

PD-ABC-252

TECHNICAL ASSESSMENT  
FORESTRY FACULTY TRAINING

Agricultural Research Project

Project No. 386-0470

FINAL REPORT

By

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December 15, 1990  
New Delhi, India

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## EXECUTIVE SUMMARY

The Forestry Faculty Training Program was initiated in 1985 to accelerate the development of forestry education, research and extension in India and to facilitate the adoption of new institutions and technologies within the forestry sector. The Program was designed to continue to 1995. However, uncertainties in respect to continued funding and associated support have prompted this technical assessment of the the Program at this time. This assessment is based upon information provided by USAID, ICAR, Winrock International and a Workshop for this purpose convened at NAARM at Hyderabad.

The Program's goals and purpose remain valid at this mid-point in the Program life. Further, the underlying needs of India in respect to wasteland rehabilitation, social forestry development and new agroforestry production systems are unchanged at this time.

Program activities included professional and institutional development to support agroforestry units in the State Agricultural Universities (SAUs) throughout India. Agroforestry research programs were established at 26 SAUs throughout the nation. All departments undertake agroforestry research; 14 universities offer academic programs leading to the BSc degree in agroforestry; 5 universities offer MSc degree programs; and 5 universities offer PhD programs.

The ten year Program prescribed 12-month specialized training at land-grant universities in the United States for 206 faculty members. At this time, Phase I of the Program has been completed successfully. That is, 72 faculty members have completed this training and are now assuming active new roles in the newly created departments of Agroforestry. Specialized training occurred at 14 prominent land-grant universities in the USA and in 9 specialized subjects in agroforestry.

Trainees have responded positively in terms of the relevance and usefulness of their training. Most of the effort of the Trainees is devoted to teaching responsibilities. Significantly smaller efforts are devoted to research and extension efforts, respectively.

Arrangements should be undertaken to continue the Forestry Faculty Training Program until 1995 at which time a major Program review should occur. More Trainees are required in several specialized subjects of agroforestry in which some training has already occurred. Additionally, there is an acute need for Trainees in several specialized subjects of agroforestry in which no training has occurred yet in the Program. Furthermore, Program activities should be expanded across all objectives. It is recommended that Winrock International Institute should submit to USAID a proposal for the implementation and management of Phase II

of the program in cooperation with ICAR, the SAUs and the land-grant universities in the USA. The proposal could address one or more of the following areas: accelerated education of a larger number of post-graduates; linkage with the private sector in regard to employment of graduates and advocacy of education and research programs at the SAUs; computer literacy both in information systems and research; and formalized dialogue with the large number of GOI agencies and training/education institutions relative to forestry education. Phase II would also address Objectives 6-10 in a more continuous, direct fashion.

Notwithstanding the significant and impressive Program achievements to-date, there are some matters of concern which deserve serious attention at this time:

1. At several SAUs, the Department of Agroforestry has been moved physically from the main campus to a relatively remote forested site. Such moves will impede the long term development of these programs. Education and science thrive in university environments where libraries, laboratories, and interdisciplinary studies are available for the intellectual and cultural development of students and faculty. The reverse is true. Every effort should be pursued to dissuade SAUs from separating agroforestry departments from the main campus.

2. Faculty development and program enrichment are enhanced through the diversity of faculty experiences. Evidence suggests that some departments intend to satisfy their needs for additional faculty members by employing graduates of their own programs. This situation should be discouraged. Faculty members who hold MSc degrees should be encouraged to earn PhD degrees in agroforestry departments at other universities.

3. Faculty and administrators of new departments of Agroforestry must make every effort to identify and cultivate new constituencies for these new programs. New constituencies will bring new program support.

4. The Government of India and its agencies should make every effort to eliminate institutional barriers to the employment of graduates of new Departments of Agroforestry at SAUs. These are the only science based university programs in India and are designed to produce the nation's future scientific and professional agroforestry manpower requirements.

5. The faculty and administration of the new Departments of Agroforestry should be encouraged to manage their growth and development so as to ensure that high quality standards take precedence over growth in size and diversity. Departments should emphasize those program activities which they do best. They should develop program philosophies and activities which are unique. India is not well served by having nearly identical agroforestry

programs at all SAUs. ICAR should facilitate this development by funding on a competitive basis imaginative proposals from agroforestry departments for creation of specialized programs.

6. Continued encouragement of faculty and staff to use computers for instructional and research purposes can be provided by making this technology more available in agroforestry departments. Its use in centralized library collection systems should also be realized.

7. The initial plan for the development of each Department of Forestry/Agroforestry at each SAU provided for 10 forestry/agroforestry faculty members. Seven of these faculty members were funded by the SAU's. Three of them were funded by ICAR. However, in reality all 10 of these faculty members will be undertaking research. As a consequence, research operating funds must be made available to Departments of Agroforestry to support the activities of the 7 SAU created research positions. These funds should be comparable with those provided for the 3 scientists participating in AICRPAF.

## FORESTRY FACULTY TRAINING PROGRAM

### I. PROGRAM DESCRIPTION

#### A. Goals

The goal of this Program is to raise incomes and employment among the rural poor through the use and application of appropriate social forestry and agroforestry practices. An important collateral goal, served by achievement of the main goal, is to improve the environment in rural India.

#### B. Purpose

The Program's purpose is to accelerate the development of forestry education, research and extension in India and to facilitate the adoption and assimilation of new institutions and technologies within the forestry sector. The purpose will be fulfilled through:

1. Professional development activities for faculty which includes overseas training;
2. Institutional support which includes collaborative opportunities between State Agricultural University (SAU) departments and in-country and overseas institutions with expertise directly related to SAU goals;
3. Program excellence in teaching, research and service which is fostered through intensive training for students and faculty in research methods, program design and management, and formal recognition of teaching and research excellence;
4. Improved libraries which support academic programs through the provision of forestry teaching, research and extension instructional materials; and
5. Facilities which provide state-of-the-art field, laboratory, classroom and computational resources for education and research programs.

