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**In-Service Training in Natural Resources  
and the Environment  
for AID Personnel**

**Prepared for the Training Division  
Office of Personnel Management  
Bureau for Management**

by

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## Preface

This survey of in-service training needs on the subjects of natural resources and the environment was commissioned by the Training Division of the Bureau for Personnel Management in late 1987. It is intended to guide PM/TD's training work on these subjects. At the same time, it is of general interest to the agency. Training in these fields has been the focus of a special committee within AID's Natural Resources Sector Council. The explicit mention of natural resources in AID's new Agricultural Focus Statement and the recent incorporation of the sustainability concept into the agency's programming are important reasons for attention to staff competence in these areas, in AID/Washington and in the field missions. These recent emphases add to AID's expanding mandate to devote attention and resources to natural resources and the environment.

The present study was carried out in several phases. During the drafting and data compilation phase in late 1987, the author was asked to focus on the content of two courses in particular -- the Development Studies Program and the State-of-the-Art in Agriculture and Natural Resources. Memoranda specific to these courses were prepared and submitted, and are included in a separate annex. A review draft was submitted in Jan., 1988. A prolonged review of the first draft caused the preparation of this final draft to be delayed, due to other commitments that I had previously scheduled. I hope that the unavoidable delay has not jeopardized the value of this final version.

I wish to thank Dorothy Young, PM/TD and Molly Kux, S&T/FENR for their guidance throughout the study and reaction to the first draft. I am also thankful to the forthcoming cooperation of all the interviewees. Finally, I am grateful to the staff of the Technical Support Office of the Information Resources Management Division, Bureau for Management, for assistance in conversion of this document to Word Perfect and for access to printers in that office.

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## **Executive Summary**

This report assesses in-service training needs of AID personnel in the topics of environment and natural resources (E/NR), reviews sources of long and short term training, within and outside of AID, and makes recommendations for in-service training for AID employees likely to be required to take on added responsibilities in E/NR, especially agricultural development officers. A three year time horizon for the strategy is used.

The assessment and recommended strategy are based upon interviews, 1987 cables from missions on the topics of training and staffing needs for E/NR, personnel policy, data from AID's RAMPS data base, and evaluations of AID training events on the topic.

### **1. Training Needs.**

Institutional needs related to AID's expanding mandate and programs in E/NR, as well as individual needs were assessed.

By law, AID employees must be able to perform or manage environmental reviews of projects. Every mission needs competence in conducting initial environmental examinations or assessments, in accordance with Reg. 216. However, since 1978 there has been no training in this area. In 1978, Clark University held three, 2-week training sessions for mission environmental officers, financed by PM/TD. In 1975 a special course on environmental assessments for all AID engineers was organized. Only 20 of the 120 engineers who took the course are still employees; only 10 are in field missions. The quality of IEEs is often poor partly as a result of no trained personnel in the missions.

AID is being required to more fully address the needs for restoring and managing the natural resources and biological bases for development. USAID staff must be able to design and manage programs dealing with soil and water conservation, range management, forest management and conservation, small and large scale forestation, and biological resources conservation. Programs financed by P.L. 480 revenues and support to PVOs and NGOs are increasingly important features of AID's E/NR work.

Only a small number of individuals in AID are trained and assigned fulltime responsibility for natural resources and the environment. As of April, 1987, there were only 33 individuals with occupational titles or job descriptions in E/NR. Twenty-one had master's degrees; 8 had Ph.d's. Seven of the nine foresters had Master's or Ph.d's. All the foresters were posted as agricultural development officers, and managed forestry projects.

(Eight of the 33 were Government Service employees, posted in Washington D.C., within S&T and regional bureaus.)

In recent years, the additional expertise needed at the mission level and in regional bureaus to manage greater levels of activity in E/NR has been provided through contracted personnel or RSSA's rather than foreign service employees with corresponding job descriptions. However, this competence is not internalized institutionally and does not represent a long term commitment. On the other hand, additional recruitment of a few direct hire employees will not meet the general need for awareness of and competence to deal with E/NR questions.

Present staff, will have to be better trained to manage AID's expanded work in E/NR, notwithstanding the resort to contracted personnel. Agricultural development officers would be the principal professional group within AID needing training. Their numbers and academic preparation are summarized below.

**Academic Backgrounds of Agricultural Development Officers  
(April, 1987)**

	Agricultural sci.	Forestry, soils, range mgmt.	Agricultural economics, economics	Engineering	Other
Degrees & totals					
BS/BA (37)	21	3	1	2	10
MS/MA (128)	47	12	60	2	7
PHD (37)	15	5	12	-	5
	<u>83</u>	<u>20</u>	<u>73</u>	<u>4</u>	<u>22</u>

## **2. Desires for training.**

Training is voluntarily undertaken in AID, so that individual desires must be gauged, in addition to institutional needs. Desires for short term training reflect immediate needs, which are specific and quite diverse, while long term training desires reflect career advancement considerations.

AID employees worldwide were queried in April, 1987, about their desires for short and long term training in E/NR. Sixty- five responded, the most numerous being agricultural development officers (25 respondents), foreign service nationals (15) and rural development officers (10). The responses of these three groups were distributed fairly evenly among the training topics of:

- \* environmental procedures (much interest among FSNs),
- \* natural resources economics,
- \* forestry and agroforestry, and
- \* other natural resources topics (soil and water conservation, biological diversity conservation, range management, etc.)

Most of the 65 respondents indicated interest in short term training; only fifteen wanted long term (one year or more) training. The most frequently mentioned long term training themes were natural resources economics and natural resources management.

## **3. Training opportunities.**

There are numerous training opportunities for E/NR, however, a unified annual directory does not exist. There is only limited financial support for USAID employees to take advantage of training opportunities. The travel and subsistence expenses of USAID staff that attend courses must be borne out of the USAIDs' Operational Expenses budgets, upon which there are many demands. Time away from the mission is another expense, that is lessened somewhat by "piggy backing" training TDY's onto annual home leave trips. PM/TD's modest budget constrains the amount of training it can finance.

### **3.1 Short term training.**

The Office of Personnel Management's Training Division (PM/TD) conducts two short term training courses that could offer training in E/NR:

- (1) State-of-the-Art in Agriculture and Rural Development and Agricultural Policy

(one week each, offered consecutively, once a year in June). In 1987 and 1988 this course was planned around the theme of natural resources and the environment.

(2) Development Studies Program (7 weeks, twice a year), which could introduce the topics of natural resources institutions, policies and economics into its broad curriculum.

In addition there is some scope, albeit very limited, for introducing E/NR subject matter into these short courses organized by PM/TD or the Foreign Service Institute:

Project design course (treatment of Reg. 216)

Project implementation course (treatment of Reg. 216)

New entry training course (very little scope)

Area or country studies (self study materials & videos)

Foreign language studies (awareness training possible with foreign language videos on E/NR topics)

Foreign Service Institute's Area Studies Course(at least one 2-hour lecture per session on the area's environment and natural resources.)

Short term "off-site" training is financed by PM/TD also, from a relatively modest \$150,000/year budget available only for registration expenses. Course work can be pursued in the Washington D.C. metropolitan area (e.g. USDA graduate school), or anywhere in the world where short term training courses are offered. In any one year there are literally hundreds of short courses sponsored by the U.N. family, universities and specialized centers around the world.

Short courses in tropical agroforestry and forestry are now widely available with sponsorship from institutions such as CATIE in Costa Rica and FAO. Also the U.S. universities organize and host many short courses. USDA's short course offerings do not presently meet USAID short term training needs.

The possibility of collaborative training with the World Bank or IDB in Washington, D.C. was explored. Neither have systematic in-service training programs for staff. However, joint sponsorship could be explored for a theme of common interest, e.g. environmental aspects of policy reforms.

### **3.2 Long term training.**

Long-term training in academic institutions, e.g. graduate schools, is also financed by PM/TD on a very restricted budget, that limits support to approximately 15 individuals per year.

Period of training is one quarter to one academic year, with the possibility of an extension to permit obtaining a degree. But costs of the extension must be borne by the candidate.

Many U.S. universities offer graduate level course work or programs in natural resources and environmental fields, but few can claim excellence in the problems of extreme tropical environments -- humid or arid -- that often confront AID field staff. Nevertheless, there are many good programs for gaining competence in the broad fields of natural resources management and natural resources economics and several that focus on tropical forests or soils.

### **4. Recommended Training Strategy**

The recommended strategy is premised on the continuing and growing importance of natural resources and environmental aspects in AID's program and the need for a larger proportion of AID personnel to apply awareness and knowledge to these aspects.

The recommended strategy would:

- (1) increase general awareness among all employees,
- (2) build general knowledge among employees and
- (3) build working knowledge or skills among selected back-stops, principally agricultural development officers (BS10).

Other backstops that could benefit from working knowledge of E/NR are economists (11), program development officers (12), rural development officers (14), Food for Peace officers (15), and engineers (25). Energy and natural resources development officers (BS 30) who numbered 10 in 1987 are targeted for skills up-dating.

4.1 Awareness training could be provided most easily by including short presentations in routinely scheduled events such as ADO and mission directors' conferences, foreign language study programs (using foreign language videos on natural resources or environmental themes), FSI Area Studies courses, and New Entry courses. Emphasis would be on emerging issues, e.g. biological diversity, and skilled presentations.

4.2 General knowledge among AID staff could be increased through a two part

training package aimed at employees transferring from one region to another, i.e. on temporary duty in Washington, D.C., often in language training. One part would treat major ecosystems in the region of destination; the other would treat regional natural resources problems and related work in addressing them throughout the region. Training modules, and the use of local scientists and experts are proposed.

4.3 Building working knowledge and skills is the major thrust of the strategy, and BS 10s of whom there were 214 in Sept., 1987, would be the principal target group. The training goal would be to equip the individual with sufficient knowledge and discriminatory ability to select and commission appropriate technologies and approaches, and subsequently to manage their implementation and judge their accuracy and quality. This would be accomplished by the following:

- \* An annual or biennial state-of-the-art short course in natural resources and environmental problems, issues and actions. This would be a new undertaking, that might be co-sponsored or co-hosted by the World Bank.

- \* Adapting existing training to better account for E/NR issues, in particular the SOTA in agriculture and rural development short course. (It is assumed that after 1989 it will switch from the NR theme back to an agricultural production and rural development theme). The Development Studies Program could include lectures and case studies on natural resources economics and sustainability as affected by the integrity of the natural resources base of development.

- \* Environmental assessment training for one or two individuals (BS 25 and BS30) in every mission, including for FSNs (many of whom requested it). Two week course.

- \* Pesticides management training for BS10s and 30s. 4 or 5 day courses, best held in the different regions.

- \* Environmental and natural resources economics training for BSs 11, 12, 14, and 94 as well as 10s with economics backgrounds. 3-day short courses.

Long term training in natural resources economics and the general field of natural resources management is recommended to be encouraged, so that 3 to 4 or more applicants for LT training are funded each year for the next three years.

#### 4.4 Establish an Information Center for E/NR Training Resources.

This proposal is founded on the fact that nowhere is there a single source of information on training offerings in these fields, including academic as well as short course training.

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## A. INTRODUCTION

This report assesses the training needs of direct hire personnel (FSs, GSs and FSNs) in the environment and natural resources (E/NR)\* and presents a draft strategy for meeting these needs during the next 3 years. It is based on a study of cables from missions concerning training in E/NR and staffing competence in E/NR; interviews (Annex A), statistical data on backstop positions, training and training eligibility obtained from the RAMPS data bank, and evaluations of recent training.

Increased support or an increased share of support for a wider range of natural resources and environmental (E/NR) activities\* in AID's programs is foreseeable. This increase is driven by several factors, especially congressional mandates and earmarks attached to the Foreign Assistance Act Appropriations. Changes in Sections 118 and 119 of the FAA direct AID to extend assistance for the conservation of biological diversity and tropical forests. Congress earmarked \$2.4 million in FY87 for supporting the conservation of biological diversity and AID has committed \$4.5 million to this objective in FY 88. Activities under the first earmark were programmed in AID/W, but USAIDs worldwide will become more substantively involved in the subsequent design of activities, as understanding and competence is gained on this new facet of foreign assistance.

These mandates are likely to shift USAID portfolios towards a greater proportion of E/NR activities than in the past, possibly without an absolute spending increase. CDSS's are now being revised worldwide to focus on E/NR concerns. Thus, more staff in AID would be engaged in E/NR work than previously.

In-service training is a strategically important means of equipping existing AID employees to handle increased responsibilities in the areas of natural resources and the environment as the focus of CDSSs and the content of mission portfolios shift toward an increased emphasis on E/NR work.

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\* Natural resources include water, soils, vegetation and wildlife (including fishes) in different physical environments, e.g. lowland humid tropics, semi-arid tropics, coastal zones and high altitude zones. The environmental rubric encompasses those natural resources and ecological systems that contribute indirectly to development rather than directly, e.g. genetic resources in wilderness areas, and various ecosystems that stabilize or buffer environmental extremes, such as mangrove swamps and cloud forests.

The broad spectrum of technical specialities, approaches and development contexts involved in natural resources and their cross- sectoral, systemic nature present a real challenge to in-service training in this field. Whereas in the case of agriculture there are many employees with both technical and general backgrounds in the agricultural sciences, relatively few have equivalent preparation in natural resources areas. Further, at present there is no upward career path for individuals on the basis of technical specialization in natural resources. This document attempts to address this challenging context for training.

