PN-ABW-244
95301

TRAINING REPORT

WORKSHOP ON ADVANCED QUANTITATIVE FOREST MANAGEMENT

Pakistan Forest Institute
Peshawar, Pakistan

December 4-10, 1991

Submitted to:

Pakistan Forestry Planning and Development Project
Winrock International
Islamabad, Pakistan

by

Dr. Lawrence S. Davis

Department of Forestry
University of California, Berkeley

January 20, 1992

INTRODUCTION

I arrived in Islamabad on November 25, and spent three working days meeting with the project's Technical Assistance Team, checking the computers software and computer set up for the course, and collaborating with Charles Hatch on the development of MFIR, a strategic planning model for use in the course. I believe MFIR will also serve as a useful template for strategic forest planning in Pakistan in both mountain conifers and irrigated plantation applications.

Charles Hatch and I traveled to Peshawar on December 1, met with institute staff and installed XTREE PRO, SARA, LINDO, and the course problem files on the five, 286 and two, 386 micro computers in PFI's computer laboratory. All of the equipment and software functioned very well for the entire course.

COURSE DESCRIPTION

The course was broken into two segments. The first segment, during the period November 30 to December 3, was taught by PFI faculty and introduced the participants to spreadsheet software. The second segment on Advanced Quantitative Forest Management, which I taught, began at 8:30 a.m. on December 4 and continued until 11:00 a.m. on December 10. A complete course outline is given in Appendix A.

PARTICIPANTS AND COURSE MATERIALS

A total of 19 students, and four forestry staff from PFI participated in the course. A list of participants is given in Appendix B. Less than a third of the class had significant computer skills and only 2 or 3 had any experience in forest planning. Nevertheless, considerable progress was made and I believe over two-thirds of the participants achieved a level of understanding to a point where they could contribute to a forest planning project. All students, working in two to four person teams, defined two to four planning problems as mathematical equations, created original spreadsheets to define problems, and did analysis with instructor prepared spreadsheets and files for more complex problems in operational and strategic forest planning that apply to Pakistan.

The students made interactive and linked use of a wide range of software programs including MS-DOS, XTREE PRO, LOTUS 1-2-3, LINDO, the SARA programs of EQUATION, REPORT, TABLE and MATRIX, and a text editor. Textbooks used in the course were:

Davis, L.S. and K.N. Johnson. 1987 (Third Edition). Forest Management. McGraw-Hill Book Company, New York, NY. 790 p.

Davis L.S. 1989. Analysis of Agroforestry Systems: A workbook of supplemental teaching material. Winrock International, Morrilton, AR. 203 p.

EVALUATION

The 10 question quiz in Appendix C on Forest planning was given to all students before the course and at the end of the course. The two quiz's were graded for each student on a 0 - 60 scale. The average scores for the 18 students who took both quizzes were 22.8 before the course and 42.3 after the course, almost a 100% improvement. I identified about eight of the students who seem to have better than average skills and/or aptitude for forest planning work. Overall I believe it was a successful course.

FOLLOW-UP

The course introduced the students to advanced quantitative forest management methods, gave them some experience, and showed them several practical application. To make the skills permanent, the interested students need to do the following:

a) be assigned in groups of 2 or 3 to work on a practical forest planning project. I would suggest an irrigated plantation such as Changa Manga or a conifer forest tract in the mountains;

b) form a network where they periodically meet, communicate and share ideas; and

c) receive periodic follow-up training in selected topics.

Based on my discussion with the Technical Assistance Team, the project staff, PFI staff, and the students, I believe the SARA/LINDO planning technology will have useful Pakistan applications in four areas.

a) <u>Strategic planning of public forests</u>, particularly the high yielding irrigated plantations. By examining a wide range of silvicultural options considering different species, sizes, product quality, and market values, the economic performance of these forests could likely be improved.

b) Operational planning of public forest activities, for 1 to 3 year periods. The focus should be on the efficient scheduling of candidate final harvest and commercial thinning stands and compartments for sale. The growth rate and quality of logs from the sales should be assessed considering the market's evaluation of log quality or grade.

c) Social Forestry, providing a solid quantitative basis for evaluating programs, policies and recommendations to private landowners. The models, such as those presented in the workshop text, Analysis of Agroforestry Systems, can provide a useful organizing framework to compile research, empirical case studies, and expert information on the growth and yield of crops and trees used in Pakistan agroforestry.

d) National and Provincial master planning, as illustrated through a Forestry Master Plan example. The integer modeling framework facilitated by SARA may be very useful in helping high level policy makers understand their option and the tradeoffs between different social goals for the forest resource system.

