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REPORT ON

THE INDO-U S RESEARCH-TRAINING WORKSHOP ON EVALUATION OF AGROFORESTRY SYSTEMS

HELD AT

DR. Y.S. PARMAR UNIVERSITY OF HORTICULTURE & FORESTRY
NAUNI-SOLAN 173 230, HIMACHAL PRADESH, INDIA

03 - 15 OCTOBER 1991

by

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Executive Summary

An All-India "Indo-US Research-Training Workshop on Evaluation of Agroforestry Systems" was held during 03-15 October 1991 at the University of Horticulture and Forestry (UHF), Nauni-Solan, Himachal Pradesh. The Workshop, jointly sponsored by the Indian Council of Agricultural Research (ICAR), New Delhi; UHF, Solan; and the US Agency for International Development through Winrock International, New Delhi, was attended by 29 scientist participants from different parts of India. Most participants were currently working on agroforestry projects at State Agricultural Universities or ICAR Institutes. Their background and expertise included a number of agricultural- and forestry-related disciplines; all participants had at least an M.Sc. degree; 18 had Ph.D. degrees. The Workshop's core faculty consisted of Drs. P.K.R. Nair and Alan J. Long from the Agroforestry program at the University of Florida, Gainesville, Florida, USA, as short-term consultants, Drs. S. Chinnamani and J.C. Dagar of ICAR and Drs. D.K. Uppal and S.D. Kashyap of UHF.

The idea of the Workshop originated from the realization of the importance of evaluation, according to some common criteria and procedures, of the numerous agroforestry systems that exist in a variety of conditions in different parts of India. Such evaluations are essential for better exploiting the multitude of benefits from such systems, and extrapolating them to other potential sites. Furthermore, the evaluation would lead to the designing of research endeavors for improving the systems. Drs. Dagar and Kashyap had worked with Drs. Nair and Long at the University of Florida during January-May 1991 and jointly formulated the procedure for evaluating the agroforestry systems and developed the Workshop program.

The Workshop strategy was to stimulate and provoke the participants to systematically, and as much as possible, quantitatively, evaluate the merits, benefits, and weaknesses of the agroforestry systems with which they were familiar. In order to set the stage for focused, objective discussions, background information on the complex and diverse systems in India was presented in a series of papers by core faculty and invited (guest) lecturers. Additionally, a number of relevant technical papers were copied to the participants as background reading materials. These were supplemented by participant presentations, and field visits to different field projects and UHF research fields.

Criteria and procedures for evaluating agroforestry systems were discussed, and it was surmised that agroforestry systems would need to be evaluated based on their biological productivity, economic viability, social acceptability, and, above all, sustainability based on biological and socio-economic parameters. The participants then formed themselves into four working groups and applied these evaluation criteria to assess the merits and benefits of selected agroforestry systems from their respective agroecological regions. The individual group results were presented to the whole group, and a final set of results and recommendations were formulated.

The Workshop was a unique exercise in which scientists currently working in agroforestry projects in different parts of India brought together the varied experience and perceptions and worked on a common procedure to compare and evaluate the systems. It took a while for them to reconcile with the Workshop theme, which, they agreed, was quite different from the common instructional type of training. A detailed participant evaluation of the Workshop, conducted at the end of the Workshop, showed that the participants fully appreciated the approach, they thoroughly benefitted from the exercise and some of them were determined to include this type of evaluation in their research projects.

We are satisfied that the Workshop objectives were fulfilled. We realize that this Workshop is only a beginning in this direction; it has set the stage and initiated a very useful type of approach. It is our earnest hope that the followup activities, as suggested in this report, will be undertaken by ICAR with the support of USAID.

1. INTRODUCTION

1.1 Workshop Background

India has a long tradition of agroforestry. Different kinds of indigenous agroforestry systems have been practiced in various agroecological and geographical regions of the country. Most of these traditional systems are, however, very location specific so that their benefits have been neither fully exploited nor extrapolated to other potential sites.

Interest in agroforestry has grown rapidly among farmers and development experts in India as well as elsewhere in the world during the past 10-15 years. It is now well recognized that systematic and scientific introduction of woody perennials in farming systems is a sound approach to sustainable land management and resource conservation. It has also been recognized that a major opportunity exists in improving the efficiency of the multitude of existing agroforestry systems through scientific intervention. The launching in 1983 of the All India Coordinated Research Project on Agroforestry (AICRPA) by the Indian Council of Agricultural Research (ICAR) represented a significant step in the efforts to implement a major activity to realize the potentials of agroforestry. One of the early program thrusts of the Project (AICRPA) was to understand the various indigenous agroforestry systems in the country with a view to improving their efficiency and adoptability. However, the lack of a systematic procedure to evaluate these extremely location-specific systems was soon recognized to be a major impediment to this task.

The idea for this workshop originated from the realization of the importance of developing a set of widely-adaptable criteria and procedures for evaluating the multiple-output agroforestry systems. It was felt that the workshop would provide a forum to bring together scientists working on agroforestry projects in different parts of the country and enable them to integrate and synthesize their knowledge on indigenous or improved systems according to a coherent and objective evaluation procedure, and that such an exercise would help the scientists to reorient their future research programs in accordance with the rigorous requirements and focused criteria of objective evaluation procedures.

1.2 Development of the Workshop

The Agroforestry program at the University of Florida was contracted in late 1990 by USAID/Winrock International to help develop and deliver the workshop. In accordance with that agreement, two agroforestry scientists from India, Dr. J.C. Dagar (Senior Scientist, Central Soil Salinity Research Institute, Karnal, Haryana) and Dr. S.D. Kashyap (Deputy Director-Agroforestry, University of Horticulture and Forestry, Solan, Himachal Pradesh) traveled to the University of Florida for a five-month research training (January-May, 1991) under the supervision of Dr. P.K.R. Nair and Dr. Alan J. Long of the University of Florida's Agroforestry Program. Drs. Dagar, Kashyap, Nair, and Long worked together to

develop the procedures and criteria to be adopted to evaluate agroforestry systems; and they prepared a document outlining the objectives, strategy, program and technical details of a two-week workshop to be held at the University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh in October 1991. This document is attached as Appendix 1.

1.3 Workshop Objectives

The activity was planned as a research-training workshop with an overall goal of stimulating and helping the participants to evaluate the agroforestry systems in their respective locations, according to a common objective approach. In order to accomplish this goal, the workshop was designed with the following specific objectives:

1. Provide the conceptual, scientific and technical principles that are necessary to understand the existing agroforestry systems and evaluate them in terms of their productivity, social benefits, and sustainability.
2. Develop prototype research plans for evaluating selected agroforestry systems in different agroecological zones.
3. Prepare recommendations and guidelines for evaluation methodology.

2. THE WORKSHOP

2.1 Participants

Twenty-eight participants initially registered for the workshop, including 18 people from research centers and universities geographically dispersed across India and 10 people from UHF, the host university. At the start of the second week one additional participant arrived from Bihar and he stayed to complete the workshop despite missing almost all the lecture sessions. All participants had at least an M.Sc. degree in disciplines related to plant sciences or forestry; 18 had also completed Ph.D. degrees and two more were finishing the requirements for a Ph.D. The spectrum of educational and research experience included horticulture, ecology, botany, agronomy, forestry, agricultural economics, plant breeding, soil science, agrostology, animal husbandry and Plant physiology. Most are currently involved in agroforestry teaching and/or research. Although six of the participants indicated they had no previous agroforestry research experience their work has been closely related to agroforestry and they provided valuable input to the discussions. A biographical proforma was completed by each participant at the beginning of the workshop, and is summarized in Table 1. A copy of the proforma is attached as Annexure 4.

TABLE 1. INDO-US RESEARCH TRAINING WORKSHOP ON EVALUATION OF AGROFORESTRY SYSTEM
UHF, SOLAN 173 230, HP; OCTOBER 3-15, 1991
PARTICIPANTS' BACKGROUND AND EXPERIENCE