### **1.0 AID's growing responsibilities in E/NR.**

Over the near term AID will be asked to devote greater amounts of its assistance to addressing the broad problem of environmental degradation in the Third World, and, more specifically, the decline in the natural resources base that sustains agricultural activities and rural livelihoods, and the loss or degradation of tropical forests and threats to biological diversity.

The likelihood of an earmark in the FY 88 FAA for natural resources work in Africa spurred the development in the Bureau for Africa of a Plan for Supporting Natural Resources Management in Sub-Saharan Africa and the subsequent regional Natural Resources Management Support Project. That earmark represents 10% of a \$450 million special Development Fund for Africa. Thus, E/NR yearly spending levels for Sub-Saharan Africa would be at least \$45 million.

An FY 87 earmark of \$2.4 million to support biological diversity conservation is being followed by an FY 88 commitment by AID to spend \$4.5 million in this area.

AID policy dialogue work and related program assistance is likely to be expanded to include natural resources problems, and urban environmental problems are to be included in a study of the problems of cities, called for in the FY 88 authorization bill, by the House Appropriations Committee.

Changes in AID policies and program orientation the outcome of internal analyses as well as congressional mandates. Several years ago the Bureau for Latin America and the Caribbean identified the fragility of steeplands and humid lowlands as a priority development concern and initiated a five-year regional project DESFIL (now into its second year) to orchestrate appropriate responses. Experience to date by the contractor in dealing with missions is taken into account in the diagnosis of training needs presented below.

The 1987 Plan to Support Natural Resources Management in Sub-Saharan Africa and the subsequent regional project to help missions initiate actions for implementing this plan (Natural Resources Management Support Project) will

increase the relative if not absolute amount of development assistance to E/NR. These initiatives respond to an internal assessment of the region's natural resources problems as well as congressional pressure to address environmental problems in SSA.

The New Agricultural Focus Statement specifies assistance in maintaining and enhancing the productivity of the natural resources base for agriculture. The concept of sustainable agriculture is rapidly being accepted and developed as an integrator of concerns for agricultural production, food security, rural income generation and maintenance of the resource base for agriculture. When translated into programs and projects, this will undoubtedly increase the level of activity in agricultural development assistance that is devoted to soil and water management, agroforestry, on-farm forestry and grazing land management. Awareness of the various technologies available and the different approaches and modes that can be pursued will be important for agricultural development officers.

## **2.0 Development assistance levels and trends.**

AID is presently supporting a wide range of activities involving natural resources: forestry and agroforestry actions, agroforestry research, soils research and conservation, irrigation and soil water management, rural water supply and urban waste water infrastructure, renewable energy resource development, wildlands preservation and management, coastal zone management, fisheries and fish culture, and watershed management, and remote sensing of natural resources, among others. Also, through the collaborative research support projects, research on soils and water management is being supported.

The environments of human settlements, from large towns to cities, have been an occasional focus of AID assistance, e.g. Economic Support Funds for Cairo's wastewater system have amounted to over \$1.0 billion. Renewable energy systems planning for large towns in Asia has also been undertaken.

In the LAC region total assistance devoted to natural resources and the environment amounts to \$250 million (for the life-of-project expenditures) distributed among 55 different projects. Assistance levels will probably increase relatively if not absolutely, according the Bureau's Environmental Coordinator.

In the Bureau for Africa, E/NR activities are currently found in the portfolios of 22 missions, distributed among about 75 projects (of which 9 were regional projects) representing an annual expenditure of approximately \$65 million. This level of project spending will decline to \$48 million in FY 89, but thereafter may increase relatively or absolutely. It was to be set at 10% of the total bilateral package by a congressional earmark. However, support for forestry projects in Africa has in fact declined compared to levels in 1981, but the nature of projects is much more diverse.

In the Bureau for Science and Technology twenty-two projects support mission level research and project development in all the areas listed above in the first paragraph of this section.

An increase in general program assistance linked to policy reforms, and supported by local currency generated from PL 480 food sales, has taken place worldwide and in the African region in particular. Greater use of these local currencies for natural resources and environmental activities is foreseen, for governmental actions as well as support to PVOs and NGOs working in forestry, soil and water conservation. Mission Food for Peace officers in particular must be able to plan and program assistance accordingly.

### **3.0 The general need for E/NR training.**

The fact that AID already has a rather sizable portfolio devoted to assistance in a wide range of natural resources activities would seem to belie the need for a training strategy in E/NR for AID personnel. However, as indicated below amounts spent are significant mainly in terms of the AID's commitment to support assistance in this field. They do not reflect a commensurate commitment to develop staff competence. For instance, among the 214 backstop 10s (Ag. development officer), there is only one "official" agroforester in AID ( B.S. in agriculture), only five individuals with graduate degrees in soils science, and only four agricultural engineers. (The following section reviews the staffing profile more completely).

An indirect indicator of training needs is the performance of projects in natural resources. For instance there has been a general failure of range management projects, forest plantation projects, and river basin development authorities supported by a AID in Sub-Saharan Africa. Many factors and explanations contributed to the poor performance of these projects, but staff competence (seldom if ever examined in evaluations) to design and manage projects in these areas cannot be ruled out as a factor.

Performance with respect to environmental impact assessments has been weak. All the regional environmental coordinators consider that compliance with Regulation 216 has often been perfunctory or inadequate. Environmental analysis in project design continues to be viewed as hurdle rather than a means of guiding project design. Although the project review process will probably uncover inadequate Initial Environmental Examination or Environmental Assessments (or project designs that don't reflect these analyses), the fundamental issue is how to improve project design, and how to employ environmental analysis to do so. Also, project designs usually fail to include baseline, monitoring and impact studies, needed to measure positive or negative results.

The regional environmental coordinators as well as USDA and university experts in pest management pointed out the lack of mission staffs' abilities to deal with pesticides. The use of pesticides creates an on-going, technical management task which few if any individuals in missions are competent to execute. AID/W technical support helps but does not alleviate the on-going mission-level management that is needed to safely supervise the use of these chemicals in AID-supported projects or programs.

In conclusion, new directions as well as on-going needs establish a clear need for in-service training in E/NR. The trend towards more emphasis on the natural resource base for agricultural development and a greater diversity of E/NR activities, together with the small likelihood of expanded staff or additional assistance money indicates a concrete need for generalized as well as some specialized training. The kinds and levels of training needed (and desired) will vary according to job responsibility, academic preparation, the staffing patterns in missions, and individual circumstances.

#### 4.0 Agency personnel profile.

A general review is presented of the agency's staffing situation for positions where E/NR responsibilities would be increased. It is based upon the rather sparse and not invariably accurate data contained in the RAMPS data bank (particularly as regards academic background). The profile helps establish the overall context for specific training needs and the subsequent strategy.

The positions of concern are the following:

Backstop	Description
Foreign service:	
10	Agricultural development officer
11	Economist
12	Program development officer
14	Rural development officer
15	Food for Peace Officer
25	Engineer
30	Energy and natural resources officer
94	Capital projects/development loan officer
95	International Development Interns

Government service (GS or GM): (not posted abroad)

75 Environment/ natural resources officer

Backstops 10 and 14 are the principal candidate categories for short or long term training, because they are the most numerous and are the persons who would initiate and design additional work in natural resources. Some double as BS 30s. Their academic backgrounds are reviewed below. BS 30 and GS 75 are the agency's professional staff in environment and natural resources. They are well prepared academically for the most part.

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Table 1. Backstops by Region as of September 30, 1987

BS	Africa	ANE	LAC	non regional	total
10	69	67	51	27	214
11	21	17	19	7	64
12	33	18	35	22	108
14	2	13	6	6	27
15	12	7	1	13	60
25	19	24	10	5	58
30	2	6	1	1	10
94	68	73	52	16	219
			Total		760

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### Backstop 10

The academic backgrounds of the BS 10s are quite varied.

\* 83 had degrees in agricultural sciences, including general agriculture, agronomy, and animal sciences and many had advanced degrees in fields such as plant physiology, plant pathology, horticulture, soils science and entomology.

\* 73 had backgrounds in agricultural economics, economics and farm administration and management.

\* 20 had degrees in natural resources related fields: forestry, soils, range management, fish and wildlife management.

\* 4 were engineers.

\* 8 out of 10 had master's or Ph.ds. Slight more higher degrees were in the field of agricultural economics than in agricultural sciences. Most of the undergraduate degrees were in agricultural sciences or a non-agricultural discipline.

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Table 2. Academic backgrounds of agricultural development officers  
(April, 1987)

	Agricultural sci.	Forestry, soils, range mgmt.	Agricultural economics, economics	Engineering	Other
Degrees & totals					
BS/BA (37)	21	3	1	2	10
MS/MA (128)	47	12	60	2	7
PHD (37)	15	5	12	-	5
	<u>83</u>	<u>20</u>	<u>73</u>	<u>4</u>	<u>22</u>

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Motivations for long term training possibly leading to a degree can be generally assessed against this backdrop. A total of 27 individuals (discounting the non-agricultural degree holders) might be motivated to pursue a long term program possibly leading to a Master's. Some of the Master's might be interested

in another Master's degree, and a preliminary idea is gained from the responses to the cabled inquiry, reviewed in the next section.

Of the total BS 10 group only 11 occupied positions specifying forestry, environment or natural resources. All of the foresters are included; the foresters functioned as agricultural development officers as well as forestry project managers.

#### Backstop 14

Rural development officers are predominantly from social sciences background; many are anthropologists, economists or political scientists. Only one of the 27 rural development officers (BS 14), an IDI, has a natural resources designation in his position description.

Only four of the agency's 58 engineers are occupying positions titled "environmental engineer" (and all have environmental engineering backgrounds).

#### Employees with occupational titles or job descriptions in E/NR

These are the employees officially charged with and working virtually fulltime on E/NR matters. Since April, 1987, seven additional International Development Interns had been recruited and assigned to positions involving natural resources, environment or forestry.)

Academic levels among these backstops were distributed as follows:

Ph.d	8
Master	21
Bachelor	4
total	33

Those with bachelor's degrees only included two employed in AID/W and two BS 10's in the field, both with forestry degrees. None of this group have academic degrees in economics.

Nine of 33 have degrees in forestry, including seven with master's or Ph.d's. All functioned as agricultural development officers (BS 10), and were managing forestry projects. Six of the group had degrees in ecology or biology (including marine biology). Four are engineers (environmental or civil). Other academic backgrounds include anthropology, city and regional planning, entomology, law, agricultural sciences, animal sciences and history.

They were distributed by backstop code as follows (as of 4/87):

BS	number
01	1
10	12
14	1
25	5
30	3
75	8 (all in AID/W)
94	2
95 (IDIs)	1
total	33

Only one of these these individuals expressed interest in long term training when the missions were queried on the subject in State 180861. Only one responded with interest in short term training, a backstop 10 with a BS in forestry who desired training in coastal resources management. This is an indirect indication of the lack of career incentive to further specialize in natural resource fields, but it also may reflect a recognition by respondents with such training that U.S. universities may not offer state-of-the-art training in tropical resources management (in fields the have already studied).

#### Foreign service nationals

On-going technical competence within a mission can build up among the foreign service nationals, long term personal service contractors or GS employees attached to missions as support staff or advisors. (which in fact is the case in many missions). The unique effectiveness of foreign service nationals, owing to the continuity they provide as well as their cross-cultural communications abilities, is of particular note.

The numbers, backgrounds, job descriptions, and longevity of professional (as opposed to clerical) FSNs in the USAIDs worldwide were not ascertained. Many have served under more than one mission director and have seen a complete turn-over of American staff.

## **B. TRAINING NEEDS**

Institutional needs and individual needs and desires for training in NR/E are reviewed. Institutional training needs are driven by personnel policies and programs. Individual needs reflect personal desires and motivations related to job responsibilities and an individual's career path.

Since AID training courses are voluntary with few exceptions (the exceptions being language training and training concerning terrorism), institutional and individual needs must coincide for training to be successful. In this respect the agency's commitment to assistance in natural resources is an important factor in a individual's perceptions of the need for training. Also an individual's basic agreement with the policy and program context of E/NR work would have to precede a decision to seek training in new areas of endeavour. These kinds of perceptions could not be determined except indirectly through interviews.

AID personnel here includes foreign service officers, government service staff and foreign service nationals. The latter are increasingly shouldering environmental review and analysis work in many missions, are eligible for training offered to American AID staff, and in the past have participated in courses such as the Development Studies Program. A profile of the relevant backstops is presented in the preceding section.

### **1.0 Institutional Needs.**

Institutionally determined training needs are related to personnel policies as well as agency changes or to new initiatives generated at the AID/W level, often congressionally mandated, which cause policy and program changes. Corresponding shifts in mission portfolios can generate special needs, possibly requiring training. Short or long term training may be indicated by such changes, according to how extensively they impact upon the agency's work, personnel policies regarding occupational specialties and the financial resources made available through the FAA for the agency's work.

## **1.1 Personnel policies.**

Training required of AID personnel includes the five-week New Entry course for new employees (IDIs or BS 95s) and foreign language training.

