructors do not use it correctly.

Advantages

- 1) The teacher faces the class at all times and speaks directly to students while projecting material on a screen behind him or at his side. This is not possible when using a blackboard.
- 2) The OHP can be used in a completely lighted room. Projected images can be seen clearly by all students, including those in the last row.
- 3) Once the transparency is made, it is permanent and can be used repeatedly (even copies can be made). It cannot be accidentally or deliberately erased like a blackboard.
- 4) The projector is lightweight and easy to carry.
- 5) The instructor is able to maintain complete classroom control.
- 6) Transparencies are easy to make using a felt pen or many of the common electrostatic copying machines such as xerox.

Techniques for Using the OHP

Pointing. A simple way of drawing attention to the item you wish to emphasize is to use a pointer. A pointer can be any opaque object placed on that part of the transparency under discussion. The point object casts a shadow image on the screen. A pencil, pen or even your finger can serve. The pointer should be rested on the projector stage to eliminate movement.

Blackboard technique. The OHP can be used in place of a chalkboard, thus providing you with more versatility. A grease pencil or felt pen is used in lieu of chalk and a clean sheet of transparency film is used in place of the chalkboard. This prevents the instructors from wasting time writing on the blackboard.

Revelation technique. This technique is one of the most important because it enables to employ one of the most effective teaching methods known. Revealing projected material to a class bit by bit is a psychologically sound way to attract attention to the subject. An opaque sheet of paper is the simplest revelation mask. As one moves from point to point, it is possible to uncover the topic of the moment for revelation to the class. When the illustration is no longer needed, the projector is turned off so it does not detract from the lesson. This is vitally important and should be kept constantly in mind. A transparency that is projected on the screen when it is not needed competes for student attention.

Overlays. This is a particularly effective technique for building up the material in a step-by-step fashion. Information which lends itself to this type of presentation is information that can be broken down in component parts. A transparency is made of each component and then the component transparencies are put together. The series of components are then flipped into place on the stage as the information is developed. A good use of the overlay technique in agroforestry is to illustrate farm diagramming. Rather than presenting students with a completed diagram, this technique allows to gradually build up the final diagram.

Use of color transparencies. There are several ways of making color transparencies. Their production however does not fall within the scope of this manual. Color will improve the presentation by performing three tasks: 1) heightens realism; 2) helps to see differences, to distinguish and to emphasize; 3) produces pleasant esthetic effects.

Placement of projector and screen. It is essential that everyone sees all of the projected image - and sees it clearly. The screen should be placed as high as possible from the floor in one of the front corners so the lecturer can remain in front of the class and permit every student to view the unobstructed screen. Often keystoneing, or distortion, occurs when the screen is not square with the projector. To avoid this, it is advised to slightly incline the top of the screen (20°) toward the projector. Or if the screen is moveable, to move it until a line drawn from the projector lens to the screen forms a 90° angle.

Designing transparencies. The human eye can see only so much at a time, and the human brain can comprehend and retain only a certain amount of information at a time. Therefore the basic elements of transparency design, simplicity and image size, should be carefully kept in mind.

Simplicity. If it has too much information or too many details that have only secondary value to the point of a lesson, the transparency will tend to confuse the class and detract from the presentation. A transparency that is crammed with information is hard to read, the information is difficult to assimilate and makes the presentation dull. When text is needed on a transparency, it is advisable to limit it to essential information. The transparency serves to support a point and should never explain the point and thus act as a substitute for the instructor.

Common mistakes to be avoided and possible solutions are the following:

- too many words on a transparency and letters too small to be read by all participants in the room; break down in several transparencies or even better, summarize in one or two (no more); lettering on a transparency should be large enough to be read easily by students

in the last row. The smallest image seen on the screen must have a height of 3 cm for every 10 meters of viewing distance;

-Too much time for one transparency keep to 20 seconds or less.

References: 1, 2, 6, 10, 12.

Using Slides: The Illustrated Talk

The slide talk is one of the most common forms of presentation. Slides serve very well to reinforce a talk and simplify complex concepts. Too often instructors merely throw a number of slides in a carousel with little thought to organization and presentation, and proceed to lecture. Using slides to support the spoken word is quite a different matter and requires a considerable degree of skills and careful preparation. Slides can be used for the whole talk or for sections. The following guidelines when planning and delivering your slide talk may be useful.