FOREST POLICY AND MANAGEMENT CONSIDERATIONS

Through discussions and reading, at least three problem areas in forestry institutions and laws related to forest production and utilization could be reviewed for possible changes. Most of these, I am sure, have already been identified and discussed.

a) As I understand it, on natural forest lands, the government apparently holds title to all trees once they are planted, regardless of the land ownership or the source of funds used for planting. The reason is to protect watersheds against erosion and stream sedimentation by letting the government decide where and how to cut these trees. The problem well recognized, of course, is that this gives no incentive for private land owners to plant, tend and protect trees, to invest in tree growing, or to respond to national goals to increase forest production.

The answer, in whatever form it takes, must essentially give ownership of the trees to the landowner and the rights to the profit from growing and harvesting trees. Some possible approaches, that give landowners the needed incentives but still achieve the watershed protection goals are:

(1) give ownership to landowners but require a harvest permit before any trees, public or private, can be cut. This permit would state when, where and how the trees will be cut and how the land will be planted and erosion damage prevented or mitigated. A post harvest inspection would be made to ensure that regeneration and watershed protection was successful. The professional forest officer would approve the permits and make the inspection; and

(2) give title to trees to the landowner. State policies and requirements of watershed protection. Require the stumpage or log buyers to send 5-20% or so of the sale proceeds to an escrow account supervised by a commission or the Forest Department. This money would be held until the landowner successfully regenerated the cut area and satisfactorily prevented or mitigated erosion damage. On successful completion the money would be refunded to the landowner. If not completed in a timely manner the Forest Department would use the money to do the work.

b) In irrigated plantation and agricultural areas, where the greatest potential for intensive forest production is found, the tenant farmers receive a share of agricultural crop revenues but do not receive a share of forest crop revenues. Again, this is a clear lack of incentive for the tenant to care for and grow trees. I don't know if this is a law or simply a traditional practice of landlords. If it is the latter, do analysis and mount a high level extension effort with the landlords to show how it is counterproductive to their economic intent.

c) Under the current system of moving timber from the stump to the final wood manufacturing stage, there are time delays of one or more years that cause the log quality, in term of lumber grade yields to deteriorate. This happens because of insects, fungus, warp, cracking, stain, or theft. The effective result is that the economic value of the logs and timber realized are much lower than if the logs were cared for and rapidly moved from stump to end user.

It appears that the public forests and land managers do not receive any portion of the stumpage revenue for improving the management of their forests. Again, their is no incentive for them to search for their most valuable species and silvicultural prescription. The

timber is sold as stumpage so the forester has little control over the logs once they are cut.

The government woodlots collect the logs and auction them to the highest bidders. However the manager of the woodlots are apparently not rewarded for increasing the profitability of their operation. The result of all this is that the government and Pakistan may be receiving 10 to 50 percent less return from the public forests than would be possible. Both woodlot and forest officers need an incentive to manage these assets for the highest profits. This objective needs to feed back into the strategic planning of public forests in that net revenue, log grade, and logging costs became important criteria in developing forest working plans. An alternative might be some form of concessions or licenses of the wood lots to private entrepreneurs with the government getting a fee and a percent of the profit.

The three problem areas associated with forestry institutions and laws related to forest production and utilization listed above represent areas where quantitative forest working plan analyses could be helpful in evaluating alternative forest management policies and strategies.

APPENDICES

APPENDIX A
COURSE OUTLINE AND DAILY SCHEDULE

Nov 30 - <u>Opening</u>
a. Address by Director General, PFI

<u>Lecture Topics</u>
a. Introduction to Spreadsheets

Dec 1 - Lecture Topics
a. Training in Lotus 1-2-3

Laboratory Exercises
a. Entering data and equations.

Dec 2 - Lecture Topics
a. Training in Lotus 1-2-3

Laboratory Exercises
a. Graphical presentation of data.

Dec 3 - Lecture Topics
a. Training in Lotus 1-2-3

Laboratory Exercises
a. Printing worksheets and graphs.

Dec 4 - <u>Lecture Topics</u>
a. Introduction, handouts, schedule, references, your expectations, my expectations.
b. Principles of problem identification (Davis and Johnson, Chapter 6).
c. Writing problems as linear equations.
d. Linear Programming, what it does, its power and its limitations.

<u>Laboratory Exercises</u>
a. Conduct pre-quiz.
b. Problem identification.
c. Introduction to LINDO, practice writing input and interpreting output.

<u>End of Day Discussion and Review</u>
a. Problems
b. Tools
c. Microcomputers

Dec 5 - <u>Lecture Topics</u>
a. Elements of the strategic forest land planning problem: land, prescriptions, planning horizons, economics, solutions attributes of interest, policy and direction (Davis and Johnson, Chapter 2).

b. Discussion example: The Baker Forest Problem. Go through identification and specification of elements.
c. Use of SARA. Overall concept, running the EQUATION and REPORT programs. How the Baker problem was handled in SARA (SARA Users manual).