Personnel policy encourages and facilitates transfers from one major region to another, e.g. Africa to Latin America, after four years or more in a post. Such transfers out of a region and increased job responsibilities generate a need for orientation-type training. Examples are shifts from field missions in one region to work in Washington in the bureau of another region, or shifts from one region to another, involving among other things language training (usually in French or Spanish) in Washington, D.C.

Inter-regional transfers present the employee with entirely different environments and ecosystems, or similar environments and ecosystems but entirely different natural resources management problems with respect to the social, economic and institutional context, e.g. African highlands v the Andean Zone. IDIs (BS 95s) about to be assigned to a region would also have a need for regional E/NR orientation.

## **1.2 Policy and program driven training needs.**

In the context of NR/E assistance, a number of new directions or emphases in AID policies and programs have occurred. These changes which originate in AID/Washington generate at least four sorts of training needs: (1) awareness raising training, (2) programming training, (3) substantive or technical training, e.g. skills training, and (4) regional environmental orientation.

### **(1) Awareness training**

Such training is needed when an entirely new initiative is begun, and for which there is no agency experience. This is well exemplified by the conservation of biological diversity. Virtually all AID personnel, beginning with AID/W staff in the regional bureaus should somehow be reached by this training.

A lack of awareness of the role and importance of biological diversity conservation at the USAID level was revealed during the ADO conference in Nairobi in September, 1987, during a workshop for BSs 10, 14, and 30. Of the 12 participants only two ranked plant germplasm conservation/improvement as a theme of critical importance to their work. One of the two was on detail to ISNAR (International Service for National Agricultural Research), where the issue is an important one.

## (2) Training for development assistance programming.

This refers to the explanation and clarification of a directive, plan or strategy to make it comprehensible -- and do-able -- in the context of bilateral program or project assistance. Program officers, project development officers, and agricultural development officers in particular would benefit from such orientation.

An example is the Food Aid Workshop series (Mombassa, Kenya, May, 1987, and Guatemala, Feb., 1988). These one-week workshops were organized by the Forestry Support Program to educate participants in the ways local currencies can be programmed to support forestry and agroforestry activities, a change resulting from the 1985 Farm Act.

AID's New Agricultural Focus statement, articulated after considerable consultation with missions, but drafted in Washington, is another example. Its reference to the maintenance and enhancement of the natural resource base as one of two major goals of agricultural development assistance, represents a major new directive whose wording raises questions at the mission level (and within the Title XII universities). At the LAC Agricultural Development Officer Conference in Harper's Ferry, for example, many questioned what sort of indicators besides production could be used to measure progress in maintaining or enhancing the natural resource base.

Clarification was sought among the land grant universities of the implications for their partnership with AID of the natural resources reference in the New Agricultural Focus Statement. A special BIFAD task force on environment and natural resources examined AID programs and related involvement of the land grant universities during September 1987 to February, 1988. (See draft report "Environment and Natural Resources: Strategies for Sustainable Agriculture.", BIFAD, Washington, D.C.).

## (3) Technical training.

New directions or emphases may require a measure of technical training to equip DHs with the needed level of knowledge and skills. Agroforestry, the conservation of biological diversity, pesticides management and environmental assessments are illustrative. Changes in the state-of-the-art of various technical fields also call for periodic training.

Two levels of technical training may be needed: (1) a management-oriented training level for DHs and (2) and specialized training for PSC or FSN advisory staff, whose qualifications may not include a specific skill.

Management oriented technical training would be of the type afforded in the current State of the Art in Agriculture and Rural Development Course. Basically it would equip a BS 10 14, or 12 to survey and diagnose needs, review options

and proposals and undertake pre-design surveys and commission PID design work in new NR/E areas mandated by AID/W.

Skills training would be targeted on selected backstops and on PSC or FSN advisory staff, especially long term environmental advisors who help scope and manage work required under Regulation 216 and generally advise mission DHs on a range of environmental and natural resources issues.

## **2.0 Mission defined training needs.**

Training needs may arise from unique mission circumstances or projects which demand not only additional technical staff (PSCs or FSNs) but greater competence among American DHs as well. The emergency locust and grasshopper control program in the Sahel is illustrative. It created the need for special management skills related to the handling and monitoring of pesticides used, and several workshops were held to fill this training need.

In missions which handle very large PL 480 accounts, e.g. the Republic of Guinea or Madagascar, special training on the institutional dimension of natural resources management may be called for, to the extent that such accounts could support institutional strengthening programs. Earlier in this decade a number of USAIDs in Africa launched ambitious schemes in support of river basin development; prior or on-going training in the various approaches, successes and failures in this type of development might have been well received and used. The management of very large infrastructural projects financed with Economic Support Funds represents another unique situation, requiring among other things competence in environmental assessments.

In small missions discrepancies between staff capabilities and the management skills required by a mission's portfolio are to be expected. In such missions officers may perform multiple backstop functions, e.g. 10 and 30, 11 and 94. Discrepancies can also occur in larger missions with changing portfolios that focus on natural resources aspects more than previously. However, the rather deliberate pace of CDSS changes and the project cycle normally allows for needed staff changes through routine rotation or contracting.

An indication of mission-defined training needs was elicited in responses to a cable to missions inquiring about staffing needs in E/NR, specifically, "What [E/NR] specializations would be most useful to future mission requirements?" (State 145149 -- ANE and State 165203 -- LAC, "Environment/Natural Resources Staffing Needs). Many missions responded by referring to existing PSC and FSN staff resources which met current needs for specialized assistance.

In the Asia and Near East region, large missions with substantial on-going work in natural resources have resorted to contractors and foreign service nationals to supplement direct hire expertise. Consequently, there wasn't a strong perceived

need for a regional E/NR advisor nor did the question elicit a listing of specializations. However, useful comments were made.

USAID/New Delhi addressed the widespread situation of environmental degradation and its implications for staff competence as follows:

"It is our impression that the principal environmental degradation issues in India stem from the cumulative effects of decisions and actions taken by hundreds of thousands of small farm households in the course of securing their livelihood from agriculture operations and the rural economy more broadly. These cannot be reached through standard environmental impact assessment nor regulations. We believe the principal need is to supplement existing skills of BS10 and BS14 employees and enable them to more rigorously assess the longer-term impact of agricultural practices and behaviors of rural people in meeting their energy, fodder and fiber/building material requirements."

USAID/Bangkok suggested the development of an intensive natural resources and environment training program, along the lines of the Development Studies program, and which would be oriented to backstops 10, 12, 15, 25, 30, 75, and 94. USAID/Manila stressed a continuing need for watershed management and forestry expertise (which existed in the mission at the time.)

In the Latin American and Caribbean region all of the Andean nation missions projected the needs for competence in forestry and soil conservation; only two mentioned biological diversity as an area needing special mission expertise (ROCAP and the Dominican Republic) even though Peru and Ecuador are hosting activities in this area as well. More broadly stated needs for future specialization were also stated: natural resources management, watershed management, water resources management.

Coastal and island nations foresaw the need for specialized backstopping in water resources management, fisheries and mariculture, and in pollution questions (water and wastes)

These responses are somewhat helpful in mapping out a training strategy, but are more indicative of missions' thoughts on staffing for E/NR than for training.

### **3.0 Individual desires and needs for training.**

Individual training desires were elicited in June, 1987, query worldwide on training needs and desires in the fields of natural resources and the environment ("Development of AID Professional Staff Competence in Environment and Natural Resources", State 180861).

Missions were asked to indicate interest in training among their direct hire and foreign service national staff. Four examples of training subjects were offered in the cable and the desires for training in the responding cables referred to those same four subjects, 9 times out of 10. The four examples were:

- \* Forestry and agroforestry
- \* Environmental impact assessment
- \* Soil/water management
- \* Natural resources economics

Responses to this cable set forth training candidates, including for each one data on backstopping responsibility, education and experience, and desired short and long term training areas. Individuals indicated interest in short and/or long term training in the four categories given in the cable as examples, as well as additional topics.

	Total missions	Missions responding	Individuals responding		
			DH	FSN	Total
Africa	33	9	6	5	11
ANE	17	12	32	13	45
LAC	11	5	9		9
	61	26	47	18	65

There were no responses from REDSO/ESA, REDSO/WCA or ROCAP.

It is noteworthy that so few missions from Africa responded, given the gravity of the various environmental problems on that continent.

[Nevertheless, at the African ADO conference in Nairobi, September '87, 10 out of 12 BSs 10 and 14 at a workshop on training indicated that training in natural resources and conservation was one the most critical themes. ]

The number of respondents is small relative to the total numbers of employees in the field, in the various backstops.

\* 25 out of 202 BS 10s

\* Only 2 of the agency's 219 BS 94s

\* Only one of the agency's 64 BS 11s responded

\* None of the 27 BS 14s responded

Expressions of interest in terms of subject matter were distributed as follows:

Soil and water conservation, biological diversity, land use planning, natural resources "management",etc.	30
Agroforestry or forestry	15
Natural resources economics	17
Environmental policy and procedures (i.e. in complying with Reg. 216)	18

Interest in long term and short term training was distributed as follows:

	Long term	Short Term
Africa	5	13
ANE	8	35
LAC	2	6
	<u>15</u>	<u>54</u>

Fifteen were interested in long training, two of whom were FSNs. Fifty-four listed short term training. The totals reflect that some indicated both long and short term training.

The most numerous expressions of interest in various training subjects came from BS 10s -- 25 of the total of 65 individuals. Next most numerous were foreign service nationals with engineering backgrounds; they accounted for 15 expressions of interest. They were followed by BS 12 officers with 10 mentions.

The responses of these three groups were distributed among the four subject areas as follows:

	Nat. Res. economics	Env. procedures	Agroforestry forestry	Other NR -- soil/water conservation biodiversity etc.
<b>Backstop</b>				
10	9	3	4	9
FSN eng.	1	6	2	6
12	3	2	2	3
Other BSs & FSNs	10	9	7	12
<u>Totals</u>	<u>23</u>	<u>20</u>	<u>15</u>	<u>30</u>

Only one BS 11 (economist) responded, expressing interest in short term training in agroforestry and soil and water conservation. Only two BS 94s responded, expressing interest in natural resources economics and forestry/agroforestry. The remaining 8 individuals were scattered among BSs 12, 16, 20, 25, and 30.

The academic backgrounds of the 25 responding BS 10s were quite diverse, and included agricultural economics, horticulture, irrigation engineer, agronomy, forestry, zoology, wildlife management, range science and soils. In fact, because of this diversity and the mention of more than one short term training topic there is no basis for a quantitative analysis. There was a tendency to broaden skills. A number of BS 10s with formal training in agronomy or forestry indicated an interest in natural resources economics, while the agricultural economists expressed a desire for training in agroforestry, forestry and other aspects of resources management.

This desire to broaden or diversify one's skills was evident in responses from other American direct hire backstops also. On the other hand, among the FSNs who responded there is interest in training which builds on prior training and experience, i.e. which specializes. Also, the numerous requests by FSNs for training in environmental assessment is notable, and revealing the importance of FSNs in helping comply with Reg. 216 in some missions( principally in the ANE region).

FSNs and long term PSCs appear to constitute a professional cadre of technical specialists in the field who provide continuity as American DHs rotate in

and out of missions. A training approach geared to these individuals is needed. There is no career path for FSNs, which nevertheless did not detract from many requesting skills-enhancing short term training.

### **3.1 Short term training desires.**

All respondents were interested in short term training.

Cable responses concerning short term training were fairly precise, and many topics were mentioned in addition to the four given as examples in the out-going cable, which were:

Agroforestry and forestry  
Soil and water conservation  
Natural resources economics  
Environmental impact assessment

Additional topics in which there was interest were:

Biological diversity conservation  
Natural resources "management"  
Coastal resources management  
Industrial pollution  
Water planning  
Landuse planning in semi-arid environments  
Programming implications of AID's natural resources policies

Notable for their absence are the topics of watershed management, common property resources management, fisheries, and renewable energy resources.

The frequency of mentions was fairly evenly distributed, although in general natural resources economics was of less interest in short term training than the other technical areas.

The academic backgrounds of the BS10s who proposed short term training show:

\* a desire for those with specialized degrees(e.g. zoology, range science, wildlife management), to diversify within their general field, e.g. into other natural resources technical specialties. Most with specialized degrees were relatively new employees.

\* a desire by those with more general degrees and degrees not related to natural resources to diversify into fields such as agroforestry and natural resources economics.

\* a desire by economists to study natural resources economics, and in one case only, soils conservation.

Only two of the 40 engineers in the field expressed interest in environmental impact assessment training. This is notable given the fact that since 1975 there has been no in-service training for AID engineers in environmental assessments. According to Robert Adams, engineer in the Africa Bureau and with AID since 1960, only about 10 of the 40 current field engineers took the 1975 training course, given at the University of North Carolina

### 3.2 Long term training desires

Interest in long term training was modest; only 15 individuals responded. In general, these individuals sought to broaden their academic base, rather than specialize further in their previous field of training.

The cabled query for expressions of interest in training gave examples of training that might be desired: forestry and agroforestry, environmental impact assessment, soil and water management, and natural resources economics. Respondents listed additional fields of interest for long term training:

- integrated watershed management
- coastal zone management
- natural resources management
- landuse planning for arid/semi-arid lands

These are lumped below with soil and water management under the rubric of natural resources management (in technical fields other than forestry and agroforestry).