These activities must be coordinated to create "esprit de corps" within and among departments, and a sense by all participants, that the pursuit of excellence is the primary task. This report primarily covers the assessment of Phase I of activities in support of Objectives 1-5 of the Program.

### C. Concept

The overall Program concept calls for the creation and strengthening of highly focused and specialized departments that are capable of evolving to meet India's local, regional and national forestry needs. Thus, the education of B.Sc. foresters will be accompanied by the development of the capacity to educate M.Sc. and Ph.D. graduates to fill faculty and advanced research roles in SAUs, Indian Council of Agricultural Research (ICAR), Forest Research Institutes (FRI) and the private sector. The method employed will enhance the in-country capacity for faculty renewal and the creation of new tree culture ideas and teaching materials.

By 1995, the SAUs should have a clear world lead in social and agroforestry education and research and should be evolving towards three broad, long term goals:

1. The production of forest resource managers capable of serving "estate management" as well as "farm forestry" clients;
2. The integration of classical agriculture with forestry concepts and methods; and
3. The sustained production of a strong basic science base including personnel and knowledge focused on forest resource management.

In-country and international networks will accelerate the flow of ideas, techniques and materials among SAU faculty and between them and colleagues in other organizations, and a formal, continuing evaluation system will provide for goal modification, research and teaching quality control, and the comparative evaluation of SAU forestry and supporting departments.

### D. Statement of the Problem

There is an ever-increasing demand for food, fuel and fodder in India. As projected by the National Commission on Agriculture (1976), the population may be 935 million by the year 2000. This population would need more than 200 million tons of foodgrain as compared with the 172 million tons produced today. The need for fuel wood is expected to be 250 million m<sup>3</sup>. In addition India consumes 60-80 million tons of dry cowdung equivalent to 300-400 million tons of freshly collected manure. A deficit of 100 million m<sup>3</sup> fuelwood is estimated by 1990 A.D.

The ecological systems in the country are under severe stress due to growing human and livestock populations. Forests are being denuded, marginal lands are being cultivated and grasslands are overgrazed. Desertification is increasing and renewable resources are getting depleted.

The total forested area in India is about 67.5 million ha. However, the Forest Sector satisfies only 6% of the total requirements of fuel for energy. Excessive deforestation for domestic fuel, fodder and timber needs is creating ecological concern. Therefore, massive efforts to scientifically manage the natural forests, and to grow tree crops for ecological objectives and for fuel, fodder and timber is of utmost importance. Such efforts are severely limited by a shortage of scientifically and professionally educated manpower.

The Government is, therefore, undertaking a large expansion of forestry education throughout the country. Recent analyses conclude that institutions administered by FRI at Dehra Dun, Burnihat, Coimbatore, Kuoseong, Balaghat and Chandrapur are insufficient to provide the country's growing need for trained human resources in the field of forestry. The greatest constraint to improved forestry education is the severe shortage of adequately trained faculty. A large faculty development program is necessary. Education and training facilities for this purpose within the country are inadequate. Training in other appropriate ways is essential.

A core forestry faculty must be trained rapidly during the next few years in the following subject matter areas...

1. Tree Crop Genetics and Species Improvement
2. Tree Crop Propagation and Nursery Management
3. Silviculture
4. Forest Management
5. Forest Measurement
6. Forest Economics
7. Integrated Pest Management
8. Agro-forestry

#### E. Technical Analysis of the Problem

##### 1. Manpower Requirements

Manpower estimates have been considered for five organizations: State Forest Departments, State and Center Forest Research Organizations, State Agricultural Extension Departments, State Agricultural Universities, Industry and Nongovernmental Organizations. For each of these, the total manpower requirement is estimated at present and for the year 2000. In addition, estimates of the annual recruitment for the year 2000 manpower

levels are provided as well as an estimate of the number of these positions that might be filled by SAU graduates. In the year 2000, the number of SAU graduates that could annually be recruited into these five organizations is conservatively estimated to be 340. Presently, it is reasonable to expect that at least 60% or 200 individuals could be recruited annually from SAU graduates to meet current workloads. Each of these projections is presented separately by organization.

a. State Forest Departments

Table 1 presents the forestry manpower estimates for cadre positions in State Forest Departments. SAU annual recruitment is estimated to be 20% of the Assistant Conservator of Forests positions and 50% of the Range Forest Officer positions. Each year about 100 of the Assistant Conservator of Forest positions are expected to be recruited by the Union public service commission for entry into the Indian Forest Service. The remaining Assistant Conservator of Forest positions and all Range Forest Officer positions are selected through recruitment procedures of the state Public Service Commissions. For this latter group, the annual recruitment requirement met by SAU graduates could approach 100% as state forest departments gain confidence in and respect for SAU forestry departments.

TABLE 1. State Forest Department Projections.

Type Manpower	Year		Year 2000	Year 2000
	1985 <sup>1/</sup>	2000	Annual Recruitment	Annual Recruitment Expected from SAUs
CF & above	489	872	-	-
DCF	1,462	3,224	-	-
ACF	2,255	4,855	175	35
RFO	11,604	21,665	406	203

<sup>1/</sup> Hatch, C.R. 1986. Present and future forest manpower training requirements: Estimates and implications. Typed manuscript. 15 p.

b. State and Center Forest Research Organizations

Table 2 presents the forestry manpower estimates for state and center research positions; positions that exclude deputed forest officers. SAU annual recruitment is estimated to be 60% of these positions and would emphasize specialization in forest policy, social forest management systems, and forest economics and marketing. Preference will be given to graduates with M.Sc. and Ph.D. degrees.