Planning

Length of talk. Normally the illustrated talk portion of your program should not exceed 40 minutes and is not effective when limited to 20-30 minutes. After 40 minutes, listeners have trouble maintaining attention and they often become drowsy, which is greatly accelerated by the darkness. The length of time a slide is projected to prevent monotony and anticipation of slide change may vary; it is advisable not to project an illustration for more than 12 seconds. otherwise the audience will start "searching" in the picture and the words of the lecturer will be lost.

Outline. The slide talk is simply an ordinary talk illustrated by slides. Therefore the guidelines suggested in the chapter on the lecture method also applies here. It should be remembered that the slides serve only to illustrate the talk, they do not constitute the talk. Slides should be carefully selected to fit the talk, rather than choosing words to explain a series of slides. Forgetting about slides, it is advisable to plan a talk that will stand on its own. A written outline of the talk will help. Like the lecture, it should have an introduction, body and conclusion. The talk should not gradually fade away and end with something like "well, I guess that's all I have to say". It is worth-while to look for a slide which will clearly support your concluding statement.

Selection of slides. Each slide should illustrate only one point and it should illustrate it adequately. It is highly recommended to be very selective in the slide choice. The temptation to include many slides of questionable quality is high. It is the visuals that the viewing and listening audience will most likely remember not the words. If an appropriate slide to illustrate a point, cannot be found one of two things are advisable: either the talk should be modified to eliminate that point or an additional point that can be illustrated should be made.

Marking slides. One of the most annoying parts of slide shows, are slides that appear upside down or reversed. Distractions like this tend to pull attention away. Once the slides have been selected, arranged and tested, for instance on a white surface such as a wall or a white cardboard, they should be marked to indicate proper placing. The edge of the lower left corner is a good place so the slide reads correctly on hand viewing. To put the slides correctly in a carousel the mark should appear on the top and toward the outside of the carousel. This way it is easy to check with a quick glance that all slides have been correctly placed.

Delivering the talk

Location of speaker. It is desirable to stand in front of the audience to one side of the screen. A remote control is very useful, this will allow the audience to see the speaker. If notes must be glanced at, a small light directed at the notes but hardly noticeable by the audience is appropriate.

Transition. Every change of scene on the screen is a momentary distraction from the spoken word. This should be made to work for, rather than against the lecturer. One way is to make the transition to the idea illustrated by the next slide a few seconds before the picture is changed. In the commentary, next scene should be anticipated. A new slide should not be advanced before time. If the change is too soon, the listener will examine the new slide and lose the train of thought while being confused as to the meaning of the new slide. For example, the transition could be like this: (photo of Gliricidia sepium used in a live fence posts)
"...Gliricidia sepium, is not the only species used for live fence post in Costa Rica. Another species is... (change slide to show Erythrina) Erythrina berteroa which..."

Reference to slide. Direct reference to the slide being projected, such as "this is a photo of a coffee plantation combined with laurel" should be avoided. With the proper slide showing, there is no need to refer to it. It is enough to simply state the facts. "Laurel, an important timber tree, is often used as shade in coffee plantations". When the words "this scene shows" are pronounced it implies a reminder to the audience to focus their attention on the screen; but what is really requested of them is to listen to what is being said.

Apologies. It is unnecessary to draw attention to the talk's faults by apologizing for the poor quality of slides or malfunction of equipment.

Concordance between slides and words. Deviating from the theme supported by the slide should be avoided at all costs. For instance this is not the time to tell a story (however funny). It is wise to tell it before or after the show.

Black slides. It is inconvenient to stun the audience's eyes with flasing a brilliant white light on the screen. It is appropriate to use a black slide to eliminate this problem.

Backup equipment. If possible an additional projector should be available and ready in case of equipment malfunctions. A spare bulb is always indicated as a second choice. If the equipment malfunction cannot be corrected the lecturer should be able to give an interesting talk, When the use of the projector is completed it should be completely turned off, as the projector bulb life is increased, if it cools slowly rather than being cooled rapidly with the fan.

References: 1, 2, 6, 7, 10, 12, 13.

The audiovisual (AV)

Characteristics

Audiovisuals are instructional aids which combine both sight and sound to improve the learning experience. Examples of audiovisuals are slidetape shows, movies, filmstrips, video cassette and television. Currently their use in agroforestry short courses is quite limited due to the lack of audiovisuals available concerning agroforestry.

Uses

Audiovisuals can be employed in short courses to:

- introduce a new theme
- reinforce another activity such as a case study, discussion or lecture.
- provide the base for a discussion
- provide individualized learning for students who want to view materials on their own.