Of the 15 individuals in USAID missions expressing interest in long term training, two were foreign national direct hires. All but two possessed Master's degrees. Several responses expressed interest in several fields. The fields of most interest were:

Natural resources economics	6 requests
Natural resources management	5 requests
Forestry/agroforestry	4 requests
Environmental assessment	1 request(an FSN)

The relationship of academic backgrounds to requests was as follows:

<u>Training requested</u>	<u>BS and Academic background of respondent</u>	
Natural resources economics	11	engineering
	14/30	ecology
	94	economics (FSI grad.)
	10	forestry
	10	agriculture
Natural resources management science	10	environmental (various technical fields)
	10/30	zoology
	12	science and technology in public policy (GWU)
	10/30	range management
	FSN	diplomas in survey methods, ecology
Forestry or agroforestry	11	economics
	FSN	agriculture/livestock
	FSN	other

The individuals who expressed interest in long term training in forestry and/or agroforestry were not foresters, even though there are four foresters in the agency with bachelor's degrees only. Individuals interested in other technical fields in NR/E ("natural resources management") showed interest in broadening their technical preparation by choosing an another specialty, or alternatively by studying a more general curriculum, e.g. landuse planning.

Lack of interest in further forestry training among the agency's forestry degree holders is may be explained in part by their realization that U.S. universities are weak in tropical forestry, at least from the viewpoint of mid-career AID professionals with experience abroad. Also, U.S. universities have only recently begun to develop programs in agroforestry, notably the U. of Florida. Non-foresters would not be aware of this weakness in graduate level training, of course.

Frequently mentioned during interviews on the question of training as it relates to career advancement was the career incentive to broaden one's academic base rather than to further specialize. There are limited opportunities for career advancement on the basis of a specialized field (with the possible exception of Bureau for Science and Technology positions requiring technical competence). On the other hand, becoming competent in other fields or other skills than those of one's academic focus prepares one for greater management responsibilities.

The above factors probably explain the pattern of responses for long term training when these are compared to the respondent's previous training. Also they may explain the lack of interest in long term training in E/NR among AID staff with responsibilities in natural resources and the environment.

Interest in obtaining long term training leading to a degree, as opposed to non-degree training is not likely to be great among individuals with graduate degrees, unless a second Master's were desired (e.g. M. Kux, BS 75, who added an M.S. in forestry to an M.A. in political science).

## **4.0 Discussion**

The cable responses concerning short term training appear to reflect individual's immediate needs for additional skills or knowledge, and the fields of interest were very diverse, reflecting the host government's environmental and natural resources needs as well as job responsibilities.

### **4.1 Motivations for training**

Agroforestry and environmental assessment were the most frequently mentioned specific fields for which there was interest in short term training.

The interest in agroforestry came from economists or persons with general agricultural training, indicating that this technology is now well accepted and important to understand.

The demands of undertaking adequate IIEs and EAs as well as the regulatory requirement motivated many to seek training in EIS procedures. However, almost one half the interest was among FSNs; only two BS 25s were interested, indicating a greater diffusion of responsibility for EIA among AID staff. Also it is indicative of the relative decline in the number of capital projects in USAIDs around the world, evidenced by the fact that the population of engineers in AID has halved since 1975, from 120 to 58. None are among the current IDIs. Understandably the FSNs interested in EIA training are from those missions with important capital projects, e.g. USAID/Islamabad.

The considerable variety of other short term training topics that were mentioned revealed the great diversity of situations in which individuals find themselves, in terms of particular skills or knowledge that would help their performance. Trends or patterns were not evident in terms of subject matter, but it was clear that individuals sought to broaden their knowledge base rather than specialize, with the exception of the FSNs mentioned at the end of this discussion.

Long term training desires are indicative of individuals' career path strategies, and especially the preparation needed for career advancement. Since career

advancement is very limited at present for BS 30 officers, there is little strategic incentive to seek long term training in natural resources or environmental fields. It is therefore all the more remarkable that eight individuals expressed interest in technical fields in NR for long term training, as opposed to training in natural resources economics. None were BS 30s.

#### **4.2 The special case of FSNs**

The respectable number of FSNs who expressed interest in short term training, as well as their tendency to specialize or become better prepared in a technical field creates a special context for training planning. These individuals' career motivation is considerably different from that of their American colleagues. Their career path must be towards technical specialization, for lack of opportunity to advance along the path of increasing management responsibilities, at least as long as they are USAID employees.

#### **4.3 How much specialized knowledge is needed?**

At the mission level, specialized technical knowledge is not a predominant or routine requirement in the various tasks carried out by different backstop officers, with the exception of the environmental officer (or advisor if contracted). Rather there are sporadic needs at more or less predictable points in program or project development for specialized knowledge. Many BS 10s are nevertheless trained in forestry or agronomy with emphasis on soils, and many have worked on natural resources projects during Peace Corps tours or in the United States prior to joining AID. Their hands-on or practitioner's knowledge is a valuable asset but is seldom needed, however.

During the September, 1987, Nairobi Conference for African ADOs one of the workshops examined what skills are needed by BS 10s, 14s and 30s for future programs. Managerial skills were ranked more important than technical skills. Needed technical skills were listed as follows:

- \* general background and experience in ag/rural development and/or natural resources.
- \* basic scientific background (knowledge of scientific method)
- \* ability to relate this process[sic] to client application
- \* ability to think in a systems perspective.
- \* socio-economic analytical skills to assess trade-offs

The responses may reflect the ability of missions to contract or acquire by

means other than direct hiring specific technical skills. Technical expertise can be contracted or accessed through regional support offices as well as various support projects, e.g. NRMS in Africa and DESFIL in Latin America, regional bureau RSSAs and PASAs, and some 22 support projects in the Bureau for Science and Technology. The Joint Career Corps also is being drawn upon to supplement mission's staff needs and could be used for obtaining long term expertise in natural resources. In the field of forestry in particular, the Forestry Support Program constitutes the repository and source of specialized technical knowledge in all aspects of forestry. Until now, USAIDs have thus obtained needed technical expertise while at the same time observing hiring ceilings by contracting PSCs or FSNs, or by arranging for long term assignments through USDA PASA agreements.

Nevertheless, there are disadvantages. Contracting out expertise in E/NR has the disadvantage of isolating technical competence at the advisory level, especially since advisors are usually enlisted to do as much management work as is administratively possible. Hence, even management expertise in technical fields is not gained by the American DH supervisor. As a result the American DH who supervises the staff may have neither the on-the-job experience nor the background needed to evaluate the accuracy and completeness of work done and, more generally, to make technically sound decisions.

A certain level of in-house technical competence is needed to begin a project or program, that is, to conceptualize and develop the rough outlines of its operation, as well as to manage its implementation. Portfolio programming and planning also requires a measure of competence and understanding in many different areas, but increasingly in natural resources. Country Development Strategy Statements are being revised and up-dated world-wide to take into account the directive to support the conservation of biological diversity and tropical forests. Ideally, Program Development Officers should have a grasp of the principles and practices involved in natural resources management. Also, within missions there should exist competence to deal with the relationships, both technical and economic, between agricultural policy and natural resources management.

Finally a program strategy revision will be required by the emphasis in the New Agricultural Focus statement on the maintenance and enhancement of the natural resources base. These shifts are beginning to stimulate new projects, which, the case of biological diversity conservation have initially been designed and managed at the regional bureau level. Mission-level design and implementation will follow as a more deliberate process of funding is achieved. A certain degree of competence to deal with these subjects must exist at the mission level. A brief look at the generic skills involved in project or program design process helps define the level needed.

## **5.0 Generic and specific needs for knowledge and skills**

### **5.1 Generic needs.**

Mission personnel begin the project design process in preparing for the annual budget submission (ABS). Fairly complete project concepts are drafted and presented in summary fashion in the ABS. These concepts must be sufficiently complete to be justified and defended at the ABS reviews in AID/W. They are generated with little outside assistance except for short-term services from S&T support projects or regionally based advisors. An approved ABS level project concept becomes the kernel and basic orientation for subsequent PID and PP design work.

The mission project officer, whether backstop 10, 14, 15 or 94, must have sufficient familiarity with the field to envision a project in its early design concept, and to draft scopes of work for pre-design studies or technical assistance, as well as for PID and PP design.

Sufficient competence must exist to discriminate among technical alternatives, development approaches, and other methods that may be proposed by host country colleagues, contractors and others. Where issues, controversy, or disagreements cannot be resolved the AID project officer must know where to go for help, and ultimately to successfully justify and defend a project paper.

The project officer must be able to manage technical work performed by others during design or implementation. Here again, in addition to interpersonal skills, technical discrimination is needed, especially with regard to technologies or approaches that may be proposed or required in the course of project implementation. In their management of FSNs or PSCs, American DHs in backstops 10, 14 or 25 may not have to enter into technical detail, unless there is controversy. However, they must have sufficient grasp of various technical fields to address such issues as the appropriateness of methods or approaches, the reasonableness of costs, the soundness of economic analyses, and so on.

### **5.2 Needs for knowledge and skills related to environment and natural resources.**

Technical, social, economic and institutional aspects of natural resources management must all be addressed during design work as well as project management. Ideally, a project officer would be conversant in all these areas. This is unlikely. However, those with technical skills and background only are handicapped more than those with social sciences and managerial backgrounds only.

Needs for E/NR skills and knowledge vary according to backstop and position responsibilities. Backstop 30 should be the most well prepared, with a broad base

of knowledge and skills plus professional competence in two technical areas: environmental assessments and pesticides management. Competence in both areas should also exist in every mission with capital development and agricultural development projects.

Backstops 10 and 14 should have considerable familiarity with natural resources and the environment and some working knowledge of problems and solutions relevant to the soils, water and forest resources of the host country or the region, particularly in their role of sustaining agricultural activities and rural livelihoods.

Food for Peace Officers should be sufficiently familiar with the kinds of technologies and approaches in soil conservation, forestry and agroforestry that can be supported through PL 480 to conceptualize, design and negotiate programs with the host government and associated implementing entities. Normally FFPOs can obtain technical advice and design assistance from a BS10 or 14, but there are exceptions, e.g. Guinea.

Program development officers (BS 12 or 11) and officers in charge of project development (BS 94 or 11) should possess a comprehension of the essential role played by various natural resources in rural and other development, of the basic aspects of renewability or sustainability, of the principles of natural resources economics, and the methods of economic analysis pertaining to natural resources.

All engineers should be capable of performing IEEs and commissioning EAs where necessary, of capital development projects.

A more detailed listing of general knowledge and skills related to environment and natural resources areas is presented in Annex 11. Reference is to a range of knowledge and skills that are needed to assess, initiate and carry out project or program assistance concerned with natural resources. Knowledge required of specific natural resources, e.g. soils, or of specific approaches, e.g. watershed management, is not noted, however.

In essence, what AID needs are many generalists in natural resources management, rather than a few technicians. Technical depth in one of the natural resources fields is a desirable foundation for broader more general knowledge and skills, but not necessarily a sine qua non, as long as fundamentals are learned.

## **5.2 Environmental assessment and pesticides management.**

The exception to the axiom that DH's need to be well prepared generalists is found in two areas requiring a higher level of technical competence:

- (1) environmental assessment and
- (2) pesticides management.

Work in these areas is guided by Regulation 216. In neither case is there adequate technical competence, notwithstanding the fact that Regulation 216 has been in force since 1979.

### Environmental assessment.

Individual requests for training in environmental assessments, noted above, tend to corroborate the need for this kind of training and indicate the need for a short course or other training exercise. EIA training has been held in the past for AID personnel but the attendees represent only a small proportion of the present personnel. During the early 1970's, when the focus of environmental concerns was on capital development projects, all AID's engineers were required to take a special two-week course at the University of North Carolina, titled "Engineers Environmental Program". A total of 119 engineers attended this series during 1973-1975. Of that group approximately 20 are still with AID, half of whom are in field missions. Thus, only 10 of the 40 engineers presently in the field had the training.

Also, fifty-seven individuals attended a series of three workshops on "Techniques of Environmental Investigation" at Clark University, during 1978 and 1979. This course, also sponsored by the Training Division, targeted a more general audience of middle level personnel. The proportion of those who took the course that are still with AID was not determined.

### Pesticides management

Cable traffic did not reveal any interest in pesticides management skills. However, these are not adequate according to the contractors and USDA people who assist missions in pest management.

There needs to be on-going professional training in pesticides management, and ideally one person in every mission with an agricultural development office should be competent to supervise and monitor the pesticides used in various projects or programs. The individual could be a BS 30, 10, FSN, or PSC.

Secondly, greater skill and competence in the addressing pesticides issues and pest management of IEEs and EAs is needed, especially as regards their use in choosing design alternatives. In agricultural projects that support production, integrated pest management, as opposed to control only with pesticides, would be the normative or anticipatory aspect of an environmental focus on project design.

Training in environmental impact assessment methods is especially needed to equip DHs and FSNs to plan and oversee environmental assessments. A level of technical competence and professionalism should be attained by BS 30s and their FSN counterparts in this area.

## 6. Conclusions

Technical training for AID DHs in virtually every mission is needed in two specific areas: (1) pesticides management and related pest control methods and (2) environmental assessments. FSNs and PSCs may also need this training, if they are charged with these tasks by missions.