TABLE 2 State and Center Forest Research Organization Projections.

Type Manpower	Year		Year 2000 Annual Recruitment	Year 2000 Annual Recruitment Expected from SAUs
	1985 <sup>1/</sup>	2000		
State	49	375	15	9
Center	189	400	15	9

<sup>1/</sup> See Table 1.

c. State Agricultural Extension Departments

Table 3 presents the manpower estimates for positions as subject matter specialists with state agricultural extension departments. Four levels of subject matter specialists are assumed with recruitment occurring at the lowest two levels. At the district level, approximately half of the officer positions are filled by direct recruitment and half are filled by the promotion of subdistrict level officers. Since agroforestry is the likely forestry emphasis in these positions, social forestry extension and forest economics and marketing will be important subject matter areas. SAUs could play a significant role in supplying subject matter specialists for social forestry extension and marketing positions.

TABLE 3. State Agricultural Extension Department Subject Matter Specialist Projections.

Type Manpower	Year		Year 2000 Annual Recruitment	Year 2000 Annual Recruitment Expected from SAUs
	1985 <sup>1/</sup>	2000		
Director Level	NA	25	-	-
Zone Level	NA	60	-	-
District Level	NA	450	10	7
Subdistrict Level	NA	2,700	100	70

<sup>1/</sup> See Table 1.

d. State Agricultural Universities (SAUs)

Table 4 presents the manpower estimates for positions with SAUs which offer forestry programs. Two types of university programs in forestry are considered: 17 universities are assumed to have formal departments which offer graduate and forestry as a course work elective within an agricultural degree program. Since agroforestry likely will be emphasized in these programs, social forestry extension, forest policy, and forest economics and marketing are important course work areas. Preference will be given to graduates with M.Sc. and Ph.D. degrees.

TABLE 4. State Agricultural University Projections.

Type Manpower	Year		Year 2000 Annual Recruitment	Year 2000 Annual Recruitment Expected from SAUs
	1985 <sup>1/</sup>	2000		
Faculty & Scientists Depts.	40	272	9	9
Without Forestry Depts.	20	63	9	2

<sup>1/</sup> See Table 1.

e. Industry and Nongovernmental Organizations

Table 5 presents the manpower estimates for positions with industries and nongovernmental organizations in India. The number of positions in this category is currently estimated to be small but will become the most rapidly growing sector by the year 2000. The annual recruitment impact on SAU graduates will be increasing.

TABLE 5. External Agency Projections.

Type Manpower	Year		Year 2000 Annual Recruitment	Year 2000 Annual Recruitment Expected from SAUs
	1985 <sup>1</sup> /	2000		
Foresters	200	1000	30	25

2. Agroforestry Research

In India the national needs for increased forest area to reduce the projected wood imports and to ameliorate local environments have been clearly expressed. At the same time demand for fodder, fuel, timber and other wood products greatly exceeds the supply. Additional markets exist for other agroforestry products such as certain fruits and specialty items. Thus, agroforestry provides an opportunity for additional cash income and capital formation for farmers and could be particularly appropriate for those with small holdings on rainfed and marginal lands.

F. Proposed Problem Solution

An alternative to expanding the facilities and building a competent corps of teaching staff within the Ministry of Environment and Forests system is to transfer major responsibilities for forestry education to the State Agricultural University system. This alternative reflects a growing recognition that the universities hold certain advantages over the traditional forestry institutions in conducting forestry education and research relevant to social forestry programs. These advantages include their state level presence, service orientation, and ties with local extension networks and NGO's, and the academic environment of a comprehensive university.

### G. Specific Objectives

Objective 1. To provide the capability of 17 SAU forestry departments to grant B.Sc. forestry degrees and another 9 SAU forestry departments to offer strong elective programs in forestry to students passing B.Sc. agricultural degrees.

Objective 2. To provide the capability of 12 SAU forestry departments to grant M.Sc. degrees in forestry.

Objective 3. To provide the capability of 6 SAU forestry departments to grant Ph.D. degrees in forestry.

Objective 4. To train 520 B.Sc. forestry and/or B.Sc. agriculture (forestry elective) graduates.

Objective 5. To provide 6 to 18 months of overseas training and experience to 206 SAU forestry department faculty and supporting faculty from within the universities.

Objective 6. To establish library collections at each SAU to support forestry teaching.

Objective 7. To establish a complete library collection at a central location together with an access system to facilitate forestry research.

Objective 8. To provide improved seed and nursery stock to state level clients by establishing a seed technology laboratory, a seed orchard and a forestry nursery at each SAU.

Objective 9. To develop teaching materials by SAU faculty by collaborating with other Indian scientists and international experts.

Objective 10. To encourage long-term institutional relationships between the SAU's and other Indian/International institutions in order to support faculty exchanges and collaboration in degree programs, and related teaching and research activities.

### H. Financial Input and Expected Output

1. The Program will be implemented over a 7-year period beginning in 1988 and ending in 1995. The total cost is currently estimated at \$31.5 million, including \$20 million in USAID resources. The Program will focus on upgrading the capabilities of India's SAU's to contribute towards meeting the country's forestry research and education requirements.

The Program will provide incentives and support activities which encourage each SAU to progress as far as its unique institutional, bureaucratic and political environment will allow in developing its own capacities as a forestry research and education resource. By 1995, all 26 of the Universities are expected to offer at least forestry electives to B.Sc. Agriculture degree students. Seventeen of the universities will have developed departments of forestry capable of awarding B.Sc. forestry degrees. Twelve will have the capacity to award M.Sc. forestry degrees, and six will have developed Ph.D. programs.