Merits

Many recent studies show the high effectiveness of audiovisuals as a learning device. Their effectiveness is largely based on the combination of both sight and sound. Many psychologists and educators agree that we acquire most of our learning through our senses in this manner:

Sight	87 %
Hearing	7 %
Touch	3 1/2 %
Taste	1 1/2 %
Smell	1 %
<hr/>	
Total	100 %

Audiovisuals can do the following to improve learning:

-Heighten motivation for learning. Audiovisuals are quite effective in lighting the spark so that students want to learn more about the given subject.

-Change attitudes. Audiovisuals serve particularly well when the desired behavioral objective involves an attitude change.

- Provide freshness and variety. Learning experiences should be varied. Monotony can be a powerful deterrent to learning. Audiovisuals provide an experience that is fresh, exhilarating and new.
- Assure order and continuity of thought. Concept building is in no sense an random accumulation of diversified experiences. There must be an order, a logic that is implicit in the process. In this regard audiovisual materials can be especially beneficial. A well-prepared television program, motion picture, or filmstrip presents its subject in a logical, carefully structured fashion. Relationships between various elements of the material are clearly indicated and important similarities and distinctions are vividly illustrated.

Furthermore, the instructional message emphasizes the continuity of a particular topic, its interconnections with many other aspects of the subject matter and the important role that it should play in a learner's progressive development.

- Captures student's attention. By projecting the image on a screen, an audiovisual captures the attention of the students as all eyes and ears are focussed in.
- Improves information retention. We remember better what we see.
- Easy-to use. Since an audiovisual is already prepared there is not need to practice or prepare lecture notes.

Limitations

Dependence on equipment. Equipment must be found and transported, it must of course function well.

- Easily out-dated. It is difficult to insert up to date information in audiovisuals.
- Not tailored for specific groups. Unlike other instructional methods, audiovisuals cannot be adapted for specific conditions.
- Impersonal. Listening to a recorded voice is not as desirable as live commentary.

Use of Audiovisuals

Many instructors feel that using audiovisuals is an easy way out of preparing and instructional activity. They believe it is worthwhile to merely show the audiovisual and then ask for questions. Using an audiovisual requires much more thought and preparation than turning on a projector. Their use should be carefully planned.

Above all it must be remembered that an audiovisual is not a substitute for an educational experience. Audiovisuals should not be used in place of other forms of instruction but rather to reinforce them.

Like other forms of mass media, audiovisuals serve to alert and inform their audience. Used alone, they are not effective in educating. Education takes place primarily from interpersonal communication, i.e. person to person. When audiovisuals and interpersonal communication are combined, the effect of each is greater than each one used separately. Therefore it is essential to plan activities that involve interpersonal communication (e.g. group discussion, case studies, or role playing) before and after viewing the audiovisual in order to reinforce the information presented.

Before projecting and audiovisual it is important to give an orientation to the show and discuss the following; What is the objective of the AV? Why is it being shown? How does it relate to what the course participants have already studied or will study? The following points may also be discussed: 1) questions to be "answered" by the AV; 2) problems and problem situations noted in the AV, 3) new words, phrases or concepts used in the AV.

It is recommend that the AV be projected without interruptions which causes a break in thinking. For AVs produced in a foreign language or AVs that are below or above the level of instruction, the sound can be turned off while an expert takes over the narration.

After discussing the AV using other instructional strategies, repetition of show may be warranted. Research indicates that one showing of an AV is not sufficient for attitude change.

Sources of Audiovisuals

Media Extension Education Training Service (MEETS)
AID Training office
Coordinator for Films
1735 North Lynn, Room 405
Rosslyn, VA

National Audiovisual Center
National Archive and Records Service
General Services Administration
Washington, DC 20409

FAO Filmstrips
Distribution and Sales Section
Food and Agriculture Organization of United Nations
Via delle Terme di Caracalla
00100 Rome, Italy

CIAT
Oficina de Distribución de Publicaciones
Apartado Aéreo 6713
Cali, Colombia

USDA
Motion Picture Service
South Building Room 1850
Washington, DC 20250
U. S. A.

APPENDIX C

ORGANIZATION OF A SHORT COURSE

The essential components of an Agroforestry short course are listed below, with the purpose of helping potential course organizers in shape their program.

Seven short courses given at CATIE form the basis of the recommendations.

Inauguration and first day activities

It includes the wellcome speeches by the Director of the organizing institution, the Head of the Department or Unit and the course coordinator. Then the course participants should be introduced to each other, with the request to provide some details on their jobs and experiences. A slide show and a field visit will allow the participants to get an introduction to the institution. They should then receive further details on the course organization and logistics, especially background material and information on the documentation system. In the evening of that day a cocktail party should allow the participants and the staff to get together.