A high level of technical knowledge and skills cannot be demanded at the mission level in the fields of soils, water, forests, range, agroforestry, conservation of biological resources, watershed management, and others. Only a "renaissance technocrat" or someone with long and diverse experience (there are a few) would be able to claim such a curriculum vitae. AID DHs do not become directly involved in these fields as practitioners, but rather are the architects, facilitators, and managers of financial and technical support.

Within missions ENR expertise is contracted, and general rather than expert knowledge is what DHs need. To the extent, however, that large AID missions rely heavily on long term PSCs or FSNs for technical expertise, and given the fact it is difficult to keep up with one's technical field while working abroad, there is justification for continuing state-of-the-art training in E/NR subjects and also for sending PSCs or FSNs to more in-depth technical workshops and other training events that perfect or broaden their expertise.

AID direct hires occasionally need short course training in specific E/NR topics or skills, to better equip them to deal with design or implementation work. Soil and water conservation and agroforestry are examples, and are topics frequently mentioned by AID staff in cabled responses on training desired.

## **C. TRAINING OPPORTUNITIES AND POSSIBILITIES**

Training opportunities and possibilities are reviewed against the backdrop of training needs presented in the previous section. Short term training is the means whereby most needs must be met, whether these be individually felt needs or institutionally determined needs. Numerous opportunities exist in currently offered AID in-service training courses for introducing awareness training. There are limited opportunities in AID courses for teaching general or specific knowledge and skills in E/NR, however, particularly as compared to the training needs.

### **1.0 Training provided by AID**

AID's Office of Personnel Management is in charge of agency personnel training, both long term and short term. Only the short term training is relevant to E/NR training possibilities. The long term training consists of a six month course in economics at the Foreign Service Institute, which stresses mathematical applications and econometrics. The Training Division does not finance travel and living expenses of USAID employees who participate in these courses. That expense is borne by the mission out of Operational Expenses (OE) budgets.

The "target backstop population" mentioned below comprises backstops 10, (total of 214), 11 (64), 12 (108), 14 (27), 15 (60), 25 (58), 30 (10), and 94 (219), totalling 760 individuals as of September 1987, not counting those on complement, i.e. in language training, in long term training, in transition and not yet assigned, sick leave, etc.

### **1.1 Short term training**

That office finances and manages (or contracts out management for) a number of short term training activities that could be vehicles for short term NR training of two types: Awareness raising and general E/NR skills and knowledge. They are listed next with brief comments on the scope for introducing subject matter on natural resources and the environment. Recommendations have already been made to PM/TD concerning the first two activities.

### Development Studies Program.

7-week course, twice a year, 25 per course. Available to employees with 5+ years.

In the target backstop population of concern here, 304 of the total 760 are eligible for the program, and 67 have completed the study program. There is some scope for introducing E/NR material into this course, especially in the area of natural resources economics, institutions and policies (see Annex).

### Agriculture and Rural Development and Agricultural Policy.

One week each, back to back, once a year in June, 25 per course.

E/NR resources emphasis has been introduced into this course in 1987 and will be retained in 1988. General knowledge and skills can be taught, plus some state-of-the-art review.

#### Project design course (begun in 1984)

1 week long, three times in 1987

223 of the target population have taken this course and as of September, 1987, only 27 were eligible.

Very little scope exists for including anything except Reg. 216 compliance, and there is no time to enter into normative environmental planning methods for project design.

#### Project implementation course (begun in 1981).

2 weeks long. This course was held four times in 1987, including one in Harare and one in Santo Domingo. When held in the regions, it is open to PSCs and FSNs.

471 of the target backstop population have taken the course; 163 were eligible to take it.

Very little scope exists for anything except Reg. 216 aspects (of "rolling designs" that require periodic assessments during implementation) and a mention of monitoring and evaluation of environmental impacts.

New Entry Training Course.

4 weeks plus 1 week project design course.

No RAMPS training statistics were seen on numbers trained.

There is very little scope for E/NR material. Attendees report being overwhelmed with information and documents before the first week is up. Also perspective on what is needed is weak for lack of experiential context.

Area/country studies.

1 week, self structured, prior to departure to post

Some possibilities exist for awareness training as well a general orientation on environmental and natural resources of destination country, but these depend on individual motivation. Well chosen videos could provide awareness training.

Foreign language studies.

Distinct possibilities exist for awareness training using foreign language films on E/NR subjects. The language trainee is preparing for work in a region unknown to him or her. Both language abilities and a general orientation on environmental and natural resources characteristics and problems could be obtained by seeing and discussing a film on the subject.

Additional training supported by PM/TD but not managed by that office are:

Foreign Service Institute Area Studies Course.

2 weeks long, at two month intervals.

Available only to AID employees with regional responsibilities in AID/W or in the field.

Limited scope exists for introducing E/NR material, but the course could be an opportunity for imparting awareness and general knowledge. One, two-hour session is already devoted to the topic for the Africa region (Ecology and Development in Africa).

Off-site training.

The off-site training budget of approximately \$150,000 sponsors 300 to 400 individuals per year for short term training. The content depends upon the applicant's initiative.

"Off-site" refers to university-based or USDA courses (no more than one semester or quarter, i.e. 32 to 40 hours) taken after hours in the Washington D.C. metropolitan area, as well as short workshops or technical courses. In the case of training outside of the Washington D.C. metropolitan area, only short technical courses or workshops can be attended and PM/TD only pays tuition or workshop fees. The applicant or the bureau or mission must pay for travel and per diem expenses.

This training vehicle is an excellent mechanism for gaining specific skills or knowledge useful to an employee but not of sufficiently generalized importance to warrant AID financing of a special short course.

The short term training possibilities in this category are very large indeed, and could include international short courses and workshops as well as ones presented in different parts of the United States, treated below in Section 3.0. Off-site training is probably the best vehicle for an individual to obtain short term training on a specific skill that may be catered to in a U.S.-based or international short course.

In the Washington metropolitan area, the University of Maryland and the USDA Graduate School offer the most courses germane to E/NR subjects. However, the choice of after hours courses at U. of Md. may be limited; special arrangements may be needed for leave without pay to attend lectures, which may or may not be practical, depending on timing. Courses available at the U. of Md in 1987/88 and at the USDA Graduate School are annexed.

The E/NR training resource center, described in the recommendations section would compile and communicate short course availabilities to AID employees in AID/W and worldwide.

## **1.2 AID-financed long term training**

Long term academic training is offered to a small number of individuals in AID every year. From one quarter to one academic year (3 quarters or two semesters) is financed. If justified, training may be extended by one semester or a quarter, in order to acquire the course credits needed to obtain a Master's degree. However, educational costs of the extension must be borne by the candidate, who would be on leave without pay status.

In any one year 10 to 18 candidates for long term training may be approved for support. Under existing funding only a handful of individuals could be trained in NR/E fields each year...probably not more one third the total, assuming acceptable proposals. (In 1987 none of the long term academic trainees was studying a natural resources subject.)

The supply side of the long term training equation is far greater than the demand, or trainee, side. Contacts were made with a number of universities and centers, but not all possible places. Two compilations of natural resources training offered at U.S. academic institutions exist:

RARE/WWFUS/IIED. 1984. Natural Resources and Environmental Management at North American Universities: a Guide to Training Opportunities. 306 ps plus supplements. Available from the World Wildlife Fund, Washington D.C.

USDA. 1987. Profiles of USA Forestry Schools; A Report by the Forestry Support Program(FSP). 235 p. Available from the Forestry Support Program, International Forestry Staff, USDA Forest Service, Washington D.C.

These are the best available guides for individuals interested in long term training in technical areas. The first does not cover the subject of natural resources economics as thoroughly as the various technical fields and is somewhat dated, but is the most complete guide available.

A few brief comments attempt to sketch in broad brush strokes the "supply" of long term training.

The cutting edge of knowledge in Third World natural resources management is often found or being forged in development assistance projects, not in academia. For instance, the management of natural forests in the semi-arid tropics, low cost land rehabilitation techniques, and fuel-conserving stoves are examples of innovations occurring in the Third World, largely within the context of development assistance projects.

However, in instances where university professors and researchers are involved in AID or other international development assistance (and/or have benefitted from Title XII support for program development), development experience, knowledge and special courses can be found within universities. Consequently, land grant universities actively involved in AID programs are a clear first choice for long term training with a technical or scientific focus, as well as training in natural resources economics. Lists of programs and strengths of some of the land grant universities, along with information taken from the above two sources appear in the annexes.

The ideal long term curriculum for an AID employee seeking to broaden his/her capability to manage technical and financial assistance dealing with various kinds of natural resources interventions would include a range of resources: soils, water, rangeland, natural forests and other natural vegetation, biological resources, and coastal zone resources. The course should work equally well for zoologists

and economists. It would amount to an introduction and a review of technical approaches in the different fields.

Nowhere was a two-semester or three quarter program found with such a curriculum. Although the various subject matters might be found in courses in different parts of large universities such as the U. of Florida, UC Berkeley, U. of Wisconsin at Madison or Cornell U., the programmatic umbrella would be missing.

Nevertheless, some universities cater to the need for flexibility that would apply to AID mid-career professionals, i.e. Duke University, and the U. of Washington. A broad offering in natural resources economics and related social, institutional and planning aspects of natural resources in economic development are also represented in the programs of non-land grant universities including Clark U., U. of Michigan and UC Berkeley.

Deficiencies exist in U.S. universities, according to interviewees, especially in the fields of tropical forestry whether humid or arid zone, agroforestry, and range management in the underdeveloped tropics. An evaluation of a recent agroforestry study tour for Senegalese (arid zone) foresters stressed the fact that there are no ecological parallels between arid tropical and temperate zone forestry, even in the Sonora desert. One of the most interesting "agroforestry" sites visited was a black walnut plantation in Missouri, interplanted with field crops.

Unlike work in the agricultural sciences, tropical conditions cannot be simulated for the forestry sciences. Only the U. of Florida and Yale claim to have tropical forestry training capabilities, and although the U. of Florida now is developing agroforestry education and research, with P.K. Nair formerly of ICRAF included in its faculty, this is a new program. The U. of Washington has also had a long involvement in S.E. Asian tropical forestry. Only the U. of Arizona has developed training and research in arid zone forestry and related watershed management.

The influence of environment also applies to the applicability of soils course offerings to the developing world in the tropics. However, Cornell U., the U. of North Carolina, the U. of Florida, and possibly the U. of Hawaii have teaching staff well experienced in tropical soils.

There are some possibilities outside of the U.S. For instance, the graduate school at CATIE (Turrialba, Costa Rica) provides Master's level training related to humid tropical environments, in soils, forestry, agroforestry, watershed management and pasture management.

The subjects of natural resources economics and water resources planning and management are less bound by environmental circumstances. Several U.S. universities are strong in natural resources economics and, moreover, have

international interests and involvement, e.g. U. of Md., U. of Wisconsin, Madison, UC Berkeley. Watershed management work is a strength at U. of Arizona, where international short courses as well as graduate programs have been developed. Also at CSU, Boulder, watershed management is a strength; Ted Cheng formerly a watershed management expert with FAO now teaches and does research there.

## **2.0 Relevant training offered by other development institutions**

Short term E/NR training offered by the World Bank, the Inter-American Development Bank, or UNEP could be of relevance to AID employees. In fact, the potential is greater than the actuality, and AID initiatives in regards to collaborative in-service training might be well received and mutually beneficial in terms of cost sharing. This possibility is treated in the next section on recommendations.

### **2.1 The World Bank**

No resources are presently devoted to staff training, although there are internal initiatives towards determining training needs in environmental matters, in response to the recent creation of an Environment Department and Regional Environmental Advisors in the Bank. During the Bank's recent reorganization the Personnel Department's Training Division was dissolved.

The Bank's Economic Development Institute has recently organized a high level Land and Water Ecosystems Management Seminar for presentation in the different regions of the world. Two have been given (in Washington, D.C. and Nairobi) and two more were planned (Costa Rica and Manila). The course's syllabus is appended for its potential interest to AID in designing in-service training on the same subject. This experience could also be turned inward to the needs of World Bank personnel, and if so would be of potential interest to AID as a joint endeavour. However, the general view in the World Bank is that its personnel are already high trained and experienced professionals, not in need of training. Nevertheless there is considerable attendance and professional interest among World Bank personnel diverse seminars organized by environmental staff as well as the yearly Agricultural Sector Symposium, which increasingly treats natural resources.

### **2.2 The Inter-American Development Bank**

In December, 1987, IDB held a three-day seminar for its staff on environmental considerations in project development. The event was contracted out to Tropical Research and Development, Inc. one of the AID IQC contractors in environment and natural resources. The seminar examined the environmental aspects of projects in agriculture, livestock, transportation and hydroelectric power.

The seminar dealt with what is one of the identified short term training needs in AID, namely environmental assessment procedures. It may be given again. However, IDB's needs in this area are on the one hand far less defined (for lack of the regulatory specificity contained in Reg. 216) and on the other hand much broader, since IDB deals with industry and infrastructure, as well as agriculture. An exchange of course reading materials would be fruitful, however.

### **2.3 UNEP sponsored courses.**

A three week geographical information systems course on "environmental management" which focuses on national level concerns and the use of remote sensing for planning is being offered in Switzerland for the third year.

Training in water management will be available through UNEP's newly begun program for the Environmentally Sound Management of Inland Waters, with particular reference to expertise needed for institution building. An 11-day course on the theme was given in Harare, Zimbabwe in October, 1986.