## 2. Estimated Costs and Method of Financing

Estimated costs are given in Table 6 below.

Table 6. Estimated Costs and Method of Financing

		(Dollars Million)		
		<u>USAID</u>	<u>GOI</u>	<u>TOTAL</u>
1.	Overseas Faculty Development	13.0		13.0
2.	Continuing Faculty Development	0.2	0.6	0.8
3.	Curriculum Development & Library Materials	3.0	0.8	3.8
4.	Collaborative Research	0.8	0.4	1.2
5.	Facilities		9.2	9.2
6.	ICAR Project Administration		0.5	0.5
7.	U.S. Coordination Mechanism	3.0		
		-----	-----	-----
		20.0	11.5	31.5

USAID funds will be used almost exclusively to meet the offshore foreign exchange costs of the proposed activity. The facilitating institution contracted by USAID will oversee the placement and maintenance of Indian professionals at U.S. institutions. Appropriate AID guidelines governing the financing of such long-term professional development activities would apply. The facilitating institution will also oversee the procurement of library materials, arrange travel for collaborative research and curriculum development activities, and provide other technical and logistic support as required. Standard ICAR and SAU budget and financial procedures will apply regarding GOI provision of local cost requirements.

## I. Approach

Objective 1. A directive from the Prime Minister in 1985 instructed the SAUs to undertake forestry education and research. The SAUs, under the direction of ICAR were expected to formulate forestry departments, develop a curriculum and initiate a training program for faculty. In 1986, the establishment of ICFRE indicated that degree courses in forestry education were to be established in SAU's. The faculty are to be integrated into a primary research mission in the All India Coordinated Research Project in Agroforestry (AICRPA). The curriculum is to be used as a basis in which to define the academic expertise requirements of faculty as well as to provide a theme to which continuing development of research and teaching activities can be organized.

The Program will produce a core of at least seven regular faculty plus three AICRPA scientists at each of 17 institutions by 1995. The seven faculty are to be distributed into: genetics and tree improvement, seed and nursery management, tree vegetation propagation, tree crop culture and grassland agronomy. At those nine institutions which will offer only forestry elective coursework, there should be only four faculty selected from the five areas. Supporting departments at the SAUs should provide faculty with expertise in: soils and microbiology, pathology, entomology, social forestry/rural sociology, marketing/economics and watershed management/engineering.

Objectives 2 and 3. The SAUs will initiate procedures to provide postgraduate opportunities for advanced research degrees in forestry. Also, the ICAR and ICFRE institutes will provide a process for post graduate research for advanced SAU students through collaborative degree programs. These should evolve naturally from collaborative research between SAU and institute faculty. Collaborative efforts will be encouraged through a process described in Objective 10. Postgraduates in forestry will become eligible for research and teaching positions. Post graduate M.Sc. degrees will be awarded in 1995 in twelve SAUs. Ph.D. degrees will be awarded in six SAUs by 1995.

Objective 4. It is expected that the first SAU forestry graduates will be available for employment in 1989 and/or 1990. Forestry graduates will be made eligible for selection to different positions in the forest departments. Graduates will have training in seed and nursery management, forest propagation, genetic tree improvement, and tree crop culture integrating fodder production. The education will be flexible to accommodate the changing needs of local and regional clients.

Several universities will begin upper division forestry instruction in 1987. At that time, two to four faculty in each university will assume responsibilities for classroom instruction. Most of these instructors will be selected from other departments

by ICAR and the Dean/Vice Chancellor at the respective SAUs.

Objective 5. The Program is expected to produce a core of faculty members with some forestry/agroforestry expertise to staff the newly established departments of forestry/agroforestry. More specifically, the requirements are to identify 206 faculty members with expertise in the following specialized subject areas:

Genetics and Tree Improvement  
 Seed and Nursery Management  
 Tree Vegetative Propagation  
 Tree Crop Culture  
 Grassland Agronomy  
 Soils and Microbiology  
 Pathology  
 Entomology  
 Social Forestry and Rural Sociology  
 Marketing, Economics and Policy  
 Watershed Management Engineering

The new forestry department faculty members are to be selected from other SAU departments and given overseas experience in forestry at forestry departments located at landgrant universities in the United States. The objectives of the 12 month special training Program are:

1. To introduce the faculty member to the management and functioning of a forestry department in agricultural universities;
2. To develop and strengthen individual academic and technical capabilities;
3. To strengthen long-term professional development.

Upon return to India from the United States, the faculty members are to begin functioning as a forestry/agroforestry faculty member by initiating new teaching and research programs.

Objectives 6 & 7. Library collections will be established at each SAU to support forestry teaching. Procurement of U.S. library materials and equipment will be handled through the Project Support and Management Facility. Indian funded activities in these elements will be coordinated through ICAR by the Assistant Director General (ADG, Forestry Education). A complete library collection will be established at a central location together with an access system to facilitate research.

Because SAU forestry programs are new, an information base of library collections of existing material, newly prepared teaching and research material, and information exchange technology must be

constructed to service each SAU.

Before library collections are augmented, a team of Indian and U.S. specialists will construct a model collection and acquisition strategy to meet the teaching and research goals of the SAUs. Because bringing all 26 SAU libraries to the full model in seven years is unrealistic, a "minimum teaching set" will be specified by the team within the full model and each SAU will immediately begin to assemble it. For example, a minimum teaching set would consist of 20 textbooks and 20 journals subscriptions keyed to required forestry courses taught for the B.Sc. and M.Sc. programs.