Laboratory Exercises
a. Practice SARA using the Baker tutorial. Duplicate runs in the users manual.
b. Formulate the Jerry Wilcox problem as a SARA spreadsheet and control file, and solve.

End of Day Discussion and Review
a. Problems
b. SARA

Dec 6 - Weekend, Free Day

Dec 7 - Lecture Topics
a. Types of planning problems. Hierarchies in time (strategic, tactical or budgeting, and operating) and space (state, regional, river basin, ownership, watershed, stand). Single and Multiple goal problems. Single and Multiple decision maker problems.
b. Calculating cash flow and present net value.
c. Reporting and presenting with SARA. The MATRIX and TABLE programs

Laboratory Exercises
a. Practice presenting results using MATRIX, TABLE and LOTUS.
b. Formulate the PAK short term harvest scheduling problem as a set of linear equations. Solve.

End of Day Discussion and Review
a. Logistics of SARA
b. Kinds of problems in Pakistan.

Dec 8 - Lecture Topics
a. Harvest Policies and Allowable Cut Effects.
b. Analysis of Harvest Schedules.

Laboratory Exercises
a. Formulate the MFIR harvest scheduling problem.

End of Day Discussion and Review
a. Harvest policies

Dec 9 - <u>Lecture Topics</u>

a. Roles of Economics, policy, non-timber values, culture, and forest stewardship in planning (Davis, Chapter 2, Analysis of Agroforestry Systems)

<u>Laboratory Exercises</u>

a. Formulation of Agroforestry problems.
b. Unfinished work from past 4 days.

<u>End of Day Discussion and Review</u>

a. This is the last complete day of instruction. Questions about SARA, Microcomputers, capacity, workbooks, and manuals, software, anything.
b. Tomorrow we want to transfer these ideas to working on strategies and problem structures for Pakistan. Especially tonight think about how to define the planning problems of the forests you are working with.

Dec 10 - <u>Lecture Topics</u>

a. Review and discussion of Pakistan problem statements.
b. Discussion on where to go from here.
c. Conduct post-quiz.

APPENDIX B
PARTICIPANTS AND INSTRUCTORS

Ser. No.	Name	Designation	Affiliation
PARTICIPANTS			
1	Abdur Rauf Qureshi	A.C.F.	AKFD, Muzaffarabad
2	Mohammad Kaleemullah	RFO Planning	Balochistan FD
3	Abdul Razzaq	RFO FEFP	Punjab FD
4	Muhammad Azeem	RFO Bhakkar	Punjab FD
5	Abid Ali Abid	RFO Sohawa	Punjab FD
6	Pir Dilshad Shah	SDFO Attock	Punjab FD
7	Mohammad Zubair Qureshi	RFO	Malakand SFP, NWFP
8	Nisar Ahmad Khan	RFO	KIDP, Kalam, NWFP
9	Abdur Rashid Awan	Manager FDC	FDC, NWFP
10	M. Asif Majeed		PFI
11	Safdar Ali Khan	Asst. Prof.	PFI
12	Ghulam Ali Bajwa	Asst. For. Entomol	PFI
13	Mohammad Ajmal Khan	Sub Engineer	PFI
14	Syed Shahid Hussain	Sub Engineer	PFI
15	Ejaz Ahmed	Sub Engineer	PFI
16	Gohar Rehman Marwat	SDFO	WI/PFI
17	Ayaz Mehmood	SDFO	WI/PFI
18	Ch. Abdul Khaliq	Research Officer	PFRI, Faisalabad
19	Muhammad Ajmal Khan	Scientific Officer	NARC, Islamabad
INSTRUCTORS			
1	Dr. Lawrence S. Davis	Professor	UC-Berkeley
2	Iqbal Muhammad	Instructor	PFI
3	Asif Kamal	Instructor	PFI
4	Syed Qasim Ali Shah	Instructor	PFI
5	Dr. Charles R. Hatch	Instructor	TAT
6	Dr. M. Ayaz Khan	Coordinator	PFI
7	Tahir Wadood Malik	Coordinator	TAT

APPENDIX C
PRE- AND POST-QUESTIONNAIRE

1. What is forest planning?

2. What is harvest scheduling?

3. What is the difference between strategic and operational planning?

4. What is the role of economic analysis in strategic forest planning?

5. What are the benefits and costs of quantifying several alternative strategic forest plans before choosing one to implement?

6. How important is growth and yield data for natural and intensively managed forest stands to developing a reliable forest plan?

7. What is a "Fully regulated forest"?

8. What are the benefits and limitations of achieving and maintaining a fully regulated forest?

9. What is the "Long Term Sustained Yield" (LTSY) of a managed forest and how is it calculated?

10. How, specifically, can computers be used in forest planning?