Training in industrial pollution control is supported and organized in different parts of the world by CEFIGRE, the UNEP/Government of France funded International Training Center for Water Resources Management, in Valbonne France.

### **3.0 Special short courses and workshops**

Agroforestry, soils and water conservation, environmental assessment procedures and methods, and natural resources economics were themes frequently mentioned by AID employees interested in short courses. AID's Training Division can underwrite the registration costs of such events, but not travel and per diem.

A systematic survey and inventory of the availability of short courses on these themes was not carried out. A calendar of short training events related to agroforestry and other forestry subjects is appended.

Short courses and workshops which build skills, general knowledge, and awareness in various E/NR subject matters or themes are very numerous. They are held here and abroad. It appears that few are suited to in-service training in development agencies such as AID. Most are aimed at Third World participants. However, the more specific and technical the subject matter treated in a workshop, e.g. agroforestry design methods, the less problematical is the question of fitting workshop learning goals to participant needs. Awareness raising workshops would have to be more tailored to AID participants. Training to increase general knowledge and skills, e.g. SOTA course, requires the greatest care in fitting course content and process to AID employees' needs. The recent IDB seminar on environmental considerations in project design would have been unsuited to AID employees needs, for example.

The general weakness among U. S. universities in the scientific and technical aspects of natural resources in tropical environments is a distinct handicap in respect to skills-enhancing short term training. Interviewees had reservations as to the possibility of U.S. universities putting courses in the fields of agroforestry and watershed management. Short courses on these topics organized and held in the Third World are likely to be more relevant.

Agroforestry training has been held in CATIE (Turrialba, Costa Rica) under different sponsorship. It is limited to humid tropical experiences, however. Also the CATIE manual on agroforestry (Sistemas Agroforestales) and related courses are reported to be geared to researchers and teachers rather than development workers.

Although workshops, seminars or short courses which teach specific skills in the E/NR area abound, however the offering of such events changes from year to year. Many are one time affairs, although they may be repeated if follow-up demand is sufficient. There appears to be no centralized source of information on the scheduling of such events. Professional newsletters in various fields are one source. The Forestry Support Program staff cull courses and seminar schedules from some 80 newsletters to generate a calendar of short courses on forestry subjects(annexed).

Technical conferences are an important alternative to actual skills enhancing workshops, especially if the subject matter is on the cutting edge, e.g. sustainable development, biological diversity conservation, and arid zone agroforestry.

## **E. RECOMMENDATIONS**

### **1.0 Introduction**

A training strategy for up-grading knowledge and skills in environmental and natural resources areas is presented in this section. A number of points on the context and the need for training follow, however, they do not fully recapitulate the analysis presented in the preceding sections.

The scope of AID's concern for environments and natural resources has steadily broadened although on the surface it seems to have shifted from one focus to another. In fact, since 1973, approximately, AID's E/NR agenda has grown from an initial concern for the environmental impacts of infrastructural projects and pesticides usage to one which includes all renewable natural resources -- including genetic or biological resources -- and the various approaches or technologies for conserving/managing these resources. Quantitatively, support for forestry projects has been greatest but projects or activities in all aspects of natural resources and the environment presently exist in AID. Recently the unifying and integrating concept of sustainability, especially sustainability of agriculture has begun to link production and conservation orientations, and to integrate disciplines and offices.

AID's in-service training has not kept pace with this expanding agenda and the increasing importance of natural resources in development. Nor has the normative use of environmental planning methods, in lieu of a posteriori IEEs of project designs, taken hold. Nor, with the exception of the hiring of foresters in the early 80's and recently some additional areas of environmental expertise (entomology, marine sciences, wildlife) have staff been hired who are versed in natural resources and environmental matters in general.

AID's operational abilities in these fields are to a great extent due to PSC contractors, PASAs and RSSAs, Foreign Service Nationals, and contracts with universities. This solution to doing enough without a major foreign service manpower commitment has tended to delay the building of a generalized ability in agency staff to competently deal with E/NR subjects.

Notwithstanding the objective realities of environmental degradation throughout the developing world, the impulse to respond comes largely from environmental lobby groups and congressional pressure rather than from an internalized momentum. The premise appears to be that E/NR questions are the concern of special interest groups and must be addressed in order to satisfy those

groups.

The training strategy recommended here departs from a different premise: namely that natural resources management is urgent business, is itself economic development, is a long term commitment not a fad or buzzword, and affects most of the sectors in which AID works. Therefore a large portion of AID personnel should be conscious of the principal E/NR problems and needs in their region and be able to apply awareness and knowledge to their work, according to their backstopping responsibilities.

An additional premise concerns the growing acceptance of the concept of sustainability of development, both in terms of the natural resources base for agriculture as well as the broader concerns of sustaining ecosystems and environments that provide multiple ecological services and harvestable products, besides agricultural ones.

The concept of sustainability in development is roughly comparable to the concept of feasibility in economic analysis, in terms of its integrating power. However, sustainability is a higher order integrator. It provides a framework for considering the relationship of economic and social development to the natural resources and the environment. The sustainability concept can be the vehicle for more fully integrating natural resources and environmental considerations into the development equation, while serving equally well to account for social, institutional and economic factors. Consequently, sustainable development, used as a goal and as an integrating concept, has great potential as an integrating theme in training.

## 2.0 Training strategy objectives

The strategy presented here would:

(1) increase general awareness of the nature and commitment of AID to its various E/NR policies and programs,

(2) build general knowledge among AID employees, and

(3) build working knowledge or skills, both general and specific, in backstops 10, 11, 12, 14, 25, 30 and 94, or the "target population". In September, 1987, the target population totalled 760 individuals (not counting IDIs and staff on complement).

The strategic focus of these objectives is the division of labor among backstops and the differing backgrounds and motivations for training. Thus, while all except perhaps BS 30 could benefit from general awareness training events, not all would wish to have training in, for example, soil conservation cr

natural resources economics. Those with economic backgrounds and job positions will more likely be interested in natural resources economics than in technical fields such as soil conservation techniques per se. At the same time, however, it is assumed that BS 10s with ag. sciences backgrounds would be interested in training for soil conservation and would be sources of knowledge about soil conservation techniques. Thus, a mission would eventually contain competence in both the technical and economic facets of soil conservation (or other technical aspects of natural resources management).

In addition, regulatory aspects (Regulation 216) drive the strategy. All missions should have competence in environmental planning and assessment as well as pesticides management.

The financial magnitude of the recommended training was not calculated. However, in recognition that resources are scarce, on-going training activities are key elements in the strategy. Co-sponsorship may also be possible for some courses, e.g. World Bank.

### **3.0 Increasing awareness and familiarity**

The training objective would be to impart general awareness and an appreciation of the significance of the environmental dimension and outstanding environmental issues to as wide an audience as possible.

Existing training events and periodic meetings (e.g. ADO and mission directors conferences) could be used to accomplish awareness raising, largely through guest lecturers and films or videos. Films accompanied by guest speakers are more effective than videos, but videos can reach all the missions. There is a wide selection of excellent videos or films on all the environmental and natural resources topics that concern AID. A selection by the Television Trust for the Environment is annexed.

Courses in which the material could be inserted are:

Foreign language studies, using videos or films in the language being studied.

FSI Area Studies Course, lectures and films.

New Entry courses.

Emphasis would be on (1) new areas in which AID is working especially conservation of tropical forests and biological diversity, (2) new issues or state-of-the-art advances in E/NR of general interest. One to two hour presentations, possibly enhanced with films (not videos since video screen has insufficient impact for awareness raising) would suffice.

A management contract could be let to program and organize lectures and films at the Washington D.C. level, similar to the series of issue-oriented events the Energy and Environment Study Institute prepares for congressional members. It is proposed that the costs, which should be modest, be borne by the different on-going training programs.

#### **4.0 Building general knowledge.**

General knowledge of the ecological and natural resources foundations of development should be held by all AID employees about to take a foreign post or be transferred from one region to another. This would be offered in the form of orientation training on ecosystems and regional E/NR problems.

This training would be available to all AID employees transferring from one region to another. A two-part training course is proposed which would provide general background on:

- 1) the major ecosystems to be found in the region of destination, (part 1, one hour per ecosystem, film plus lecture), and
- 2) the regional natural resources problems and AID/other donor work in addressing them (part 2, one half day ).

Videos could be used to cover ecosystems and lectures plus readings to cover regional problems and solutions. Examples of ecosystems would be (1) natural forests and agroecosystems in (a) the humid tropics, (b) the arid and semi-arid tropics, (c) the highland tropics; (2) tropical freshwater systems, (3) tropical estuaries and coasts, (4) island ecosystems.

The training could be developed as modules, given alone or integrated in other appropriate training events, including the SOTA and DSP courses noted below.

Scientists and film materials from both the National Geographic Society and the Smithsonian Institution and perhaps Conservation Foundation/World Wildlife Fund would be sources for ecosystem modules. AID and World Bank experts could lecture on the problems/solutions topic.

Annex 2 sets forth the possible content of the modules.

#### **5.0 Building working knowledge and skills.**

Both short term and long term training are needed to build working knowledge. Short term training is treated here. Section 7.0 treats long term

training. In addition to adjustments in existing training courses (SOTA in Agriculture and Rural Development and Development Studies Program), a periodic workshop on the state-of-the art in natural resources and environment workshop is proposed.

### 5.1 Target personnel

Within the target group, totalling 760 individuals as of 9/30/87, the BS 10 agricultural development officers are the second most numerous (214 total), being slightly outnumbered by the capital project officers (219). However, the BS 10s are the most important backstop in the target population for training, by virtue of the fact that they are the operational staff involved in planning and implementing most E/NR actions.

BS 10 respondents to the cabled inquiry on training desires were the most numerous single backstop responding (25 out of 65) and were largely persons with agricultural sciences or agricultural economics backgrounds (see also Section B.3). Their interests in specific fields of study focussed on natural resources economics and agroforestry. Beyond that there was interest in a wide variety of technical fields in the form of short term training events, with soil and water conservation being frequently mentioned.

As of April, 1987 their academic backgrounds as indicated by the highest degree, were distributed as follows (see also table 2):

	%
Agricultural sciences and technologies	41
Ag economics or economics	36
Forestry, soils, range management, wildlife	10
Engineering	2
Other	10
Total	99%

The responses served to reveal the very wide spectrum of E/NR concerns and the many disciplines and many technical fields involved. The various technologies and approaches applicable to development assistance are clearly beyond the capability of an individual to master, but working knowledge should be acquired sufficient to manage people and financial resources.

Virtually all BS10s should have general skills and knowledge in soils and water conservation, on-farm forestry and pasture or fodder management, and be able to conceptualize, do preliminary designs of and justify various interventions aimed at conserving and enhancing the natural resources base for agriculture. Those with agricultural economics backgrounds should be competent in natural resources economics in particular and in general be conversant with various NR management solutions. Those BS 10s with scientific backgrounds should be competent to design various interventions and ultimately to justify these economically.

The training goal must be to equip the individual with sufficient knowledge and discriminatory ability to select and commission appropriate technologies and approaches, and subsequently to manage their implementation and judge their accuracy and quality. A range of training approaches and opportunities can be used, including AID projects' training resources used up to now only for development assistance.

## **5.2 State-of-the-art training in natural resources, environmental issues and development approaches.**

This new activity is proposed in anticipation of the likely shift in the SOTA in Agriculture and Rural Development from an ecology/natural resources theme to other themes after the 1988 course is over.

The training goal would be to up-date E/NR specific knowledge as it accumulates within AID and the development community. So much is being done by so many in E/NR, much of it on the cutting edge of knowledge in development applications, that periodic reviews are needed to keep concerned AID personnel up to date. For example, a national level conference convened by AID in Nairobi in 1983 to review activities in renewable energy and the environment in Kenya uncovered over 400 projects; it was highly successful. In Africa in particular, the quantity of assistance in development and research on E/NR questions is very considerable, and new knowledge is rapidly accumulating.

This proposed training would take the form of an annually or biennially convened technical workshop, of one week in duration. It could be held in Washington D.C. or abroad according to a rotating schedule, but if finances are limited, Washington, D.C. would be the preferred location. Workshop proceedings would be printed and made widely available. A workshop somewhat along these lines was convened by AID in Annapolis in 1983, for the various officers and PSCs with environmental and natural resources responsibilities.

Target backstops would be BS 30 and GS 75 and those BS 10s and other backstops with major responsibilities in natural resources and environmental matters. A total of 50 plus individuals could participate, about one half of them

from AID/W.

If done as a workshop, the organization could be as a symposium at which presentations on work in progress would be made, perhaps enlivened with panel discussion. The successful aspects of the 1987 and 1988 SOTA courses could also be continued. The World Bank annual Agricultural Sector Symposium is another possible model, which might be broached with the World Bank in terms of a possible jointly sponsored training endeavour.

Preliminary explorations with World Bank environmental staff indicate a potential for joint sponsorship. UNEP and FAO are potential co-sponsors. This idea also generated suggestions that developing countries would like to send representatives. Several individuals proposed that training take the form of a mission by mission "road show". It is also possible to conceive of such up-dating being accomplished with a newsletter such as one the Africa Bureau will produce in connection with the NRMS project. These modalities would not achieve the same in-service training goal as a workshop or symposium format, however.