The full model will be rapidly assembled in one location from which photoprints of literature requested by SAU faculty can be sent out and other services can be provided. If possible, photoprints will be replaced by electronic query and reply technology.

Objective 8. A tree seed laboratory and experimental/service nursery is to be located at each SAU and to be directed by the faculty. The SAU seed orchard and forest nurseries will: 1) develop improved genotypes and 2) develop seed orchards and forest nurseries, and appropriate nursery techniques. These facilities and materials are to be accessed by faculty and students for teaching and research purposes. Eventually, it is expected that improved genotypes will be made available to the public.

Objective 9. A large number of synthesis publications, video tapes, and slide sets will be prepared and made available to SAU faculty. This will be done as a faculty professional development element, with collaborative assistance where necessary. Some of the synthesis will be used nationally; others will serve only one or a few regions. It will be the task of ICAR and a SAU Faculty Committee to expand and edit the list of instructional packages and to assign priorities and lead authors.

Twenty instructional packages should be developed by 1995. The development of instructional packages is needed because the existence of major teaching materials relevant to India's species, sites, environments, tree crop management systems and social systems is very limited.

This activity will be coordinated through ICAR by the ADG (Forestry Instruction). ICAR, working with a SAU Faculty Committee selected by ICAR, will develop a priority listing of instructional packages. Faculty selected by ICAR will be requested to develop these packages based upon expertise and experience. Faculty members may volunteer their services; but ICAR will determine the author(s) for each priority instructional package. These packages may evolve from summer institutes and regional workshops.

Objective 10. Twenty two collaborative projects with travel and operation funds are provided by the project. Collaborative programs in India and internationally provide the external expertise and experience. Each of the 17 Forestry Departments is allocated one quality collaborative project selected by the SAU. Five collaborative projects will be allocated on a competitive basis. Criteria for selection of these competitive programs will be established by ICAR working with the SAU's. Selection will be by a peer group appointed by ICAR. This activity will be coordinated through ICAR by the ADG (Forestry Instruction).

## II. TECHNICAL ASSESSMENT

### A. Input/Output Progress

To-date, the Government of the United States has spent \$ 3.3 million on this Program. Data are not available respecting the allocation of expenditures among the objectives of the project. Since 1985 the Government of India has spent Rs. 893 lakhs on this Program. Funds spent were allocated for:

1. Construction of academic buildings
2. Construction of students' hostels
3. Construction of faculty housing
4. Equipment
5. Field facilities
6. Faculty level manpower
7. Training of faculty in India
8. Books and periodicals
9. Other supporting services

The record of expenditures at the 13 selected SAUs is as follows:

<u>No</u>	<u>SAU</u>	<u>Location of Degree Program</u>	<u>Year of Start</u>	<u>Rs. in lakhs</u>
1	HPKVV	Solan	1985-86	40.60
2	UAS	Bangalore	1985-86	64.00
3	TNAU	Coimbatore	1985-86	64.00
4	PAU	Ludhiana	1985-86	46.10
5	PKV	Akola	1985-86	65.50
6	AAU	Vish.Cerihali	1986-87	66.60
7	KAU	Trichur	1986-87	66.60
8	OUAT	Bhubneswar	1986-87	66.60
9	KKV	Dapoli	1986-87	66.60
10	HAU	Hisar	1986-87	59.20
11	GBPUAT	Pantnagar	1986-87	67.10
12	JNKVV	Jabalpur	1986-87	63.40
13	SKUASIT	Vadodara	1986-87	56.40

During the 1985-86 academic session, forestry degree programs were started at the following five SAUs:

TNAU, Coimbatore  
 UAS, Dharwad  
 PKV, Akola  
 YSPUHF, Solan  
 PAU, Ludhiana

In 1987 the Norms and Accreditation Committee of ICAR approved the establishment of a Department of Forestry under the Faculty of Agriculture in 12 additional SAUs. These universities were:

1. RAU, Pusa
2. GAU, Dantiwada
3. UAS, Bangalore
4. MAU, Parbhani
5. HPAU, Rahuri
6. CSAUA&T, Kanpur
7. NDUA&T, Faizabad
8. BCKVV, Mohanpur
9. RAU, Bikaner
10. APAU, Hyderabad
11. IGKVV, Raipur
12. HPKVV, Palampur

A grant of Rs.10.00 lakhs was made to each of these universities for the development of additional faculty level manpower, academic buildings, libraries and other support services during the VII plan period (1985-1990).

The information available suggests there were no significant problems associated with the currency and related inputs provided to the program by the Government of the United States and the Government of India.

#### B. Assessment of Outputs

Objective 1. On May 28, 1985, the ADG(E) approved the establishment of a Department of Forestry B.Sc. program in 13 SAUs. The program was started in 5 SAUs in the 1985-86 academic session. In Dec. 1987, the B.Sc. degree programs of 12 other SAUs were approved. These programs also provide alternative electives in forestry to B.Sc agriculture students. A model curriculum was drafted in June 1985 and finalized in July 1985 by a committee designated by the DG (ICAR). It was circulated to the SAUs inviting their input.

The biologically focused model curriculum provides education in seed and nursery management, forest propagation, genetic tree improvement, and tree crop culture integrating fodder production.

The professional forestry courses in cultivated tree crops, biological forestry and general forestry are based on subject matter courses in biology, physics, mathematics and the social sciences.

The SAUs have adjusted the model curriculum to fit their respective needs and strengths. The full capability of granting degrees by 14 universities has been accomplished.