Introduction to Agroforestry concepts

The objective of this part is to discuss the main definitions and applicability of agroforestry, examine the border cases, and present elements of agroforestry systems classification.

This part of the course will normally give place to lively discussions and the opportunity for the course participants to get motivated and express their own views.

A slide show, presenting agroforestry systems from tropical Latin America and other parts of the world, is available at CATIE and is part of this exercise.

It is essential that the instructor for this part of the course be very knowledgeable of agroforestry to fill appropriately the many questions and observations from the participants.

Agroforestry systems descriptions, analysis and design

This part has the purpose of showing to participants the theoretical basis for studying whole systems and bringing methodological elements to describe and analyze existing systems as well as to design new ones.

It may include conferences on Farming System Research approach, practical sessions on diagramming existing systems and, most important, conduct farmers interviews and farm visits in small groups. Each group should then analyze and present their data to the other participants.

This part should be well received particularly if theoretical aspects and formal lectures are kept at a minimum. It would be desirable to have the same groups go back to the farmers towards the end of the course and discuss with them some agroforestry options which would be appropriate on their farms. Ideally the results of such "second round" with the same farmers would be presented again in the plenum.

Technical basis of agroforestry systems and research for non traditional systems.

This part includes lectures on agroforestry with annual and perennial crops, and with animal production systems, and discussions or formal lectures on soil management in agroforestry. The rationale for the taungya systems should also be discussed here. These classes are to show the scientific basis of agroforestry practices and to demonstrate how new agroforestry systems are experimentally evolved. Particular emphasis should be given to the discussion of interactions between the main components of the agroforestry systems.

Field visits to experimental areas complement the classroom lectures.

Economic evaluation of agroforestry systems

The objective of this part is to acquaint the participants with the problems that are likely to arise from economic evaluations of complex systems. Emphasis must be on practical aspects such as how to obtain and analyze the data. All formal lectures should be complemented with an exercise consisting of an evaluation of a case study.

Field visits and field practica

This is a most important part of any course, and it will usually take over one third of the total time.

Normally, not only visits are organized, but active students participation should be sought, mainly through measurements to be done on the plots or the farms.

Some example of visits/practica:

-Visit to a commercial caribbean pine farm ("Celulosa de Turrialba"), where maize is cultivated as a taungya crop, while other stands are grazed in a silvopastoral systems.

-Visit to a lowland farm, where the secondary forest is carefully managed. The former pastures had degraded and were abandoned.

The secondary bush was left to grow into a valuable forest and became a managed silvopastoral system (sequential form of agroforestry).

-Visit to several cocoa farms with valuable Cordia alliodora trees which were harvested during a period of low cocoa production due to a disease (Monilia), and in that way contributed to the economic stability of the farmers. The practice includes measurement of damage to cocoa by tree felling, and observations of tree regrowth from stumps (coppice). Some of the Cordia trees have been measured for several years.

-Visit to livestock farms with live fences of Gliricidia sepium. The participants measure the biomass of the branches for fuelwood and forage based on previous studies and a two entry table proposed by the staff.

-Visit to livestock farms with N-fixing alder Alnus acuminata associated with pastures and cutgrass. Some of the trees have been measured for 6 years.

-Visit to a large dairy farm in the highlands, here windbreaks (Cupressus lusitanica) are being managed for cattle protection and timber production, and there is a very well installed sawmill operating in situ.

-Visit to coffee farms with different types of shade trees and management (pruning) of both coffee and shade trees. Measurement of spacial and vertical distribution of coffee and trees is made by participants. Also included are interviews with farmers to discuss advantages and drawbacks of shade in coffee plantations. Later, group sessions present their results.

-Measurement of biomass in controlled plots of leguminous trees (Erythrina, Gliricidia, etc.) including determination of the components: fuelwood, twigs and leaf mass. This might be followed by group presentation of results, comparison with past results and comments on methodologies used.

Presentations by participants

If prepared with enough anticipation, and if the level of the course participants is adequate, this is one important and useful ingredient of the course. It gives the students the opportunity to present views other than the ones expressed by the team of instructors; it highlights different objectives and methodologies, and helps to broaden

the range of the ecological conditions discussed. The period allowed for participants to prepare adequately for such presentation is critical. Ideally, participants to the course should be instructed well in advance (2-3 months) about the program, the type of presentation requested and the audio-visual aids they should bring along. This is generally not possible due to the late candidate selection process and to the often last minute changes.