Name	Institution	Educational background	Current responsibility	Previous experience	Agroforestry research
1.ARULMOZHIYAN, Mr R.	Tamil Nadi Agric.Univ., Vaaban, Pudukkotai	M Sc (Hort)	Asst Prof. Horticulture, agro-forestry	Extension	Hortisilvipasture: germplasm collection for 175 tree species
2.BAHA, Dr R.	Parmar Univ of Hort & Forestry, Solan	Ph D Ecology(Botany)	Forest ecology, shrubs and exotic plant	Ecology, trees, grasses (1982)	--
3.CHAUHAN, Dr K.	Parmar Univ of Hort & Forestry, Solan	Ph D (Forestry)	Genetical improvement of Robinia and few shrub species of tropical area	Worked for 9 years on cereal crops viz wheat and maize breeding	--
4.DHIMAN, Dr R.C.	Central Sheep & Wool Institute, Avikanagar, Rajasthan	Ph D (Agronomy)	Scientist: Development of Feed resources for sheep & rabbits: silvi-pasture systems	Research in pasture management & development & forage.	Silvipastoral, horticultural systems variety of topics related to fodder
5.GUPTA, Dr B.	Parmar Univ of Hort & Forestry, Solan	Ph D (Botany)	Asst Scientist: Research & teaching agrostology	Grassland ecology research	Development of silvipastoral models in mid hills
6.JHA, Dr A.K.	Rajendra Agric. Univ., Pusa (Samastipur),Bihar	Ph D (Agronomy)	Jr. Scientist/Asst. Prof.: Agroforestry	Teaching, Research, Extension Agroforestry	Collection, evaluation, allelopathic potential of MPTs: management of AF systems, vegetative propagation techniques of MPTs
7.JHA, Mr B.	Birsa Agric. Univ, Kanke, Ranchi	M Sc (Agronomy)	Jr.Scientist-cum- Asst Prof: (Agronomy)	Teaching, Research, Extension in agronomy and agroforestry.	Diagnostic survey, Agroforestry management, Wasteland Development
8.KANWAR, Dr (Mrs) K.	Parmar Univ of Hort & Forestry, Solan	Ph D (Botany)	Asst Scientist (Tree physiology	Teaching and research	Micropropagation of Agroforestry species
9.MANN, Dr J.S.	Central Sheep & Wool Research Institute, Avikanagar, Rajasthan - 304 501	Ph D (Agronomy)	Sr.Scientist Feed & Fodder resource development research-pasture and silvi-pastoral programmes	Research,Teaching and extension-agronomy	Compatibil. of fodder tree species with ground vegetation in silvi-pastoral systems
10.MEHTA, Dr R.S.	Central Arid Zone Research Institute, Jaisalmer	M Sc (Forestry) Ph D (Botany)	Scientist: Tree, shrub & Fruit crop selection for rangelands & silvi-pastoral systems	Research - 20 years	Fodder tree and shrub evaluations for Thar desert
11.NAIR, Dr M.A.	Kerala Agric. Univ., Thiruvananthapuram	M Sc (Ag), Ph D (Agronomy)	Assoc. Prof: teaching and research agroforestry	Research on nutritional studies with plantation crop (Agronomy)	Modelling agroforestry farming practices on homesteads
12.PANDEY, Dr D.N.	Birsa Agric. Univ., Kanke, Ranchi	Ph D in Forest Ecology (Botany), Two year PG diploma in Forestry	Asst Prof (Jr.Scientist): teaching research, extension-silviculture & agroforestry	Research in Forest Ecology	Diagnosis & design survey: management of agroforestry systems
13.PARAMATHAN, Dr M.	Tamil Nadu Agric. Univ., Coimbatore	M Sc (Plant Breeding) Ph D (Tree Breeding)-pending	Asst. Prof. tree breeding: research & teaching: association & evaluation of important tree and plant species	Research and teaching in forage crop breeding	Germplasm collection and maintenance, and tree breeding in forestry and forage crops
14.PATEL, Dr M.M.	Gujarat Agric. Univ., Sardar Krishinagar	Ph D (Agronomy)	Assoc. Research Scientist in AICRP on Agroforestry	Cropping systems research	Collection/evaluation of tree species: management of AF systems in arid/semi arid zone
15.PATIL, Dr N.B.	Gujarat Agric. Univ., Navsari	M Sc (Hort) Ph D (Hort)	Asst. Prof.: teaching, research agroforestry, forestry	Extension-horticulture teaching	Evaluation of silvi-horticultural system with variety of tree and fruit species, cashy and pigeon pea
16.PRABHAKAR, Mr M.	Parmar Univ of Hort & Forestry, Solan	M Sc (Forestry)	Silviculture & Agroforestry	Worked at AICRP Gujarat as Asst Scientist agroforestry	Asst Scientist agroforestry

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Name	Institution	Educational background	Current responsibility	Previous experience	Agroforestry research
17.SELVAKUMAR, Dr K.N.	Tamil Nadu Vet. & Animal Sciences Univ. Vepery, Madras	B V Sc, M Sc (Agri.-Economics)	Asst. Prof: Teach & Research animal husbandry development schemes & agri economics	ICAR Socio economic features in animal husbandry	Protection costs in animal systems
18.SHAMET, Mr G.S.	Parmar Univ of Hort & Forestry, Solan	M Sc (Forestry) Ph D (Forestry), pending	Silviculture & Agroforestry	Working since June 1983	Vegetative propagation of agroforestry tree species for operational planting
19.SHARMA, Mr A.K.	Central Agri. Research Institute, Port Blair	M Sc (Botany)	Scientist: research on fodder resources of Bay Islands resources: extension	Research on potato cytology & fodder	Multi-use fodder trees and related agroforestry systems for Bay Islands
20.SHARMA, Dr J.R.	RHRS, Mashobra, Shimla-7 UHF Solan	Ph D (Plant Breeding)	Scientist, research on temperate grasses	Agrostology research	Breeding and evaluation of grasses
21.SINGH, Dr A.	Punjab Agric Univ., Ludhiana	Ph D (Agronomy)	Asst. Prof. Agronomy: teaching research on medicinal plants	Research, teaching, extension in agronomy	--
22.SINGH, Dr A.R.	Haryana Agric. Univ., Hisar	Ph D (Hort)	Scientist/Assoc. Prof., Agroforestry, Nursery Tech.	Research, nursery mgt. For Fruit trees: Extension	Spacing trials with arid/semi-arid tree species and interplanted crops.
23.SINGH, Dr S.P.	ICAR Research Complex for NEH Region, Manipur Centre, Imphal	M Sc Ag(Hort)	Scientist, Horticulture and Farming systems	Multidisciplinary research citrus, vegetables, fruits, farming systems (indegenous)	Farming systems research
24.THAKUR, Mr S.S.	H.P. Animal husbandry Department, Shimla-5	M Sc (Plant Breeding)	Agrostologist, fodder development programmes in Animal husbandry department	Agrostology research	--
25.THAKUR, Dr S.	Parmar Univ of Hort & Forestry, Solan	M Sc (Plant Breeding) Ph D (Forestry)	Tissue culture of poplars	Tissue culture and agroforestry	Tissue culture of agroforestry tree species
26.THAKUR, Mr U.S.	Mandi Project, Solan	M Sc (Hort)	Development of Horticulture under rainfed conditions in hilly areas of H.P.	Horticulture development	--
27.TRIPATHI, Dr D.	Parmar Univ of Hort & Forestry, Solan	Ph D Soil Science	Forest soil	Working in the field of soil fertility since 1985	--
28.VAPI, Dr B.G.	Gujarat Agricultural Univ., Navsari, Gujarat	Ph D Botany)	Asst. Professor: Forestry-Ecology, Silviculture, Management	Teaching, Forest Rangers College, Botanist, Botanical Garden	Species tests and growth performance of horti and agri-silviculture systems, especially tree species
29.VIDYASHARAN, Mr K.	Kerala Agric Univ., Vellanikkara	M Sc (Botany), DFS Diploma in Forestry	Asst. Prof., Forestry: teaching silviculture & ecology	Survey of homesteads	--

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2.2 Core Faculty and Program

A detailed list of the core faculty and the daily program for the Workshop is included as Annexure 1.

2.3 Delivery of Workshop

October 3

Background reading material, consisting of various publications relevant to workshop objectives, was distributed to each participant. This packet of literature serves as the third part of the workshop manual and copies of each publication are included in Appendix 3. The second part of the manual (Appendix 2) includes the lecture notes and abstracts from each Workshop session.

Inaugurating the Workshop, Dr. B.R.Sharma, Vice Chancellor of UHF invited the Workshop participants to lead agroforestry in a direction that increases agricultural production to higher levels, not just to current levels that are considered sustainable, and to make agroforestry applicable to all small landowners.

Following the Inauguration, Harold Watson, Director of the Asian Rural Life Development Foundation of India, who was a guest of the University, presented a lecture on the Sloping Agricultural Land Technology (SALT) that has been developed in the Philippines and in Orissa State. SALT is designed for small farmers and includes common agroforestry features of living hedgerows of multiple purpose trees that are lopped for green manure or fodder, and perennial fruits in every third alley. His address was well received as a description of one agroforestry technology that is used on erodible slopes.

In the first working session, Dr. Nair described some general agricultural concerns around the world, and the opportunities for agroforestry to meet those concerns. He also mentioned that there are situations in which agroforestry should not be perceived as a guaranteed solution. A lively discussion with the participants indicated that their willingness and experience would be an important contribution to the success of the Workshop.

In the final session of the day, Dr. J.C. Dagar described several classification schemes for agroecological zones in India and proposed one system (with five zones) be used for focusing workshop objectives and activities. The participants agreed and determined which group they would work with based on their current professional positions. Several zones were combined, or split into two groups, for a balanced number of participants in each group. A biographical data sheet was collected from each participant to also strengthen our information on each of them.

October 4

The first section of the workshop focused on general descriptions of the wide variety of agroforestry systems used in different agroecological zones. These sessions were planned to acquaint all participants with the breadth of agroforestry and the different methods that

are currently used for evaluating systems. Four lectures on this day described systems in the Himalayan, Indo-Gangetic plains, arid/semiarid, and humid/ subhumid zones. Lectures, illustrated with slides, were presented by Drs. P.K. Khosla (UHF), H.N. Khajuria (Punjab Agricultural University), S.D. Kashyap (UHF), and J.C. Dagar (CSSRI, Karnal), respectively. Their lectures focused primarily on general characteristics of each region, and the important agroforestry systems in each. Supporting data were provided in several cases for productivity and economics of different systems. Several of the speakers also added discussions of more diverse topics such as agroforestry extension and short rotation, intensively managed tree crops. Although these diversions from the workshop theme presented interesting information, they would have been more helpful to our objectives if they had focused on different methods of evaluating the systems.

Lively discussions with the participants in all four sessions demonstrated the opportunity for excellent group discussions and activities in forthcoming sessions.

October 5

Dr. Chinnamani presented an excellent summary of agroforestry research in India, with many slides to illustrate the great diversity of systems in the country. In addition to improving productivity for small farmers, agroforestry research must also focus on meeting other social, religious, economic, ecologic and environmental needs, undergirding the importance for a variety of criteria for evaluating agroforestry systems. It was also evident that a tremendous resource of important data is being generated by research projects and centers throughout the country. However, summaries and publications describing these results are far fewer than should be expected from such an effort. There is a great opportunity, and need, to place this information in the national and international agroforestry literature.

Dr. Dagar continued the discussions from the previous day with a very detailed description of agroforestry systems in the humid coastal areas and islands. Copies of the overhead transparencies that he used for this and his lecture on October 4 are in Appendix.