Objectives 2 and 3. To-date, 5 SAUs offer both a M.Sc and a Ph.D. degree in forestry. Several of these have already graduated students through their programs into the job market. These programs appear to be viable and are supported by research activities of the forestry faculty. Tamil Nadu Agricultural University currently has 5 students enrolled in a post graduate program. According to the ADG, Agroforestry, ICAR, a total of 21 post graduate students are presently enrolled in the 5 SAUs.

Apparently, one of the principal employment opportunities for post graduates is a position at the university in which they were trained. Because of this, most graduate forestry faculty believe that all post-graduates will find employment. This is one reason why some SAUs have decided to drop the B.Sc. degree program and offer only post-graduate educational programs.

The trend to "clone" the forestry academic department with graduates from that institution, does not infuse new knowledge and new ideas from external resources. In the future, this staffing strategy will reduce the quality of these programs, particularly if the forestry programs are isolated from the main campuses which is occurring at several SAUs.

Objective 4. To-date, 14 SAUs offer B.Sc degrees in forestry. Three SAUs have terminated their undergraduate programs. This action was promoted by difficulties in finding forestry-related employment. Tamil Nadu Agricultural University has graduated two classes totalling 40 students. Nearly one-half of these students are not employed. They are seeking employment in the banking industry, state government and the overseas forest industry. The SAU faculty believe their graduates face barriers to employment by the State Forest Service and other governmental agencies. This is due in part to the UPSC examination procedures. Twenty per cent of the forestry graduates from TNAU are in graduate school at that university.

Insufficient employment opportunities for graduates may impede accomplishing a vigorous forestry education program at the SAUs. The GOI and the SAUs recognize that a dialogue on employment must take place.

Objective 5. Forestry faculty training programs of 12 months duration were arranged with Departments of Forestry at prominent land-grant universities in the United States. The objective was to train 206 SAU Forestry Department faculty members by 1995. The objectives of the training program were:

1. To develop and strengthen the faculty member's academic capabilities in the specified field.
2. To develop and strengthen the faculty member's research capabilities in the specified field.
3. To upgrade the capability of the faculty member in college level teaching in the specified field.
4. To expose the faculty member to concepts and methods of organization and management of forestry/agroforestry education, research and extension in the U.S. land grant universities.

To-date, 72 faculty members have completed the 12 month training programs. These faculty members participated at the following land grant universities:

<u>Universities</u>	<u>Number of Trainees</u>
1. Auburn University	3
2. Michigan State University	8
3. Mississippi State University	14
4. North Carolina State University	2
5. Ohio State University	2
6. Oregon State University	6
7. Purdue University	2
8. Texas A&M University	8
9. University of California at Berkley	2
10. University of Florida	11
11. University of Idaho	5
12. University of Minnesota	2
13. Utah State University	2
14. Virginia Polytechnic Institute	5
Total	72

Participating faculty members received training in the following areas:

<u>Area</u>	<u>Number of Trainees</u>
1. Tree Genetics	24
2. Silviculture	7
3. Nursery Management	18
4. Seed Technology	5
5. Tree Crop Propagation	5
6. Forest Pathology	5
7. Forest Entomology	2
8. Forest Soils	3
9. Tree Physiology	3
Total	<u>72</u>

The number (14) of land-grant Universities which participated in the program was relatively large with respect to the total number of land-grant university based forestry programs in the United States. These institutions are well-distributed geographically and offer well established and recognized forestry education, research and extension programs in the country. Further, the number of specialized aspects of forestry in which training was completed is large. The combination of 72 faculty members from India completing training in 9 specialized forestry subjects at 14 prominent land-grant universities represents a significant achievement in terms of numbers, subject matter diversity and institutional diversity.

An assessment of trainee activities following their return from the United States has been completed. One matter of interest is the allocation of time and effort since returning from the United States. Out of 72 trainees, 53 responded. The distribution of responses follows:

<u>Time Distribution</u>	<u>Percent</u>
Teaching forestry/agroforestry	57
Research in forestry/agroforestry	25
Extension in forestry/agroforestry	8
Other activities	10
Total	<u>100</u>

These data indicate that the trained faculty members are occupied in activities for which the program was intended. Further the data suggest that there are still too few qualified teachers in the system. As a result, 57% of the total effort is devoted to teaching while only 25% and 8% is devoted to research and extension responsibilities.

As the Program progressed, it became apparent that educational activities with computer use should be encouraged at the foreign host-universities. This instruction was initiated and completed by several of the trainees. However, those receiving that training have not always had computers available to them when they returned to their respective institutions.

A second matter of interest is the assessment of the trainees in respect to the relevance of the training they received in the United States. Out of 72 trainees, 54 provided the following information.

<u>Comment</u>	<u>Number of Respondents</u>
1. Rated the training as relevant and useful	50
2. Said that prior exposure to forestry in India would have enhanced greatly the effectiveness of training in the U.S.A.	7
3. Said that conditions of temperate forestry at their training locations were quite different from those of tropical forestry at their home institutions, so only the scientific aspects of the training were relevant to their new careers.	4

These data support the position of this report that the Forestry Faculty Training Program has been effective to-date. However, it is observed that an insufficient number of faculty have been trained in some of the specialized areas in which some training has occurred. Further, it appears that training is needed in some specialized areas in which no training has occurred to-date.

Objective 6&7. It was not possible to assess the library collection of all of the SAUs. However, observations of the TNAU collection indicates that sufficient progress had been made. The university had issues of key forestry journals whose collection had stopped in the early 1980's. They were attempting to obtain back and current-issues. A modest number of forestry textbooks from the library were available for student use. Faculty from one other institution (G.B. Pant Univ. of Ag & Tech) indicated that they have a "moderate to good" collection of forestry material in their library.