### **5.3 Adapting existing training**

Existing training here refers to two short courses: SOTA in Agriculture and Rural Development, and Development Studies Program.

#### **State of the Art in Agriculture and Rural Development**

In 1988, and for the second time, this course was designed around the theme of natural resources and the environment. The 1988 design benefits from the evaluation of the 1987 course as well as considerable design input from the EN sector council during late 1987. The present document does not attempt to examine or recommend further aspects.

It is predictable that demand will accumulate for other themes in agriculture and rural development, and that the natural resources/ecological focus may have to cede to these themes in 1989. A shift to the theme of sustainable agriculture would permit the retention of much of the current subject matter, but at the same time more material on soil and water management would be needed than has been inserted in the 1987 and 1988 syllabi. A state-of-the-art treatment of insect pest and weed management has also been absent from these two courses.

The question of how to measure progress in the maintenance and enhancement of the natural resources base for agriculture poses important issues for data collection and analysis methodologies that could be dealt with in the course.

The relationship between rural energy supplies and uses and the maintenance

of the soils and agorecosystem resilience by means of perennial vegetation and biomass (residues) also is a fertile theme, alluded to in the cable from USAID/Delhi, quoted in section B.2.0 (Mission defined training needs).

### Development Studies Program

There is scope for introducing general theories concerning natural resources in development and their management, as well as specific materials concerning natural resources economics. Annex 6 contains detailed comments on the possibilities as related to the present course structure.

Economists Pierre Crosson, Resources for the Future, and Daniel Bromely, University of Wisconsin, Madison, and John Dixon, East-West Center, are recommended candidates for presenting the subject matter.

### Project design and project implementation courses

(See comments in previous section on training opportunities. There is little scope for introducing anything but a perfunctory treatment of Regulation 216).

## **6.0 Specific technical knowledge and skills.**

In-house competence in specific skills is frequently needed in order to design and manage projects. Skills in environmental impact assessment, pesticides management, and pest management (all related to Reg. 216) are one category. A second category would be miscellaneous fields, knowledge of which becomes important in the course of project design and implementation. The need for such skills varies widely among from one mission and one region to another, and from one individual to another. However, there were sufficiently numerous mentions of interest in short term training in agroforestry and in soils and water conservation to justify a recommendation for supporting short course training in these subjects.

In the first instance (Reg. 216 skills) training should be targeted on selected backstops and, if necessary, on PSC or FSN advisory staff, especially long term environmental advisors who help scope and manage work required under Regulation 216 and generally advise mission DHs on a range of environmental and natural resources issues. The training of FSNs in environmental impact assessment in particular is well justified, given the adoption in many host nations of environmental protection laws.

### **6.1 Environmental assessment training (2 week course).**

Environmental planning and assessment for engineers, BS 30s and FSN's should be organized once again. It should treat all development assistance that

may generate impacts, with particular attention to infrastructural projects. In particular, knowledge of adequate drainage for access roads in fragile environments and the environmental aspects of small scale water development and irrigation should be imparted. All field engineers and FSN engineers should take the training, e.g. a total of approximately 50 individuals. Two, two-week courses would suffice. Field visits to an on-going EIA in the USA or abroad should be considered. Actual environmental assessments underway could be used for hands-on training. Approximate total cost per course would be on the order of \$50,000, not counting field expenses should participants be engaged in on-going EIAs. The course should include a treatment of the economic valuation of impacts.

## **6.2 Pesticides management training.**

A memorandum annexed to the report details initial concepts on the this training, which would be required of a BS 10s or 30s in missions where pesticides are inputs in AID projects. The initial focus should be on safety questions, compliance with regulation 216, and related concepts of integrated pest management.

Carroll Collier, S&T's pest management specialist, suggests that a four day course could cover these aspects. Regionally based courses are probably the best way to organize the training, possibly as add-ons to ADO conferences. AID has supported this kind of training throughout the Third World through its contract with the Consortium for International Crop Protection, and the course materials could be readily adapted to an all AID audience.

## **6.3 Soil and water conservation training.**

Interest in the field for short courses in this subject is considerable. The training would be best done by region and be available to FSNs as well as DHs. It is proposed that the emphasis be on proven and developing technologies, that the syllabus adjust to regional problems and needs, and that to the extent possible, local experts be used in presentations.

This training theme would best be handled on a sub-regional basis, so as to account for widely differing conservation problems between environments in the tropical world. The sub-regional breakdown used in the Africa Bureau is indicative. The training could be prepared for host country participants as well as AID personnel. Thus, financing support could be from USAID project monies and participant training budgets as well as Operational Expenses. Also various AID/W/S&T projects with training budgets could help. Co-financing is also a good possibility.

The OICD could be asked to plan and prepare this training, and S&T's Division of Renewable Natural Resources could supervise the work as well as coordinate AID input.

#### **6.4 Environmental and natural resources economics.**

BS 11s, 12s, 14s and 94s should have working knowledge of natural resources economics, including financial accounting and analysis of forestry and land conservation projects. AID's revised manual on costs and benefits analysis includes methodological aspects of analyzing natural resources, but is not meant to be a training document.

A short course of approximately three days is proposed that would introduce the basic concepts, theories and practice of economic analysis of the natural resources aspects of AID projects and programs, including policy reform (sector) support. A university may be best suited to plan and provide such training. Candidates should include U. of Maryland, Cornell U., UC Berkeley, and U. of Wisconsin, Madison. Alternatively, OICD could be commissioned to organize this short course (although USDA's Economic Research Service claims no international expertise). Experiences and course materials used at the World Bank's Economic Development Institute should be reviewed.

#### **6.5 Other specialized training**

Agroforestry, watershed conservation, biological diversity and landuse planning were topics of interest for training. Such training could be handled as off-site training, on an individual basis.

Agroforestry is only recently being incorporated into US university programs. However, agroforestry training is frequently offered around the world. The courses are sufficiently numerous to indicate that AID need not organize and finance an agroforestry course for its personnel. AID employees could attend courses organized by others with sponsorship from the Training Division (off-site training) and their missions.

Similarly, short term training in diverse other E/NR subjects of possible interest to personnel are probably available somewhere in the world, and could serve to satisfy individuals' unique training needs. AID/W must inform the USAIDs of available short courses and periodically send a calendar of E/NR training events to the missions.

#### **7.0 Long term training.**

The impact of long term training in terms of numbers of employees is relatively small. Realistically, only 3 to 4 candidates per year are likely to be approved for long term training, barring a major policy decision in favor of a larger number of NR trainees. In a three year period 10 of the 15 who expressed interest might be trained, assuming approval of their proposals.

Therefore any strategy should seek to maximize that impact, for instance by encouraging individuals to take such training who are about to advance to positions of higher responsibility (one of the criteria for reviewing proposals, in fact).

A long term training strategy which encourages professionalization or specialization in the NR/E fields does not appear to be appropriate to AID's needs or to an individual's career track. Individuals' expressed interests and foreseeable needs indicate that long term training that broadens an individual's formal educational base is the better alternative.

### **7.1 Natural resources economics.**

The field of natural resources economics is a good choice for long term training, from the standpoint of both the individual and the agency. Natural resources economics can be seen in relationship to natural resources management in the same way that agricultural economics relates to the agricultural sciences, in providing an economic development rationale and orientation to technical interventions.

As considered here the field of natural resources economics embraces the theory and practice of economics in the use and management of natural resources. Relevant themes are the economics of common property resources management, regional economics, land and other resources tenure, the economic assessment of ecological and related social and health impacts of development, and the impacts of macroeconomic policy reforms on natural resources. The last theme is receiving considerable attention in recent years in the World Bank and in other development assistance agencies who are supporting policy and structural reforms.

### **7.2 Natural resources management.**

The training of a few people per year in natural resources management would help meet agency needs. Once trained, these individuals would be especially valuable in one of the two REDSOs or in ROCAP, or as program officers in large missions with major assistance in E/NR matters.

As regards the various technical fields falling under the rubric of natural resources management, individual expressions of interest tended to seek technical specializations which either complemented or broadened prior training. This is consistent with the agency's need for broad-gauged individuals. However, the field is so broad that an individual must chose a theme around which a concentration of subject matter would be selected, e.g. watershed management or river basin development.

From an institutional perspective those themes might be defined in terms of the development contexts for assistance in natural resources management. One is rehabilitation, conservation and maintenance of the natural resource base of agroecosystems. In terms of numbers of people and area affected, this is the foremost context. A second strategically important but more selective context, is the preservation and management of natural ecosystems not devoted to agriculture -- wildlands harboring genetic wealth, coastal zones and wetlands that harbor a diversity of creatures of economic as well as scientific and ecological value, and steep, forested catchments of important watercourses, to cite the main instances.

Two areas of concentration are suggested for long term training in natural resources management. The first is natural resource management for sustainable agriculture -- soils, water, vegetation in the agroecosystem, crop residues and biomass (for fuel and soil enhancement). It would include various technologies and approaches, including organizational and institutional approaches, for conserving and enhancing the natural resources that directly support agriculture and agrarian livelihoods. A second concentration could be on the natural resources of environments outside of agroecosystems, i.e. wildlands, natural forests and range, catchments, coastal zones and wetlands. Their management entails special approaches both in development assistance (much done through PVOs) and in local institutions.

It is recommended that encouragement be given to candidates in these two areas of concentration and that appropriate university course information be sent to missions.

## **8.0 Center for E/NR Training Resources Information.**

An officer and a person in AID should function as a center of information collection and diffusion on available training around the world in E/NR subjects, especially short courses, workshops, technical meetings and conferences. S&T's Forestry Support Program is periodically compiling information on short courses related to forestry. Similar compilations should be made for other E/NR courses, including ones given in different regions and sponsored by other international organizations or institutions, e.g. UNEP, UNU, and others.

The present Training Division library would not be able to undertake this work, for lack of needed personnel and budget to collect and regularly up-date information on training.

## **Annex 1**

### **Interviewees**

**Robert ADAMS**  
Engineer  
Office of Technical Resources  
Bureau for Africa

**Steven BERWICK**  
IIED  
Washington D.C.

**Bessie BOYD**  
AFR/TR/ARD  
AID/W

**Daniel BROMELY**  
Resources Economics Program  
U. of Wisconsin-Madison

**Carl CASTLETON**  
AFR/TR/ARD  
AID

**John CHANG**  
PPC  
AID/W

**Dennis CHILD**  
Richard HARWOOD  
Winrock International

**Kjel CHRISTOPHERSEN**  
Forestry Economist  
Energy Initiatives for Africa Project  
Abidjan, Cote d'Ivoire

**Jon CLARK**  
863 1900  
Environmental and Energy Study Institute  
410 First St. SE  
Washington D.C. 20003

**Dan DEELEY**  
Project Manager  
Office of Forestry and Natural Resources  
Bureau for Science and Technology

**Joshua DICKINSON**  
Tropical Research and Development Inc.  
Gainesville, FL

**John DIXON**  
East West Center  
Honolulu

**Mr. Michel DOKINGE**  
Director General  
UNITAR  
New York

**Peter FFOLLIOTT**  
U. of Arizona  
Tucson

**Ms. Sandy FOREMAN**  
617 492 9258  
Director, Distribution & Sales  
WGBH (Boston Public Television)

**Wildford GARDNER**  
Dean,  
College of Natural Resources  
UC in Berkeley

**David GIBSON**  
REDSO/ESA  
Nairobi

**Dr. Tejpal GILL**  
Head, Division of Renewable Natural Resources  
Office of Agriculture  
Bureau for Science & Technology  
AID/W

**Robert GOODLAND**  
Environment Coordinator, Latin America and Caribbean  
World Bank  
Washington, D.C.

Lynn HAYLE  
Assistant Director  
Coastal Resources Center  
U. of Rhode Island

Bill HARLEY  
Office of Management, Personnel Management  
AID/W

Ms. Linda HARRAR  
617 492 2777  
Staff person charged with environmental films  
NOVA, Boston

James HESTER  
Environmental Coordinator  
Bureau for Latin American and the Caribbean  
AID

Daryl HEUTH  
301 454 4101  
Dept. of Agricultural and Resource Economics  
U. of Maryland

Mary Lou HIGGINS  
S&T/FENR  
AID/W

Stewart HUDSON  
Noel GERSON  
National Wildlife Federation  
Washington, D.C.