In the afternoon, Dr. P.K. Nair described general trends and developments in international agroforestry research. Despite considerable technical and institutional advancements in the last 10-15 years, there are still major scientific concerns in research for the lack of adequate scientific data in many aspects of agroforestry, and for the lack of appropriate research methodologies for such multi-component technologies.

Four workshop participants presented summaries of their agroforestry research in homegardens, multiple purpose trees, and silvipastoral systems in arid areas. Other participants were invited to do the same as a means of encouraging a network for exchange of information among scientists. Hopefully, the presentations would also serve as springboards for the group discussions on evaluation methodologies. Accordingly, participants were requested to direct their comments to specific systems and methods that are used to measure or evaluate those systems, rather than to detailed presentations about such things as bioclimatic information and lists of species. Time for the presentations this day was available because A. Rekib (Director, Indian Grassland and Fodder Research

Institute, Jhansi) was unable to attend the Workshop. He did submit a paper on agroforestry and livestock in arid and semiarid regions which is included in Appendix 2.

October 6

A field trip to Shimla featured observations of both a variety of natural forest types and agricultural and agroforestry systems in the mid-Himalaya region.

October 7

The focus for the day shifted from descriptions of agroforestry systems to various factors by which the systems and practices might be evaluated. Dr. Nair described various parameters that have been, or might be, used for evaluating biological and soil productivity, and environmental and protection concerns of different agroforestry systems. He challenged the participants to not routinely accept the current methods of evaluation, but rather to critically investigate their meaning and applicability and the potential use of new methods. Discussions throughout the sessions indicated a variety of opinions on how to measure these important criteria.

Dr. Long addressed criteria for evaluating economic and social factors. During this session the groups broke out for the first time to develop possible schemes for social criteria in their respective regions. The response to this exercise was excellent and encouraged us in our planning for the group discussions later in the workshop.

Four more participants presented summaries of their home regions and/or agroforestry research. The presentations tended to be lengthy descriptions of biophysical and species data rather than discussions of the types of evaluation criteria that they use, as we requested in the guidelines for these talks. Perhaps this illustrates the lack of attention to evaluation methodologies in the past, and the potential benefits form the Workshop.

October 8

Dr. K. Perumal, from Tamil Nadu Veterinary University, Madras, described current research on agroforestry systems and animal nutrition. Most of his information was anecdotal or had been covered previously in the Workshop. He also showed a large number of slides, many of which were repetitive or noninstructive. He attended the Workshop in place of Dr. Kudirpel, and apparently did not have a clear understanding of the objectives or professional level of participants. A copy of a paper submitted by Dr. Kudirpel is in Appendix 2.

Dr. Nair discussed research methodologies and principles for agroforestry since research is one means of evaluating indigenous systems. This session also clarified some common methods and concerns mentioned by the participants at previous sessions.

In the afternoon, Drs. Dhall and Mishra (UHF) discussed statistical considerations in agroforestry research, and showed the workshop participants various field plots near campus, respectively. Dr. Dhall did not address computer modelling as requested, but rather focused on statistical theory. Although the field plots were not geared to answer substantial research questions, they displayed an interesting array of responses to critical

fodder and tree needs in the Hills region.

Two more participant presentations were even longer and less focused than on the previous day.

October 9

This last day of lectures completed descriptions of agroforestry systems in various regions and the criteria that might be used to evaluate them. Dr. Uppal lectured for two sessions on systems in northern India and policy/institutional effects on/of agroforestry systems.

To complete the instructional stage of the workshop, Dr. Long presented a review of information needs for characterizing individual agroforestry farm systems, including general assessment parameters, types of information, and some possible summary techniques. He then reviewed survey methods and procedures for collecting that information. Questions after the session indicated a concern that the India standard of a minimum sample size of 30 might not be possible when evaluating unique indigenous systems. This needs to be addressed by AICRPA officials and statisticians. We suggest that such a standard be relaxed for these types of evaluations, and alternative statistical procedures be utilized.

A discussion with the participants at the end of the day focused on their concerns with progress of the Workshop. Several administrative/logistical problems were mentioned and should be cleared up within a day. A number of participants also indicated that they had not received notice of the Workshop until 1-2 days before they were to leave for Solan, and they did not have a clear understanding of Workshop objectives. Consequently, they did not feel that their personal expectations were being met (eg instruction on statistical designs and computer modelling). They also would like to have had some participants from the forestry sector in the Workshop. Finally, there was some displeasure with the quality of several guest lectures which deviated from the assigned topics.

October 10

A field tour to Chandigarh was highlighted by a review of the Central Soil and Water Conservation Research and Training Institute's project at Sukhomajri. Initiated in 1978, the project goal was rehabilitation of a 3,000 hectare watershed which was highly eroded and devoid of vegetation. Local villages were included in all planning, decisions and activities, and the watershed is now reforested with a variety of multiple purpose trees. Fodder production from both trees and grasses has been the highest priority objective, and the villages now have sufficient fodder on common lands for large livestock rather than goats, and have greatly expanded their production of fodder and market crops on private lands.

October 11

The four working groups spent the day developing case studies for evaluation methodology and appropriate recommendations based on those case studies. The discussions were structured with four objectives:

1. Select three (or more) case studies in each agroecological region and determine appropriate criteria for evaluating each case study on the basis of participants' experience;
2. Describe each criterion in quantitative or qualitative terms, and the types of information that are necessary for those criteria;
3. Develop recommendations for procedures for extending this evaluation methodology to a wider array of agroforestry systems, considering the necessary criteria, rating or scoring for those criteria, information collection procedures, and analysis and summary;
4. Prepare a research plan to test the reliability and repeatability of these evaluation systems as well as their utility in comparisons with other agroforestry systems.

October 12

A field trip to the Dhaulakuan research site featured examples of both on-station and on-farm research with mixtures of horticultural trees and different crops. Participants were also shown several soil/site reclamation projects. Several vehicle malfunctions resulted in an early morning return from the trip.

October 13

Participants rested from the previous day's journey and finished preparation of their reports to be given on the following day.

October 14

Each working group presented their results from the case studies on system evaluation as well as their recommendations for future evaluation methods. Each group then reconvened to consider other groups' recommendations, and revisions they would make in their own recommendations. At the end of the day all recommendations were combined into a final set of Workshop recommendations. A summary of the report follows this section.

October 15

Dr. Nair presented the final set of recommendations to the whole Workshop (see Section 2.4), with a discussion of future directions and opportunities for expanding this work. This was followed by a formal closing session attended by the Vice Chancellor and other top officials of UHF. Certificates of Completion were awarded to the participants individually by the Vice Chancellor. A copy of the blank Certificate is attached (Annexure 7).

2.4 Workshop Recommendations

The results of individual Working Groups showed, very interestingly, three different approaches to evaluating the systems. Although all groups had taken the same parameters as the bases for evaluation, two groups selected an agroforestry system and a sole component system from their respective regions, and assigned scores to each of them for each of the parameters in comparison to a best possible (100%) score for each parameter;

the sum of the individual scores for each parameter, expressed as percentages gave the final evaluation scores for the agroforestry system and the sole component system. One group compared the sole component systems against a selected agroforestry system from the region, keeping the latter (agroforestry system) as the "standard" (100 %). The last comparison was among different agroforestry systems from the same region, taking the most "promising" among them as the standard (100%). All these approaches have their merits and applications.

The results of these exercises, although based on hypothetical data, are very interesting. As mentioned earlier, it is the process that the participants have undergone that is more important, not the results.

Based on this experience, the Workshop made the following recommendations.

1. Several factors need to be taken in the evaluation of agroforestry systems. These include biological productivity, soil-related, economic, social, environmental, institutional, and others such as religious. Each of these factors consists of a number of subfactors, of which different combinations may be important for specific systems.

The Workshop recommended that all these different criteria should be used in evaluating any agroforestry system, with the involvement of multidisciplinary teams.

2. The relative importance or "weight" of each of these factors (and subfactors) depends most importantly on the objective of the user or evaluator. For example, a farmer's objectives and values will be different from those of a regional policy planner. In consideration of this,

The Workshop recommended that proper assessment of the needs and objectives be undertaken as the first step in all evaluation of agroforestry systems.

3. It was realized that agroforestry extension recommendations can be meaningful only if they are based on objective evaluation. Therefore,

It was recommended that multi-factor evaluation of results of field research should be an essential aspect of the research plan of all agroforestry-system research projects.

4. The exercises undertaken in this Workshop were not based on actual field data. Instead, hypothetical data were taken, based on participants experience with the systems, for methodology development. There is need and opportunity to test the methodology using actual field data. In view of this.

The Workshop recommended that the Workshop participants, upon their return to duty stations, undertake field testing of the methodology using actual data. They may also involve and thus train their colleagues in this activity.

5. During the Workshop, it was very clear that the role and function of agroforestry

systems depend very much on agroecological conditions. While biological production may be the most important factor in some situations, soil improvement could be the prime consideration in another, economic returns in yet another, and so on. Even the same combination of similar (or same) components may have differing roles and functions in different situations. In consideration of this,

The Workshop recommended that research projects aimed at improvement or development of agroforestry systems and/or components should take into account the specificity of the system with respect to its objectives and location.

6. The relative merits and advantages of several existing agroforestry systems are very anecdotal. Criteria and procedures for their quantitative evaluation have, so far, not been available. This Workshop made a beginning in this direction and the methodology developed by the Workshop needs to be applied for the evaluation of the existing agroforestry systems. The methodology itself, which at this stage is very crude, needs to be further developed. Therefore,

It was strongly recommended that the methodology development may be pursued further, and a field guide or manual be prepared after the methodology has been tested over a wide variety of conditions. ICAR was strongly urged to undertake such a follow up.