However, the attainment of a library with a diversified collection of forestry reading materials still is beyond the reach of most of the SAUs. Furthermore, the lack of computers and lack

of computer literacy in the case of both students and faculty does not allow for easy access to information from other institutions via electronic relay and technology. To our knowledge, no central location with a complete forestry library collection and access capabilities has been established. In addition, the "model collection" of teaching and research materials has not been designated by Indian and U.S. specialists.

Objective 8. The evidence available indicates that the new agroforestry departments at SAUs are in various stages of initiating programs to improve seed and nursery stock for state level clients. Work is progressing differentially toward establishing seed technology laboratories, seed orchards, and forest tree nurseries. Most of the development effort on this objective was intended to occur during the latter stage of the program's term; that is, between 1990 and 1995.

Objective 9. Some progress has been made toward the introduction of new teaching, instructional, reading and visual materials into the classroom. This has been a result of assemblage of these materials during the interim of the faculty training program in foreign universities. Reference textbooks and cameras were purchased. Faculty participants were able to obtain a variety of teaching materials from foreign faculty and make slide sets illustrating particular forestry concepts. More than half of the faculty responding to a questionnaire indicated that they had developed either slide sets, handouts, specimens, transparencies, or manuals for classroom use. Most of the SAUs appear to provide facilities for developing slide sets and transparencies. Video tapes have not yet been utilized in classroom instruction.

Creation of new instructional packages has been largely due to the individual initiative of each faculty member. At this date, specific Working Groups, ICAR and SAU Faculty Committees have not convened to develop instructional packages to be utilized by the general forestry faculty of India.

Faculty have begun to utilize their experiences learned from foreign campuses by improving their instructional methodology in the classroom. Over half of a total of 52 faculty responding to a questionnaire indicated that they updated their existing course, and nearly one third indicated that they had developed new courses. Many also responded that they improved their instructional methodology by introducing innovations such as question-answer sessions at the end of a lecture period; giving examinations requiring short answers to a large number of questions instead of the converse; using visual aids entirely; and overall better organization of the teaching time frame.

Objective 10. Activities to achieve this objective are underway. For example, at each SAU there has been established a Center for the AICRPA. These centers provide the mechanism for program review and planning every two years. It is expected that scientists in agroforestry will participate in these activities as appropriate.

### C. Program Progress

The objectives specified for the Forestry Faculty Training Program were both ambitious and challenging. They pertained to a new important national endeavor in a complex system. They specified large numbers of high quality output. Further, they were specified for achievement between 1985 and 1995. The information available to this assessment confirms that substantial progress has been made in achieving the objectives at this time; December, 1990.

The goal and purpose of the Program are still valid. They focus on major issues of continuing concern to the governments of both India and the United States and their respective agencies. In addition, the overall assessment of national needs in India in respect to wastelands rehabilitation, social forestry, and agroforestry have changed little since the Program was initiated.

As a consequence, continued support of the Program through 1995 is recommended. This continued support will facilitate achievement of the major objectives and should position the Program more realistically for a major review at that time.

Spurred by the directive of the then Prime Minister in January 1985, forestry/agroforestry education has made impressive strides in the State Agricultural Universities. In addition to the Birsa Agricultural University that had started a B.Sc. Forestry degree program in the 1970s, a large number of educational programs were established in various SAUs since 1985. Establishment of these programs at such a rapid pace was made possible by the multipronged, coordinated and vigorous action taken by ICAR to provide requisite support to the SAU by way of funds for the development of instructional infrastructure; faculty positions and support services; development of first generation faculty level manpower; development of a model curriculum conforming to the broad guidelines established by the Committee of Deans; and integration of their All India Coordinated Research Project on Agroforestry into the newly established program of forestry education.

This process of establishing and developing forestry/agroforestry education in the SAU is still far from complete. Substantial, additional effort and resources need to be invested into the system to let it attain a well-balanced growth and capability to adequately serve the national requirements in this vital area of education. The growth and development process has

also faced unforeseen difficulties, and the future is beset with some confusion and uncertainties over who is expected to do what.

Further growth and development, however, has to take place within the overall framework of the National Forest Policy of December, 1988. This policy envisages that forestry is to be recognized both as a scientific discipline as well as a profession. Agricultural Universities and institutions dedicated to the development of forestry education have to formulate curricula and courses for imparting academic education and promoting postgraduate research and professional experience, keeping in view the manpower needs of the country. ACADEMIC AND PROFESSIONAL QUALIFICATIONS IN FORESTRY WILL HAVE TO BE KEPT IN VIEW FOR RECRUITMENT TO THE INDIAN FOREST SERVICE AND THE STATE FOREST SERVICES. Specialized and orientation courses for developing better management skills by inservice training need to be encouraged, taking into account the latest development in forestry and related disciplines.

Bringing about these developments in forestry/agroforestry education would require development of appropriate approaches, formulation of projects, implementation machinery, requisite funds and organizational commitment. Unfortunately through a series of developments, the process seems to have reached a state of uncertainty, confusion and inaction. It is time to move away from this impasse.

Going back to the National Forest Policy of 1988, it is known that the SAU and certain as yet unidentified institutions dedicated to development of forestry education are expected to develop courses and curricula etc. It would, therefore, appear to be logical that the Association of State Agricultural Universities takes an initiative in this respect and establishes a tripartite group representing the Association, the ICAR and the ICFRE to take stock of the situation and set in motion a process that would enable the SAU to perform their assigned function timely and effectively.

But the time for taking such an initiative is running out because planning for allocation of national funds for such functions for the next 5- years is in its final stages. If such an initiative fails to materialize soon enough, ICAR should then move ahead vigorously and forcefully to provide for further growth and development of agroforestry education in the SAU.