7. Given the important role of agroforestry to address some of the immediate problems of agricultural sustainability and resource conservation, and the need for exposing the senior policy makers to the role and potentials of agroforestry,

It was recommended that a national workshop be organized for higher level policy planners, possibly through NAARM (National Academy of Agricultlural Research Management), Hyderabad.

8. In consideration of the importance of evaluation of agroforestry systems and the need for refining the methodology developed in this Workshop,

It was recommended that such workshops be organized periodically to review progress and expand the application of new methods developed by different research projects.

3. WORKSHOP EVALUATION

3.1. Administrative and Logistical

The administrative and logistical arrangements were handled by the UHF, Solan according to the directions of ICAR. The University personnel directly responsible for the Workshop were Dr. D.K. Uppal, Director of Research, and Dr. S.D. Kashyap, Deputy

Director of Research (Agroforestry), and they were said to be assisted by various committees consisting of other faculty members. The participants were all housed in the University Guest House, and the sessions were held in the auditorium of the College of Forestry.

During the workshop the local organizers were seen trying to organize the events as best as they could. However, there were several shortcomings and inadequacies. For example, lack of coordination for field-trip arrangements, inadequate preparation of meeting room and audiovisual facilities, and inefficient support services such as photocopying and transport facilities, surfaced time and again, and caused irritations and disruptions. The local organizers were profusely apologetic for the inconveniences, but seemed to be inefficient or not keen to set things right. These could be a reflection of the style and efficiency of functioning of the UHF system: Somebody said it very aptly: the prevailing work ethic is "don't say no to your boss; but do what you wish". We (the consultants) worked with the organizers and rectified some of the problems; as a result, the second part of the Workshop was relatively better organized administratively and logistically than the first.(However, the bus that took the participants to the field trip on October 12th broke down on its way back, and the participants returned to the guest house at about 3:00 A.M. the following day!. This bus was reported defective a week earlier; yet it was allocated for this long field trip on rough terrain, and that too with a driver who was running a high fever!!)

It was also evident that the pre-Workshop arrangements were inadequate. Participants were not informed sufficiently in advance about the Workshop's objectives and technical content, so they did not come well-prepared (see section 3.5: Participants' Evaluation). Logistical arrangements for participants' travel, especially settling their travel claims, were a matter of frequent discussion between the participants and the local organizers. Dr. Chinnamani said ICAR had given clear instructions to UHF on all these matters, and it was UHF's responsibility to communicate these with the participants on a timely basis. Dr. Chinnamani's presence throughout a major part of the Workshop facilitated the "sorting out" of these issues.

In summary, the administrative and logistical arrangements, were inadequate and inefficient. They provided a good example as to how a serious, professional Workshop should **NOT** be organized. There is absolutely no doubt that the Workshop could have been organized more efficiently and systematically.

3.2 Technical Content

This Workshop was designed to stimulate, encourage, and challenge the participants to think in terms of quantifying the multitude of benefits of agroforestry systems with which they are familiar, and enable them to evaluate and compare the systems with other land use (agricultural, forestry, horticulture, or any other) systems in their respective localities or regions. The participants were all expected to be active researchers in agroforestry, who are well aware of the principles and concepts of agroforestry and the current developments in agroforestry. Therefore, the Workshop strategy was to provide a forum to facilitate

intellectual, thought-provoking discussions and group exercises, rather than a series of instructional lectures. Formal lectures were therefore kept to a minimum; the topics of the lectures were chosen and their contents were outlined in advance (Appendix 1), so that the lectures would synthesize the current state of knowledge and experience in the topic and provide the conceptual and intellectual background for discussions. While most of the lectures by the core faculty were in accordance with the above strategy, many of the guest lectures, unfortunately, did not measure up to this expectation. Guest lecturers were chosen by UHF and/or ICAR, apparently based on their professional experience and technical background, and they were supposed to have been briefed on the Workshop objectives and desired contents of their lectures. However, many guest lecturers focused narrowly on their current research, and dealt with superficial generalities. As a result some of the lectures turned out to be redundant and irrelevant to the Workshop's theme.

Several participants' presentations were also arranged during the first part of the Workshop. Although the participants were requested to make their presentations according to a general format that emphasized the evaluation aspect of their work, seldom did they adhere to this directive; instead most of them just narrated their on-going work. Nevertheless, these presentations provided a much-required spectrum of the extent of diversity and complexity of agroforestry systems, so that the importance of having a set of objective evaluation criteria could be amply highlighted. The participants' presentations were also used as the basis for their case studies for evaluation in their separate working-group exercises.

Results of immediate practical application seem to be an overriding mandate of all agroforestry research projects and activities. This concern came up prominently in the discussions, especially during the first part of the Workshop. We had to remind the discussants repeatedly that the Workshop's objective was <u>not</u> to provide a set of extension or policy recommendations immediately; but, rather, was to enable the scientists to reorient their research strategy to enable them to provide the extension agents and policy makers with more meaningful recommendations in due course.

The level of participant involvements in discussions changed -- improved -- considerably as the Workshop progressed. Once they gradually got reconciled with the Workshop's objectives and strategy -- albeit with our repeated prodding -- their discussions became more and more relevant to the Workshop theme. They started discussing the methods and procedures for evaluating the systems and practices they visited during the field trips.

A large number of papers and background materials were copied to the participants at the beginning of and during the Workshop (Annexure 5; Appendices 2 and 3). Obviously, the participants did not have time during the Workshop to "digest" all these materials. But the materials would be useful to the participants in their future work. A list of "Suggested books for Agroforestry Library" was also copied to the participants (Appendix 3).

In summary, there were some inadequacies in the technical content of some of the presentations, especially guest lectures. But, in general, the contents were relevant to the Workshop's theme and strategy. Although the participants took a while, as expected, to

reconcile with the Workshop strategy, we feel that the Workshop has fulfilled one of its major objectives; i.e., to stimulate and provoke the participants to analyze and evaluate their systems objectively and systematically.

3. 3. Program Structure

The Workshop consisted of three units:

Unit I: Principles and Procedures of Evaluation

Unit:II: Working Groups and Case Studies

Unit:III: General Recommendations

All lectures and discussions during the first week of the Workshop formed Unit I, and they were aimed at exposing the participants to the different types of agroforestry systems, and identifying the criteria and procedures for evaluation of systems. A major part (50%) of the Workshop's time was devoted to this Unit; but, given the diverse backgrounds and experience of the participants, and the various expectations they had about the scope of the Workshop (as revealed in the initial survey: Table 1), it was necessary to spend a substantial amount of time to prepare them for the Working-Group exercises. Our expectations about the outcome of Unit I (see Appendix 1) were that, at the end of that Unit, the participants would have recapitulated the general principles of agroforestry, reviewed the major types of agroforestry systems in different agroecological regions of the country, and identified the parameters and procedures for evaluating the systems. These expectations were fulfilled.

Unit II consisted of Working Group sessions. The participants formed themselves into four groups according to major geographical/agroecological regions; they were given general guidelines as to how to select three or more specific systems from each region and proceed with an exercise in evaluating them based on their biophysical, socioeconomic, and other relevant criteria. This exercise, that lasted for two days, resulted in the recommendations and evaluation matrices by each group. From the level of discussions during this unit, the presentation by each group in Unit III, and our individual observations and interactions, it was obvious that three groups undertook the exercise very seriously and methodologically, while one group did not delve themselves deep into the analysis process.

Finally, in Unit III, the whole group listened to, and discussed, the reports of individual groups; some revisions and modifications were made; and a final combined set of results and recommendations were produced, which was presented at the concluding session.

The field visits (during four days) to a variety of places and projects were supportive of the programs and Workshop theme. That the participants had begun to look at ongoing projects with a critical and analytical mind rather than with a stale and subjectively

eulogistic or denigratory vision, was evident from the nature of their comments and criticism during the third and fourth field trips.

Another significant aspect of the program structure was the concept of flexibility within a framework to accommodate participant's changing views during the progression of the Workshop. Rather than adhering to a previously-decided, rigid program structure, we worked with the participants to let the program evolve itself to fulfill the perceived Workshop objectives; the participants were left to themselves, especially during the working group sessions, to decide as to how to achieve the goals. This worked out very well with the vast majority of participants.

In summary, we feel that the Workshop program was well balanced in terms of lectures and presentations, group discussions, individual interactions, and field visits and that it was very supportive to fulfilling the Workshop objectives.

3.4 Review of Workshop Recommendations

The Workshop recommendations (Section 2.4) emphasize the importance of undertaking evaluation of agroforestry systems, as well as the need for field-testing the procedure, and developing and refining the methodology. It was evident from the approaches of different Working Groups that there are many ways of comparing and evaluating the systems using the same parameters. An important achievement of the Workshop is that the major criteria for evaluation have been identified, and a procedure (however crude it might be) has been developed to quantify the various factors and subfactors.

Despite the data limitations, the participants demonstrated in the working groups, through the procedure they used, that initial evaluations of many systems are possible, even if it is only with subjective decisions reached through consensus of interdisciplinary teams. The working group results further demonstrated that system evaluations which involve more than one factor, value or benefit need to probably consider an indexing or regression procedure in which coefficients or relative weights are determined for each factor, and factors are then measured, scored or rated for each farm or system. In the case studies evaluated by the working groups, relative weights for each criterion were determined by consensus of the team of scientists. Several groups also suggested other procedures by which weights could be determined, such as statistical surveys of farmers who provide their opinion of the relative importance of different criteria.

The working groups found the step from determining index weights to understanding or determining actual values for a criterion to be more difficult than estimating index weights. However, they proposed three different schemes in which the index weights for different systems were adjusted from some standard based on the best judgement of the team. As information on each criterion and agroforestry system is accumulated these subjective evaluations will be replaced with more objective ratings. Participants agreed on the importance of developing the necessary information base through expanded measurement and observation schemes in future agroforestry studies. This agreement is reflected in the Workshop recommendations (Section 2.4).

Obviously, a lot must still be done to refine these procedures and develop a full methodology. The recommendations on follow up therefore needs serious consideration of ICAR. An outline of such a follow-up project to address these issues is discussed in section 4.

3.5 Evaluation by Participants

Participants were asked to evaluate the Workshop using a proforma (Annexure 6). Responses were stratified by those from outside UHF or faculty of UHF.

The results (Annexure 6) generally supported the conclusions discussed previously in this report. Over one third of the participants had not received pre-Workshop information, and for those who had, the Workshop objectives and arrangements were not very clear. There was also substantial dissatisfaction with the food and logistical support (travel assistance).

Regarding the technical content of the Workshop, the core faculty had high ratings across all criteria, with the best scores in presentation style and thought provocation. The guest lectures, on the other hand, had substantially lower scores, at least according to participants from outside the University. Participant presentations were received moderately well, as were the field trips, except for the organization of the latter. Overall, the participants felt that duration of Workshop schedules were good and were most appreciative of the group discussions and working groups. Twenty out of 24 respondents would recommend a similar Workshop to others. Aside from the administrative/logistical concerns other major comments focused on the fact that the Workshop should have moved into the evaluation methods earlier in the proceedings.

4. FOLLOW-UP

The Workshop was of a unique nature. Rather than adopting the "common" instructional type of approach, we worked with the participants and helped them to understand, develop, and test a methodology and procedure for evaluating agroforestry systems. Being the first of its kind, we (the group) were guided by our own perceptions and thinking rather than relying on previously established guidelines or procedures. Obviously there are many difficulties in this approach. The quantitative values of evaluation scores for different systems derived by the participants do not have much significance; but the procedure they have adopted and the thinking process they have undergone have immense significance. We feel very strongly that this activity that has made such a promising beginning has to be pursued and developed further.

The first logical thing to do in terms of follow-up would be to field-test the procedure in a wide spectrum of conditions. There is no better place than India to do this because of (1) the multitude of agroclimatic conditions and agroforestry systems in the country (2) the existence of an active cadre of agroforestry scientists and the extensive network of the All-India Coordinated Project, and (3) the "first batch" of scientists who have undergone the training in this Workshop.

The ideas that were evolved during this Workshop and the experience gained from it could lead to the preparation of something like a manual for research workers, and the manual could be refined subsequently after repeated field exercises and another Workshop. An outline for such a manual is given as Table 2.

Recommendations for Follow-up

We recommend the following steps:

1. Develop a draft manual of the methodology for evaluation of agroforestry systems as outlined in this report.

2. Launch a project to field-test the evaluation methodology in a few selected centers of AICRPA under different agro-ecological conditions. Actual field data may be used for the exercise, and the whole exercise may be efficiently coordinated by a competent scientist.

3. Organize a Workshop at the end of step 2. Participation in this Workshop will be limited to the scientists who were actively involved in Step 2, and the co-ordinators. The Workshop's objective shall be to review the scientists' experience in methodology testing and to revise the manual accordingly. A Tentative time-frame for the above procedure is as follows:

Activities

1. Development of draft manual
2. Selection of field sites for methodology testing
3. Field testing of methodology
4. Workshop
5 Revision and finalization of the manual

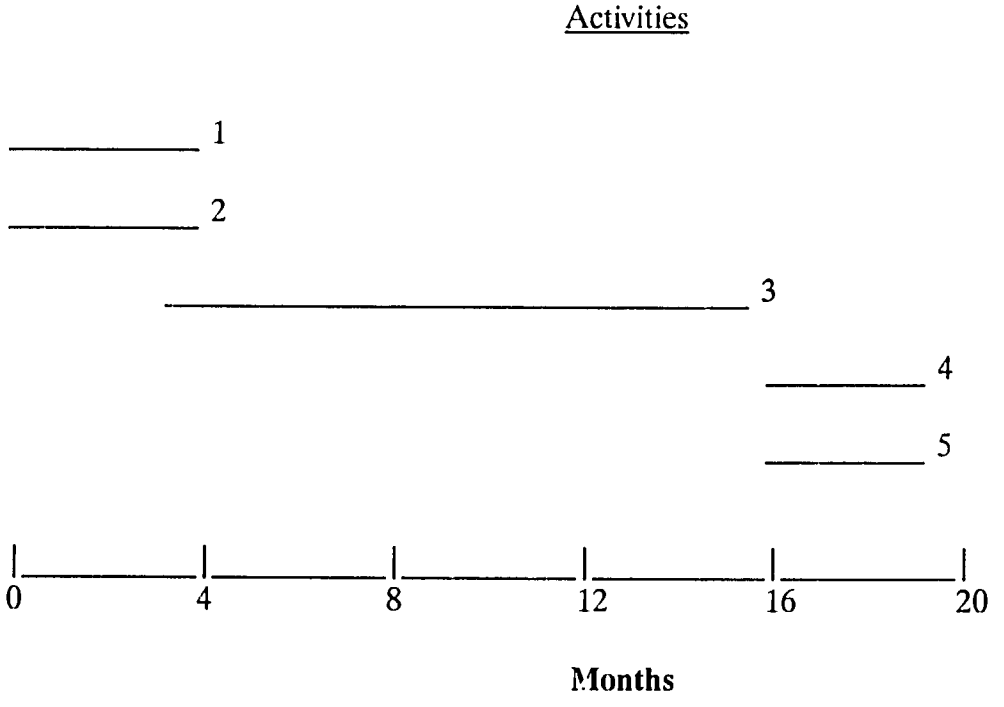

Table 2

OUTLINE OF A MANUAL FOR EVALUATION OF AGROFORESTRY SYSTEMS IN INDIA

Proposed By : P.K.R. Nair and A. Long

BACKGROUND

Agroforestry

Importance of Agroforestry in India

AGROFORESTRY SYSTEMS IN INDIA

Agroecological Zones

Major Types of Agroforestry Systems in Specific Zones (Using a common analytical format, describe representative agroforestry systems from each of the defined agroecological zones in India)

EVALUATION OF AGROFORESTRY SYSTEMS

Purpose and Criteria of Evaluation

Evaluation Methodologies

SYSTEMS EVALUATION : CASE STUDIES, PROCEDURES AND APPLICATION

Present evaluation case studies for representative systems according to the following steps:

Steps

1. Select a few (three to four) representative agroforestry systems from each agroecological zone; describe their structure (type and nature of components, their arrangement and interactions) and function (in terms of productivity and service or protection roles);

2. Assess the expected objectives and outputs of the system in terms of biological productivity, soil-related factors, economics, social acceptability, institutional and other (e.g. religious) factors;

3. Assess each of the above factors in detail in terms of the various subfactors that constitute each;

4. Evaluate each system in terms of the various factors and subfactors, in comparison with a mono-component (agriculture or forestry) system or another agroforestry system using a scoring system (either the system being evaluated or the one against which the comparison is made can be referenced to 100% for each subfactor);

5. Sum up the scores for each factor (giving relative weight for each subfactor to the total for the whole factor) and arrive at a percentage index;

6. Change the distribution of weights among different parameters (step 2) and complete the process;

7. Repeat from step 2 with a different set of relative weights.

These iterations in steps 6 and 7 will give different indices for the same system depending on the relative importance that is attached to each parameter. For example, if a system is focused mainly on soil improvement rather than on biological productivity, its index will be different from what it would if it were focused the other way round.

The exercise may be completed for systems from different agroecological zones. The final set of values will be assembled in a combined matrix, which will consist of several sub-matrices.

DISCUSSION

The matrix will be used as a basis for an objective evaluation and discussion of the selected systems. It will thus lay the foundation for evaluating any agroforestry system. The analysis will also bring out the important topics on which research should be focused to improve the output of the desired product/service from the system.

Collaboration

The University of Florida's Agroforestry Program will be willing and interested to continue collaboration in the follow-up phase as outlined. It is recommended that activity 1, development of draft manual, be undertaken at the University of Florida by two Indian scientists under the supervision and collaboration of Drs. Nair and Long. It is worth mentioning here that such a follow-up was planned originally as a part of the present Workshop.

5. SUMMARY AND CONCLUSIONS

The Workshop strategy was to stimulate and provoke the participants to systematically and, as much as possible, quantitatively evaluate the merits, benefits and weaknesses of the agroforestry systems with which they were familiar. The process worked well, and it was surmised that agroforestry systems must be evaluated based on biological productivity, economic viability, social acceptability, and, above all, sustainability based on biological and socioeconomic parameters. Within each of these general categories of evaluation criteria there are a variety of more specific benefits, values, effects, and relationships which can be used to assess different systems.

For many of these specific criteria there is an insufficient data base for most agroforestry systems. Furthermore, some of the traits are not amenable to direct quantifiable measurement, but may be described quantitatively by developing coded lists of quanlitative descriptions. Development of such codes requires considerable knowledge of individual systems and the context in which they occur. Despite the data limitations, the participants demonstrated in the working groups that initial evaluations of many systems are possible, even if, it is only with subjective decisions reached through consensus of interdisciplinary teams. Participants agreed on the importance of developing the information base through expanded measurement and observation schemes in future agroforestry studies.

The Workshop was a unique exercise in which scientists currently working in agroforestry projects in different parts of India brought with them varied experience and perceptions and worked on a common procedure to compare and evaluate the systems. An evaluation matrix, as a framework for evaluation, was developed and tested in the Workshop. Its expanded use now will depend on scientists putting the methodology into practice, as well as creating the information base and refining the measures and codes for each criterion. With these future enhancements, evaluation methodology will surpass any current procedures for measuring and comparing agroforestry systems.