Development of adequately trained faculty-level manpower for further development of forestry/agroforestry education in the SAUs still remains to be the most critical element of such an efforts as it was in 1985. Utmost attention needs to be paid to this aspect. The faculty training programs mounted with generous assistance from USAID, the British Council and several other donors have provided very crucial support of historical importance to India's national effort. Some of these resources are still

available and ICAR must move rapidly to take advantage of the opportunity.

The responses received from faculty members and educational administrators of the SAU have confirmed the basic relevance and effectiveness of the Forestry Faculty Training Program undertaken with assistance from USAID. As may be expected, the effectiveness of this program could have been further enhanced if certain collateral steps such as prior exposure to Indian forestry had been provided, etc. This and many other "ifs" were recognized but could not be implemented due to constraints in the operational environment.

In view of the critical constraint of time for action, it may be worthwhile for ICAR to aggressively move ahead to strengthen agroforestry education in the SAUs in terms of strengthening of infrastructure, program development and faculty development, while maintaining receptiveness to responses from the ICFRE.

As a first step it is important to identify the subject areas for training of additional faculty members. They are:

1. Tree Crop Breeding
2. Tree Crop Propagation & Nursery Technology
3. Tree Crop Seed Technology
4. Silviculture
5. Natural Resource Management
6. Agroforestry Biometrics
7. Agroforestry Economics and Policy
8. Tree Pathology
9. Tree Entomology
10. Silvipasture Development
11. Restoration of Degraded Lands
12. Wildlife Management
13. Watershed Management
14. Forest Products Manufacture
15. Wood Science and Technology

#### D. Summary Recommendations

The goals, purpose and objectives of the Program are as valid today as they were when the program was conceived prior to 1985. The national needs of India respecting wastelands rehabilitation, social forestry, and agroforestry production systems are also unchanged.

The progress towards achieving the objectives of the Program is significant. Further, the quality of the outputs achieved is considered to be remarkably good at this early stage of program development. Phase I of the Program was completed successfully; that is, the training of 72 faculty members at land-grant

Universitirs in the USA. These results justify our strong recommendation that the program be continued with adequate financial support until 1995.

Phase II of this program is recommended for implementation. That is, approximately 65 faculty members must be trained in specialized aspects of forestry/agroforestry for 12 month periods in the United States. Further, it is recommended that Winrock International Institute consider seriously submitting to USAID a proposal for the implementation and management of Phase II in cooperation with ICAR, SAUs and land-grant universities in the USA. A Phase II proposal could address some or all of the following areas: accelerated education of a larger number of post-graduates; linkage with the private sector in regard to employment of graduates and advocacy of education and research programs at the SAUs; computer literacy both in information systems and research; and formalized dialogue with the large number of GOI agencies and training/education institutions relative to forestry education. Phase II would also address Objectives 6-10 a more continuous, direct fashion.

Notwithstanding the recommendation presented above, there are several situations associated with the program which must be addressed to ensure the long-term success of forestry/agroforestry research and education at the SAUs.

1. The faculty and administration of the new forestry/agroforestry departments must assume a greater responsibility for identifying appropriate employment opportunities for B.Sc., M.Sc. and Ph.D. graduates. Further, ICAR, the SAUs and other appropriate agencies must resolve the problems which have resulted in employment barriers for B.Sc. graduates with some federal and state agencies.

2. The long-term development of high quality, comprehensive programs of education, research and service on forestry/agroforestry will be jeopardized at least and perhaps precluded, by the decision at some SAUs to relocate the Program to remote sites away from the main campus. Education is enriched by participation in academic, cultural, and social activities beyond the confines of immediate fields of study or disciplines. Many of these opportunities for enrichment will be unavailable at satellite campuses. Further, the remote sites will be unable to provide libraries, laboratories, and supporting programs of the quality necessary for the development of science and education in agroforestry.

3. The faculty and administration of the forestry/agroforestry units, the SAUs, and ICAR must initiate appropriate action to dissuade individual forestry/agroforestry units from satisfying their immediate scientific manpower requirements (teachers and scientists) by employing their own graduates. This practice will

reduce the intellectual vitality of these programs over time. Faculty members who hold M.Sc. degrees should be encouraged to earn Ph.D. degrees at other universities. Each department should recruit graduate students from the agroforestry departments at other universities. ICAR is encouraged to expand its program of post-graduate fellowship for this purpose.

4. Each forestry/agroforestry department should be encouraged to develop at a rate which is consistent with the creation of a high quality program. Growth in size and diversity at the expense of quality will impede the long term development of the overall forestry program. Further, each department should be encouraged to build on its strengths and to develop unique characteristics. The long-term interests of the SAU-wide program will not be well served if each department is a mere "clone" of all other departments. ICAR should facilitate this objective by providing funds on a competitive basis to forestry/agroforestry departments which submit imaginative proposals for specialized program enrichment.

5. Forestry/agroforestry faculty and staff should be encouraged to use computers for instructional and research purposes. Computer technology should be made more available. It's use in centralized library collection systems should also be utilized.

6. It is important to continue design modification of the Program as developments and adjustments occur. It is paramount to include the participation of several Trainees in the design process. Their experiences and gained knowledge will greatly enhance the overall quality of the Program.

7. The initial plan for the development of each Department of Forestry/Agroforestry at each SAU provided for 10 forestry/agroforestry faculty members. Seven of these faculty members were funded by the SAU's. Three of them were funded by ICAR. However, in reality all 10 of these faculty members will be undertaking research. As a consequence, research operating funds must be made available to Departments of Agroforestry to support the activities of the 7 SAU created research positions. These funds should be comparable with those provided for the 3 scientists participating in AICRPAF.