6. ACKNOWLEDGEMENTS

We wish to thank several individuals for their support and cooperation without which this assignment would not have been undertaken so successfully. Notably,

Dr. S. Chinnamani, ADG Agroforestry, ICAR, and Dr. J.C. Dagar, Core Faculty from CSSRI, Karnal, for support in overall program planning and implementation as well as for keenly being concerned with our personal comfort;

Dr. B.R. Sharma, Vice Chancellor, Dr. D.K. Uppal, Director of Research, Dr. S.D. Kashyap, Deputy Director of Research Agroforestry, UHF, Solan, for the local arrangements at Solan;

Dr. Maharaj Singh and Mr. P.S. Srinivasan at Winrock, New Delhi, and Dr. Colin McClung and Ms. Surbhi Bhat at Winrock, Washington D.C., for all their support and facilitation of travel and other logistical arrangements;

And finally, the participants of the Workshop for their cooperation, patience and enthusiasm.

ANNEXURE 1

INDO - U S RESEARCH - TRAINING WORKSHOP ON EVALUATION OF AGROFORESTRY SYSTEMS

UNIVERSITY OF HORTICULTURE AND FORESTRY, SOLAN-H.P.

3-15 OCTOBER, 1991

CORE FACULTY AND OTHER KEY RESOURCE PERSONNEL

Indian Council of Agricultural Research (ICAR)

Dr. S. Chinnamani, Assistant Director-General (Agroforestry), ICAR, Krishi Bhawan, New Delhi-110 001.

Dr. J.C. Dagar, Senior Scientist, Central Soil Salinity Research Institute, Karnal, Haryana-132 001.

University of Horticulture & Forestry, Nauni, Solan, H.P.

Dr. D.K. Uppal, Director of Research

Dr. S.D. Kashyap, Deputy Director (Agroforestry)

Consultants provided by USAID/Winrock International

(From the Agroforestry Program, University of Florida, Gainesville, Florida 32611, USA)

Dr. P.K.R. Nair, Professor of Agroforestry.

Dr. Alan J. Long, Associate Professor of Forestry.

THE WORKSHOP PROGRAM

Wednesday, 2 Oct. 1991

Arrival of Participants.
Registration in the University Guest House.

DAY I. Thursday, 3 Oct. 1991

09:00-09:30 Registration
09:30-11:00 Inauguration
Welcome: Dr. D.K. Uppal
Workshop Theme: Dr. P.K.R. Nair
Keynote Address: Dr. B.R. Sharma, Vice Chancellor, UHF
Workshop Outline: Dr. S. Chinnamani
Vote of Thanks: Dr. P.K. Khosla, Director of Extension Education, UHF

11:00-11:30 Tea

11:30-12:30 Workshop objectives
S. Chinnamani
P.K.R. Nair

12:30-14:00 Lunch

14:00-15:30 Agroforestry: General principles and recent developments
P.K.R. Nair

15:30-15:45 Tea

15:45-17:30 Agro-ecological zones as a basis for evaluating agroforestry systems in India
J.C. Dagar

19:30-21:00 Cultural program

DAY II. Friday, 4 Oct. 1991

09:00-10:30 Agroforestry systems in the Himalayan region and extension strategies to support them
Dr. P.K. Khosla, Director of Extension Education, UHF, Solan (Guest Lecture)

10:30-11:00 Tea

11:00-12:30 Agroforestry systems in the humid and sub-humid region
J.C. Dagar

12:30-13:00 Participant presentations (Local agroforestry systems and current research)

13:00-14:00 Lunch

14:00-15:30 Agroforestry systems in the Indo-Gangetic plains
Dr. H.N. Khajuria, Associate Professor (Forestry), Punjab Agricultural University Ludhiana (Guest Lecture)

15:30-15:45 Tea

15:45-17:00 Agroforestry systems in the arid and semi-arid regions of India
S.D. Kashyap

17:00-17:30 Participant presentations (2)

DAY III. Saturday, 5 Oct. 1991

09:00-10:30 Agroforestry systems in the coastal and island regions
J.C. Dagar

10:30-11:00 Tea

11:00-12:30 Agroforestry research in India
S. Chinnamani

12:30-14:00 Lunch

14:00-15:30 Agroforestry research - general trends
P.K.R. Nair

15:30-16:00 Tea

16:00-17:30 Participant presentations (4)

DAY IV. Sunday, 6 Oct. 1991

09:00-20:00 Trip to Shimla

Visit the dominant forest types of lower Himalayas (Chir pine, Pinus roxburghii; Deodar, Cedrus deodara; Spruce, Picea spp.; mixed Quercus-conifer)
Various indigenous agroforestry systems
- Fodder trees and shrubs, and land-use systems involving them
- Fruit trees + crops
- Terracing/mixed cropping

DAY V. Monday, 7 Oct. 1991

09:00-10:30 Criteria for evaluating agroforestry systems: Biological productivity
P.K.R. Nair

10:30-10:45 Participant presentation (1)

10:45-11:00 Tea

11:00-12:30 Criteria for evaluating agroforestry systems:
Soil productivity and environmental protection
P.K.R. Nair

12:30-14:00 Lunch

14:00-15:30 Criteria for evaluating agroforestry systems: Economic aspects
A.J. Long

15:30-15:45 Participant presentation (1)

15:45-16:00 Tea

16:00-17:30 Criteria for evaluating agroforestry systems: Social dimensions
A.J. Long

DAY VI. Tuesday, 8 Oct. 1991

09:00-10:30 Tree fodder and animal nutrition in agroforestry systems
Dr. Katha Perumal

Professor of Animal Nutrition, Tamil Nadu Veterinary University, Madras (Guest Lecture)

10:30-10:45 Participant presentation (1)

10:45-11:00 Tea

11:00-12:30 Research procedures in agroforestry
P.K.R. Nair

12:30-14:00 Lunch

14:00-15:30 Computer modelling and statistical procedures in agroforestry
Dr. S.P. Dhall
Associate Professor (Statistics), UHF, Solan (Guest Lecture)

15:30-18:00 Field visit: UHF
Various field trials involving local fodder trees and ways of integrating them with other production components.
Conducted by: Dr. V.K. Mishra, Associate Professor (Agroforestry), UHF, Solan

DAY VII. Wednesday, 9 Oct. 1991

09:00-10:30 Characterizing agroforestry systems: Survey and assessment procedures
A.J. Long

10:30-11:00 Tea

11:00-12:45 Agroforestry systems in northern India
D.K. Uppal

12:45-14:00 Lunch

14:00-14:45 Group photograph

14:45-15:30 Agroforestry and forestry research at UHF,Solan
D.K. Uppal

15:30-16:30 Tea

16:30-16:45 Review of workshop's progress P.K.R. Nair

16:45-17:30 Participant presentations

DAY VIII. Thursday,10 Oct. 1991 (all day)

Field visit to Sukhomajri Project, near Chandigarh, to view operational research project for reclamation of extremely eroded marginal lands through community participation in fodder-tree planting, soil conservation, water harvesting, etc.

DAY IX. Friday, 11 Oct. 1991

Group Discussions

09:00-09:30 Introduction and guidelines
A.J. Long and P.K.R. Nair

09:30-18:00 (With usual tea/lunch breaks) Separate discussions of the four groups representing four agroecological zones:

- Himalayan zone (10 participants)
- Indo-Gangetic plains (6 participants)
- West-coast and Island region (7 participants)
- East-coast region (6 participants)

DAY X. Saturday, 12 Oct. 1991 (all day)

Field visit to Dhaulakuan research site.

DAY XI. Sunday, 13 Oct. 1991

No formal sessions, but group discussions and preparation for presentations continued.

DAY XII. Monday, 14 Oct. 1991

09:00-10:00 Presentation of report and discussion: Group 1

10:00-10:15 Tea/Break

10:15-11:15 Presentation of report and discussion: Group 2

11:15-11:30 Tea/Break

11:30-12:30 Presentation of report and discussion: Group 3

12:30-14:00 Lunch

14:00-15:00 Presentation of report and discussion: Group 4

15:00-15:30 Tea

15:30-17:30 Review sessions by all working groups for revision of recommendations

DAY XII. Tuesday, 15 Oct. 1991

09:00-10:00 Consolidation of group reports and development of General Recommendations
P.K.R. Nair and A.J. Long

10:00-10:30 Tea

10:30-12:30 Concluding Session
Welcome: Dr. D.K. Uppal
Workshop Recommendations: Dr. P.K.R. Nair
Concluding Remarks: Dr. B.R. Sharma, VC
and Dr. S. Chinnamani
Participants representative
Vote of Thanks: Dr. S.D. Kashyap

13:00-14:00 Lunch

14:00 Departure of participants

ANNEXURE 2

CONSULTANTS' ITINERARY

Dr. P.K.R. Nair and Dr. Alan J. Long
(Short-term Consultants, Agroforestry sub-project)

29 Sept., 1991		
	12:40 P.M.	Departure: Gainesville, Florida (PA 66 From New York to Bombay)
01 Oct., 1991		
	8:30 A.M.	Arrival : New Delhi
	11:00 A.M.	Briefing/Meetings at Winrock International and ICAR
02 Oct., 1991		
	9:00 A.M.	Departure, New Delhi (by car, With Dr. S. Chinnamani, ADG, ICAR)
	6:00 P.M.	Arrival, Univ. of Horticulture & Forestry., Solan.
03-15 Oct., 1991		Indo U.S. Research-Training Workshop on Evaluation of Agroforestry Systems.
15 Oct., 1991		
	2:00 P.M.	Departure: Solan Car: Solan-Kalka Train: Kalka-New Delhi
	11:00 P.M.	Arrival: New Delhi
16 Oct., 1991		New Delhi (Winrock Int'l) Report finalization and debriefing
*17 Oct., 1991		
	2:40 A.M.	Departure New Delhi, PA 67
	11:00 P.M.	Arrival: Gainesville, Florida

* Expected schedules

ANNEXURE 3

LIST OF PARTICIPANTS

1. Mr. R. ARULMOZHIYAN
   Asstt Prof (Hort)
   National Pulse Research Center, Tamil Nadu Agriculture University, Vamban, P.O. Pudukkotai - 622 303

2. Dr. Rajan BAWA
   Asstt Scientist (Forestry)
   Dept of Forest Biology & Tree Improvement,
   College of Forestry, U H F Solan, H.P.- 173 230

3. Dr. Khamesh CHAUHAN
   Scientist (FBTI)
   Dept of Forest Biology & Tree Improvement,
   College of Forestry, U H F Solan, H.P.- 173 230

4. Dr. P.C. DHIMAN
   Scientist Selection Grade (Agronomy)
   North Temperate Regional Station (CSWRI) Garsa, Kullu, Himachal Pradesh - 175 141

5. Dr. Bhupender GUPTA
   Asstt Agrostologist
   Dept of Silviculture and Agroforestry,
   College of Forestry, U H F Solan, H.P.- 173 230

6. Dr. Amar Nath JHA
   Asstt Prof (Agroforestry)
   Dept of Forestry, Rajendra Agricultural University,
   Pusa (Samestipur), Bihar - 848 125

7. Mr. Govind JHA
   Jr. Scientist-cum-Asstt Prof (Agronomy)
   Dept of Agronomy, Birsa Agril University,
   Kanke, Ranchi, Bihar - 834 006

8. Dr. Kamlesh KANWAR
   Asstt Scientist (Tree Physiology)
   College of Forestry, U H F Solan, H.P. -173 230

9. Dr. J.S. MANN
   Scientist Selection Grade (Agronomy)
   Central Sheep and Wool Research Institute,
   Avikanagar, via Jaipur, Rajasthan - 303 501

10. Dr. Ram Singh MERTIA
    Scientist Selection Grade (Eco. Botany)
    CAZRI, Regional Research Station, Jaisalmer,
    Rajasthan - 345 001

11. Dr. M. Achuthan NAIR
    Assoc Prof (Agronomy)
    College of Agriculture, Kerela Agril. Univ.,
    P.O. Vallayani, Thiruvanthapuram, Kerela - 695 522

12. Dr. O.N. PANDEY
    Asstt Prof (Forestry)
    Dept of Silviculture, Faculty of Forestry,
    Birsa Agril. Univ., Kanke, Ranchi, Bihar - 834 006

13. Mr. M. PARAMATHMA
    Asstt Prof (Breeding)
    Forest College and Research Institute,
    Tamil Nadu Agril. Univ., Mattupalayam,
    Coimbtore, Tamil Nadu - 641 301

14. Dr. M.M. PATEL
    Assoc Res Scientist
    AICRP on Agroforestry, Regional Research Station,
    Gujarat Agril. Univ., Sardarkrishinagar,
    Dist Banaskantha, Gujarat - 385 506

15. Dr. N.S. PATIL
    Asstt Prof (Hort)
    Aspee College of Forestry & Horticulture,
    Gujarat Agril. Univ., Navsari Campus,
    Navsari, Gujarat - 396 450

16. Mr. Mukesh PRABHAKAR
    Asstt Scientist (Silviculture and Agroforestry)
    College of Forestry, U H F, Solan, H.P. - 173 230

17. Mr. K.N. SELVAKUMAR
    Asstt Prof
    Dept of Animal Husbandry Economics,
    Madras Veterinary College, Tamil Nadu Veterinary & Animal Science University, Madras - 600 007

18. Mr. G.S. SHAMET
    Asstt Scientist (Silviculture and Agroforestry)
    College of Forestry, U H F, Solan, H.P. - 173 230

19. Mr. Arun Kumar SHARMA
    Scientist (Plant Physiology)
    Central Agricultural Research Institute,
    Port Blair, A & N - 744 101

20. Dr. Janak Raj SHARMA
    Scientist (Agrostology)
    RHRS, Mashobra, Shimla - 171 007

21. Dr. Avtar SINGH
    Asstt Prof (Agronomy)
    Punjab Agril. Univ. Ludhiana,
    Punjab - 141 004

22. Dr. Raja Ram SINGH
    Scientist (Agroforestry)
    Dept of Agroforestry, Haryana Agril. Univ.,
    Hissar, Haryana - 125 004

23. Dr. S.P. SINGH
    Scientist (Horticulture)
    ICAR Research Complex for NEH Region,
    Manipur Center, Lamphelpat, Imphal
    Manipur - 795 004

24. Mr. Ram Swaroop THAKUR
    Agrostologist
    Dept of Animal Husbandry,
    Shimla, H.P. - 171 005

25. Dr. Sanjeev THAKUR
    Asstt Scientist (Forestry)
    Dept of Forest Biology & Tree Improvement
    College of Forestry, U H F, Solan, H.P. - 173 230

26. Mr. U.S. THAKUR
    Deputy Director (Hort)
    Kandi Project, Soaln, H.P. - 172 212

27. Dr. Diwakar TRIPATHI
    Asstt Scientist (Soil Science)
    Dept of Soil Science and Water Management,
    College of Forestry, U H F, Solan, H.P. - 173 230

28. Dr. B.G. VASHI
    Asstt Prof (Forestry)
    Aspee College of Forestry and Horticulture,
    Gujarat Agril. Univ., Navsari Campus,
    Navsari, Gujarat - 396 450

29. Mr. K. VIDYASAGARAN
    Asstt Prof (Forestry)
    College of Forestry, Kerela Agril. Univ.,
    Vellanikkara, Thvissur, Kerela - 680 654

ANNEXURE 4

Proforma for Participant Biographical Information

Name:

Current title:

Institution and address:

University last attended:

Highest degree:

Current responsibilities and research topics:

Previous experience in research, extension and teaching, and subject matter:

What research have you done in agroforestry; have you undertaken any evaluation of agroforestry systems?

What is your expectation for this Workshop?

ANNEXURE 5

REFERENCES FOR WORKSHOP ON EVALUATION OF AGROFORESTRY SYSTEMS

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Young, A. 1989. Agroforestry for Soil Conservation. CAB International, Wallingford, UK. P. 59-77.

* Will be mailed by Winrock International, New Delhi, to participants in October, 1991.

ANNEXURE 6

RESEARCH-TRAINING WORKSHOP ON AGROFORESTRY SYSTEMS EVALUATION

WORKSHOP EVALUATION BY PARTICIPANTS

1. Pre-workshop Information and Arrangements

Did you receive pre-workshop information? (circle one)

	YES	NO	
	11	7	← Non UHF
If yes,	3	4	← UHF

1. How clear were the workshop objectives? (circle one)

Unclear				Very clear	
5	4 3.7	3	2	1	UHF: 2.7

2. When (how many days before your departure) was the information received? (circle one)

1-2 days	3-6 days	7-14 days	15-25 days	>25 days	
5	4	3 2.8	2	1	UHF: 2.7

3. How clearly were workshop arrangements (date, place, travel) communicated? (circle one)

Unclear				Very clear	
5	4 3.7	3	2	1	UHF: 2.0

2. Workshop Administration and Logistics

UHF: No rating

Please indicate your satisfaction with the following aspects; circle the appropriate number.

	Extremely Unsatisfactory				Extremely Satisfactory
Guest house accommodation	5	4	3 2.9	2	1
Food	5	4 3.6	3	2	1
Logistical support (eg travel support)	5	4 3.6	3	2	1
Workshop facilities	5	4	3 2.6	2	1

Other comments:

Very "dirty" food; lacked drinking water & other basic needs; rooms not cleaned routinely; food lacked quality & variety

BLUE CODE : OUTSIDE (~~THE~~ UHF) PARTICIPANTS

RED CODE : UHF PARTICIPANTS

3. Technical Content of Workshop

How would you rate the overall content of the lectures and presentations in relation to the following? (circle one for each item)

CORE FACULTY (Nair, Long, Chinnamani, Dagar, Kashyap)

	Poor				Excellent	UHF
A. Technical content (subject matter)	5	4	3 (2.2)	2	1	3.0
B. Comprehensiveness	5	4	3 (2.4)	2	1	2.6
C. Relevance to workshop objectives	5	4	3 (2.3)	2	1	2.1
D. Usefulness	5	4	3 (2.3)	2	1	2.7
E. Thought-provoking and discussive	5	4	3	2 (1.9)	1	2.6
F. Presentation style	5	4	3	2 (1.8)	1	2.1

Other comments:

Thought-provoking; timely; need subject matter specialists; should have started evaluation earlier; preparation for last exercise should have had more time; lectures by the first three listed above were productive and thought-provoking.

GUEST LECTURES (Khosla, Uppal, Dhall, K. Perumal, Khajuria)

	Poor				Excellent	UHF
A. Technical content (subject matter)	5	4 (3.5)	3	2	1	2.9
B. Comprehensiveness	5	4 (3.4)	3	2	1	2.6
C. Relevance to workshop objectives	5	(4)	3	2	1	2.9
D. Usefulness	5	4 (3.6)	3	2	1	2.7
E. Thought-provoking and discussive	5	4 (3.8)	3	2	1	2.7
F. Presentation style	5	4 (3.2)	3	2	1	2.6

Other comments:

Just moderate; should have received all guest lectures in the beginning; they did not cover workshop topic; not relevant.

PARTICIPANT PRESENTATIONS

	Poor				Excellent	UHF
A. Technical content (subject matter)	5	4	3 (2·3)	2	1	2·9
B. Comprehensiveness	5	4	3 (2·6)	2	1	2·9
C. Relevance to workshop objectives	5	4	3 (2·7)	2	1	2·7
D. Usefulness	5	4	3 (2·6)	2	1	2·3
E. Thought-provoking and discussive	5	4	3 (2·4)	2	1	2·6
F. Presentation style	5	4	3 (2·4)	2	1	3·0

Other comments:

Participants should have been informed ~~befor~~ about workshop objectives before arrival at Solan; useful to know the extent of AF

Rate the FIELD TRIPS. (circle one)

	Not Helpful				Extremely Helpful	UHF
A. Usefulness	5	4	3 (2·7)	2	1	1·5
B. Relevance	5	4	3 (2·7)	2	1	2·0
C. Organization	5	4 (3·1)	3	2	1	2·5
D. Pre-trip briefing	5	4 (3·1)	3	2	1	2·7
E. Post-trip discussion	5	4 (3·4)	3	2	1	3·0

Other comments:

Relevant and thought-provoking; not well organized; poor transport arrangements.

4. Conduct and Delivery of Workshop

UHF: No comments

Were the daily schedules (circle one)

Too tight (4) ~~(4)~~ Just right (13) Very relaxed (1)

Was the course duration (circle one)

Too long (6) Just right (10) Too short (2)

Too relaxed in the first week; One week would have been sufficient

Rate the following:

	Poor (not at all helpful)				Excellent (extremely helpful)	UHF
A. Audiovisual materials	5	4	3	(2.2) 2	1	1.7
B. Group discussions	5	4	3	2 (1.6)	1	1.7
C. Individual discussions with faculty	5	4	3 (2.2)	2	1	2.1
D. Working groups	5	4	3	2 (1.7)	1	1.7
E. Large group discussions (class room)	5	4	3 (2.3)	2	1	1.9

Other comments:

Needed more time for group discussions; Groups should be multidisciplinary

Rate the overall programme for its balance between lectures, discussions, working groups and field trips (circle one)

Poor				Excellent	UHF
5	4	3	(2.3) 2	1	2.4

Comments:

Nicely presented; Needed more time for evaluation.

5. Overall Evaluation of Workshop UHF: No special comments

Was this workshop different from other workshops you have attended?

YES (17) NO (1) UHF: Yes 6; No 1

If yes, do you like the overall style and strategy of this workshop?

YES (15) NO (2) UHF: Yes 6; No 0

Would you recommend this sort of workshop to other individuals?

YES (14) NO (4) UHF: Yes 6; No 0

In general, do you feel that this workshop will be useful for your future work?

Not at all				Extremely	UHF:
5	4	3	(2.1) 2	1	1.7

Please make any additional specific or general comments on any issue related to the workshop (use the back side if necessary).

Helped a lot, but needed more time for evaluation; Overall satisfactory and thought provoking; Didn't meet expectations; Evaluation should be more practical and less imaginary; Poor coordination and facilities; Participants would have been better prepared had they been informed in advance

INDO-US RESEARCH-TRAINING WORKSHOP

ON EVALUATION OF AGROFORESTRY SYSTEMS

October 3-15, 1991

भाकृअनुप
ICAR

This is to certify that Dr /Shri .....

participated and successfully completed the Indo-US Research-Training Workshop on Evaluation of Agroforestry Systems jointly organised by the Indian Council of Agricultural Research, New Delhi; United States Agency for International Development; Dr YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh, and The University of Florida, Gainesville, USA.

Dr BR Sharma Vice Chancellor UHF, Solan	**Dr S Chinnamani** ADG, Agroforestry ICAR, New Delhi	**Dr PKR Nair** Prof of Agroforestry UF, Gainesville	**Dr DK Uppal** Director of Research UHF, Solan

ANNEXURE 7

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ANNEXURE 6

RESEARCH-TRAINING WORKSHOP ON AGROFORESTRY SYSTEMS EVALUATION

WORKSHOP EVALUATION BY PARTICIPANTS

1. Pre-workshop Information and Arrangements

Did you receive pre-workshop information? (circle one)

	YES	NO	
	11	7	← Non UHF
If yes,	3	4	← UHF

1. How clear were the workshop objectives? (circle one)

Unclear				Very clear	
5	4 3.7 ↓	3	2	1	UHF: 2.7

2. When (how many days before your departure) was the information received? (circle one)

1-2 days	3-6 days	7-14 days	15-25 days	>25 days	
5	4	3 2.8	2	1	UHF: 2.7

3. How clearly were workshop arrangements (date, place, travel) communicated? (circle one)

Unclear				Very clear	
5	4 3.7	3	2	1	UHF: 2.0

2. Workshop Administration and Logistics UHF: No rating

Please indicate your satisfaction with the following aspects; circle the appropriate number.

	Extremely Unsatisfactory				Extremely Satisfactory
Guest house accommodation	5	4	3 2.9	2	1
Food	5	4 3.6	3	2	1
Logistical support (eg travel support)	5	4 3.6	3	2	1
Workshop facilities	5	4	3 2.6	2	1

Other comments:

Very "dirty" food; lacked drinking water & other basic needs; rooms not cleaned routinely; food lacked quality & variety

BLUE CODE : OUTSIDE (~~THE~~ UHF) PARTICIPANTS

RED CODE : UHF PARTICIPANTS

3. Technical Content of Workshop

How would you rate the overall content of the lectures and presentations in relation to the following? (circle one for each item)

CORE FACULTY (Nair, Long, Chinnamani, Dagar, Kashyap)

	Poor				Excellent	UHF
A. Technical content (subject matter)	5	4	3	2.2 2	1	3.0
B. Comprehensiveness	5	4	3	2.4 2	1	2.6
C. Relevance to workshop objectives	5	4	3	2.3 2	1	2.1
D. Usefulness	5	4	3	2.3 2	1	2.7
E. Thought-provoking and discussive	5	4	3	2 1.9	1	2.6
F. Presentation style	5	4	3	2 1.8	1	2.1

Other comments:

Thought-provoking; timely; need subject matter specialists; should have started evaluation earlier; preparation for last exercise should have had more time; lectures by the first three listed above were productive and thought-provoking.

GUEST LECTURES (Khosla, Uppal, Dhall, K. Perumal, Khajuria)

	Poor				Excellent	UHF
A. Technical content (subject matter)	5	4 3.5	3	2	1	2.9
B. Comprehensiveness	5	4 3.4	3	2	1	2.6
C. Relevance to workshop objectives	5	4	3	2	1	2.9
D. Usefulness	5	4 3.6	3	2	1	2.7
E. Thought-provoking and discussive	5	4 3.8	3	2	1	2.7
F. Presentation style	5	4 3.2	3	2	1	2.6

Other comments:

Just moderate; should have received all guest lectures in the beginning; they did not cover workshop topic; not relevant.

PARTICIPANT PRESENTATIONS

	Poor				Excellent	UHF
A. Technical content (subject matter)	5	4	3 (2·3)	2	1	2·9
B. Comprehensiveness	5	4	3 (2·6)	2	1	2·9
C. Relevance to workshop objectives	5	4	3 (2·7)	2	1	2·7
D. Usefulness	5	4	3 (2·6)	2	1	2·3
E. Thought-provoking and discussive	5	4	3 (2·4)	2	1	2·6
F. Presentation style	5	4	3 (2·4)	2	1	3·0

Other comments:

Participants should have been informed ~~befor~~ about workshop objectives before arrival at Solan; useful to know the extent of AF

Rate the FIELD TRIPS. (circle one)

	Not Helpful				Extremely Helpful	UHF
A. Usefulness	5	4	3 (2·7)	2	1	1·5
B. Relevance	5	4	3 (2·7)	2	1	2·0
C. Organization	5	4 (3·1)	3	2	1	2·5
D. Pre-trip briefing	5	4 (3·1)	3	2	1	2·7
E. Post-trip discussion	5	4 (3·4)	3	2	1	3·0

Other comments:

Relevant and thought-provoking; not well organized; poor transport arrangements.

4. Conduct and Delivery of Workshop

UHF: No comments

Were the daily schedules (circle one)

Too tight (4) (4·) Just right (13) Very relaxed (1)

Was the course duration (circle one)

Too long (6) Just right (10) Too short (2)

Too relaxed in the first week; One week would have been sufficient

Rate the following:

	Poor (not at all helpful)				Excellent (extremely helpful)	UHF
A. Audiovisual materials	5	4	3	(2.2) 2	1	1.7
B. Group discussions	5	4	3	2 (1.6)	1	1.7
C. Individual discussions with faculty	5	4	3 (2.2)	2	1	2.1
D. Working groups	5	4	3	2 (1.7)	1	1.7
E. Large group discussions (class room)	5	4	3 (2.3)	2	1	1.9

Other comments:

Needed more time for group discussions; Groups should be multidisciplinary

Rate the overall programme for its balance between lectures, discussions, working groups and field trips (circle one)

Poor				Excellent	UHF
5	4	3	(2.3) 2	1	2.4

Comments:

Nicely presented; Needed more time for evaluation.

5. Overall Evaluation of Workshop UHF : No special comments

Was this workshop different from other workshops you have attended?

YES (17) NO (1) UHF: Yes 6; No 1

If yes, do you like the overall style and strategy of this workshop?

YES (15) NO (2) UHF: Yes 6; No 0

Would you recommend this sort of workshop to other individuals?

YES (14) NO (4) UHF: Yes 6; No 0

In general, do you feel that this workshop will be useful for your future work?

Not at all				Extremely	UHF:
5	4	3	(2.1) 2	1	1.7

Please make any additional specific or general comments on any issue related to the workshop (use the back side if necessary).

Helped a lot, but needed more time for evaluation; Overall satisfactory and thought provoking; Didn't meet expectations; Evaluation should be more practical and less imaginary; Poor coordination and facilities; Participants would have been better prepared had they been informed in advance.

-4b

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