Mike JONES  
653 8202  
Renewable Energy Applications and Training (936-5730)  
Oak Ridge National Laboratory

William KNOWLAND  
Environmental Advisor  
AID/Bangkok

Dagne KRESLINS  
Project Leader  
Locust and Grasshopper Control  
Office of Emergency Operations  
AID/W

**Sam KUNKLE**  
Forestry Support Project  
U.S. F.S.

**Molly KUX**  
S&T/FENR  
AID/W'

**Steve LINTNER**  
Bureau for the Near East and Asia  
AID

**Jim LISTORTI**  
World Bank  
Washington D.C.

**Steve LOWRY**  
203 235 8860  
Land Tenure Center  
U. of Wisconsin

**Dr. Arnett C. MACE**  
904 392 1791  
Director,  
School of Forest Resources & Conservation  
U. of Florida

**Dennis McAFFREY**  
Nature Conservancy International  
Washington D.C.

**Dr. Stan MILLER, Director**  
**Mr. Allan DEUTSCH, Communications**  
International Plant Protection Center  
Oregon State University  
Corvallis

**John MOORE**  
Assistant Dean  
International Programs  
College of Agriculture  
U. of Maryland

**Chuck PAUL**  
S&T/FENR

**Janet POLEY**  
OICD

**Douglas POOLE**  
Project Manager  
Fragile Lands Project  
Development Alternatives Inc.  
Washington D.C.

**Dr. Hugh POPENOE**  
School of Agriculture  
U. of Florida

**Kenneth PRUSSNER**  
Abdul WAHAB  
AFR/TR/ARD  
AID/W

**Catherine REICHELDERFER**  
786 1455  
Associate Director  
Economic Research Service, USDA

**Timothy RESCH**  
235 3734  
Food for Peace Coordinator  
Forestry Support Program  
U.S. Forest Service

**Brandon ROBINSON**  
Head, Development Studies Program  
Bureau for Management  
AID

**John ROBINSON**  
School of Forest Resources and Conservation  
U. of Florida, Gainesville  
**Jeff ROMM**  
College of Natural Resources  
U. of California,  
Berkeley

**Arthur SACKS**  
203 262 5957  
Director  
Institute for Environmental Studies  
U. of Wisconsin-Madison

**Emmy SIMMONS**  
Bureau for Africa  
AID

Charles STEEDMAN  
Director  
Center for Research on Economic Development  
U. of Michigan, Ann Arbor

Allan STEINHAUER  
CICP Manager  
U. of Maryland

Don STONE  
Secretary  
Organization for Tropical Studies  
Chapel Hill

Jack SULLIVAN  
S&T FENR  
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Gary WETTERBERG  
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John WILSON  
Office of Technical Resources  
Bureau for Latin America and the Caribbean  
AID/W

Michael WRIGHT  
World Wildlife Fund/Conservation Foundation  
Washington, D.C.

Dorothy YOUNG  
PM/TD  
Bureau for Management  
AID/W

Frank ZADROGA  
ROCAP, Guatemala

## ANNEX 2

### Orientation modules on tropical ecosystems functioning and related regional E/NR management

Every AID region or host country has at least three or more major ecosystems (or biomes) with two or three being dominant, e.g. humid tropical ecosystem or tropical montane ecosystem. Natural resources management is basically governed by the physical and biological nature of these different ecosystems. At the same time E/NR problems vary among the AID regions for similar ecosystems, due to differences in population densities, stages of economic development, policies and institutions that deal with natural resources, and other factors.

A general orientation training is proposed for AID staff in the field as well as in Washington Bureaus that would inform them of the basic characteristics of tropical ecosystems about which they have no prior knowledge or experience, and about the particular E/NR management situation in the region of concern. The training goal would be that of familiarizing AID personnel with the characteristics and the development solutions/approaches for the environments to which they are being posted or for which they are assigned management responsibility in AID/W.

The orientation addresses training needs arising from two circumstances:

- (1) lack of academic background in environmental functioning (e.g. ecology) among the majority of new and old AID employees.
- (2) the limited transferability between regions of on-the-job knowledge of particular environments acquired by AID field staff.

Interviews served to discover these limitations as well as the interest in having a general orientation. Academic training generally fails to fully link development assistance experiences with environmental and natural resources training. Also, practical experience acquired by an AID employee in a humid tropical setting will be of little applicability in a new posting in a semi-arid environment such as Sahelian Africa or in a mountainous tropical setting such as Ecuador or Rwanda.

These training modules would be integrated into the IDI program, for all IDIs with the relevant backstops. They would also be offered to individuals in Washington, D.C. on complement (1) pending overseas or bureau assignment or (2) involved in Spanish or French language training connected with a transfer between the LAC and Africa regions. The average number of language trainees per year is 100 and the average length of stay is 20 weeks. In December, 1987, 38 individuals were in Washington on language training. In September, 1987, there were a total of

54 individuals in the relevant backstop group on complement. Lastly, they would be offered to relevant backstops as short term training events that could be availed of during normal tours of duty or TDYs in Washington D.C. associated with home leave or consultations on projects or programs.

Frequency and timing of the courses would probably have to be periodically re-programmed.

Each orientation module would last one to one and a half days, involving lecture presentations, films and workshops. They would be designed for all backstops targeted in this series (10, 11, 12, 25, 30, 94) as well as GS's with related job descriptions (e.g. GS 75).

## **Syllabus**

The orientation would consist of two parts, and would take up a total of one to one and a half days. The modules, which are described below, would consist of:

1) Ecosystem fundamentals (five modules proposed),

Ecosystem concepts and principles; key features and characteristics of the ecosystem; resource uses typical of the ecosystems (agriculture, forestry and other).

2) Regional natural resources and environmental situation.

Lessons from development assistance, the institutional picture, and new directions

1) Ecosystem fundamentals (Module 1)

Five different ecosystem orientation modules are proposed: (1) humid tropical lowlands and lower elevation uplands (e.g. not mountain environments), (2) semi-arid to sub-humid tropics (6 or more dry months per year), (3) tropical mountain environments (above 1000 meters), (4) freshwater and coastal ecosystems, and (5) island ecosystems.

A combination of films and lectures could convey their characteristics. A brief, one hour presentation could be prepared for each ecosystem. It is proposed that these modules could be commissioned from organizations such as the Conservation Foundation/World Wildlife Fund, the Organization of Tropical Studies, or universities with particular expertise in one or more tropical ecosystems.

An introductory presentation of concepts and principles in ecology and ecosystem functioning would precede the presentation of the modules. Included would be a treatment of the basic concepts of cultural co-evolution in different environmental set-

tings and its relevance to NR/E management.

Each ecosystem would be treated in the following terms:

\* Climate and its influences on biotic potentials, weathering and erosion/degradation, agriculture and forestry.

\* Key aspects of soils and factors affecting soils productivity and management, trends and problems.

[For instance, a humid tropical environment module would briefly treat the very intense weathering/soil formation process, the importance of vegetative cover to moderate the soil micro-climate and prevent degradation, the various ways degradation takes place -- erosion, leaching and acidification, weed invasion, laterization (on the drier margins), toxic metal build-up -- the importance of good drainage, the nature of higher productivity soils, nutrient cycling in lower productivity soils, etc.]

\* Key aspects of the natural vegetation. Structure and functions, adaptations to the climate, productivity of different formations, ecological resilience, regeneration and reproductive mechanisms. Unique formations in the environment, e.g. for humid tropics note "islands" of diversity, coastal and inland swamps, other unique systems; or for tropical mountains note cloud forest belt, geographic proximity of very different environments (life zones) due to altitudinal zonation; unique function of higher zones for birds migrating between hemispheres.

\* Cultural ecology aspects. Adaptations and co-evolution of peoples indigenous to the environments and the corresponding significance for resource management and ultimately development assistance approaches. This perspective is of particular relevance given the typical profile of the rural poor, e.g. traditional societies with relatively intact cultural traditions and tools who are evolving new landuses, resource exploitation methods, etc. due to population pressures (internal forces) as well as external influences.

\* Wildlands and/or biological diversity aspects. Centers of diversity in the region. Nature and significance of the diversity that exists.

Typical resources values, uses and use potentials.

## 2) Development assistance in NR/E in the region (Module 2)

Each region would have its own presentation. These could draw from the materials compiled during the recommended technical workshops on state of the art in natural resources and environmental management. Presentations would examine the development implications and responses to the biological potentials and limitations treated in the ecosystems presentations. At least half day would be needed.

**Presentations could include:**

**\* Agriculture, forestry and other resource uses. Patterns and historical overview. Institutional and social context of E/NR management in the region (there vary widely among the regions).**

**\* Recent(past 30 years) exploitations and developments, e.g. deforestation and land conversion in the humid tropics, desertification in the semi-arid zones, clearing of high altitude zones in the tropical mountains, etc.**

**\* Trends and prospects. including settlement patterns, pressures on exploitation, government responses, etc.**

**\* Development assistance in the region in E/NR.**

**Maximum use could be made of AID evaluations, reviews, and other AID studies, as well as reports and evaluations of other development assistance organizations, e.g. World Bank, GTZ, etc. Many presentations could be made by AID personnel or by individuals based in the Washington metropolitan area, associated with international development.**

## **Annex 3**

**Memorandum concerning the inclusion of  
natural resources and environmental topics  
in the Development Studies Program**

Nov. 24, 1987

To: Dorothy Young, PM/TD

From: Peter H. Freeman, Consultant to PM/TD



Subject: Preliminary suggestions on the inclusion of natural resources and environmental topics in the Development Studies Program seminar.

I am attaching recommendations for additions to the DSP seminar that would cover the topics of natural resources and the environment.

This seminar is already quite ambitious in scope. At the same time it seems somewhat constrained or short on time once it enters Part 3, where much of the interesting material on natural resources and the environment could be best presented. That is, much time is devoted to assistance as policy reform and except for the exercise in Week 6 treating the North Shaba Integrated Rural Development Project, there are no occasions where the substance of project assistance is treated (as far as I could gather from the syllabus).

This lack of project specifics may be a bias explained by the faculty's background, or it may be a deliberate decision. In any case, there are few hooks on which to hang some supplementary material that treat natural resources and the environment. Also there is a striking absence of other development issues such as population control [or family planning], health, nutrition, the role of women, and education, about which there is a fairly well articulated international consensus as to their importance as development issues. Yet privatization is treated. This imbalance is puzzling. To plug hard for a good treatment of natural resources and the environment does beg the question of "What about the other issues?"

I trust that the attached recommendations are on target and within the scope of the DSP seminar. I hope they are useful.

## Development Studies Program

This 7-week intensive seminar was recently re-designed and its basic structure and orientation seem to be set for some time to come. There is, however, room for introducing the topics of natural resources and the environment at each of the three parts into which seminar is divided.

In addition to the adjustments and supplementary treatments suggested below, a one hour lecture should be fit in to Part 3, as detailed below.

### Part 1. The U.S. and Third World Development.

The following topics should be fit into the lectures:

- o The emergence of environmental and natural resources management as development priorities since 1972.

Would treat various international initiatives and the US role in pursuing them, e.g. the fight against desertification, the Tropical Forests Action Programme (World Resources Institute and FAO) International Convention on International Trade in Endangered Species, the World Conservation Strategy launched in 1980 by the International Union for the Conservation of Nature and Natural Resources and being implemented in several nations with US AID support.

- o Legislative aspects of natural resources in the FAA, including the role of US PVOs in shaping legislation and in subsequent execution of AID programs that deal with natural resources and the environment.

### Part 2. Development Goals and the Nation State.

The following topics could be treated:

"Development goals and values explored"

- o Sustainable development as a macro-goal that integrates conservation of renewable resources and socio-economic development. Writings on sustainable development and sustainable agriculture could be introduced.

"Grass roots participatory strategies"

- o Use social or community forestry case studies to exemplify such strategies. Note how such strategies are not only uniquely suited to natural resources management actions in the Third World, and may be the only viable approach.

### Part 3. Development goals and foreign assistance

In addition to the inclusion of certain topics in existing lectures, I would suggest that a one hour lecture be devoted to the increasing importance being accorded in development assistance agencies, both multilateral and bilateral, to natural resources rehabilitation, management, conservation and development. Evidence is money spent, organizational changes, policies, programs, actions.

#### "Capacity building and development"

- o Observe the growth of environmental and natural resources institutions in the public sector since 1970. Growth is dynamic, but uneven; great progress being made in some countries (Thailand, Indonesia, Costa Rica) but is lagging especially in the lowest income countries with severe environmental problems.
- o Note the unique challenges to LDC natural resources management institutions. Poor data base, esp. in Africa and esp. with regard to insidious degradation of soils and other resources. How to use computers, remote sensing, international data bases? How adapt institutional models from the First World, and their appropriateness. The TVA example and its extension into Mexico, South America and elsewhere.
- o The promise and potential of non-governmental organizations in addressing natural resources problems. Great expectations but considerable limitations. Can NGOs succeed where governmental institutions have failed or are beyond help?

Case study on improved wood burning stoves could be used.

#### "Agriculture as a leading sector"

- o The New Agricultural Focus in AID and the inclusion of natural resources maintenance and conservation should be brought up. Alternatively a panelist could argue for the primacy of a resource-conservation focus in agriculture, a position consistent with the incremental development of subsistence agriculture.

#### "Land reform" lecture:

- o Security of land tenure as a pre-condition for investment in natural resources rehabilitation and conservation.
- o Include treatment of tree tenure...laws, customs and use rights related to trees. A critical adjunct to the emphasis on social and grass roots based forestry and agro-forestry.

"The State and Agriculture: Pricing Policy"

o Include treatment of firewood and charcoal pricing policies, and their implications, including limitations, for efficient, resource-conservative use of fuelwood resources. Case study material available from Sahelian Africa through the Energy Initiatives for Africa Project.

## **Annex 4**

**Memorandum concerning short term training  
in pesticides and pest management**

## Pesticides and Pest Management -- Short Term Training

[Based on interviews with Carl Castleton, USDA PASA pest management specialist in AFR/TR/ARD, Betsy Boyd, Regional Environmental Officer, AFR/TR/ARD, Mary Lou Higgins, Entomologist and project manager, S&T/FENR; and Dagne Kraslins, Project Leader, Locust Grasshopper Control Project, Office of Emergency Operations; Mr. Ben Waite, S&T/AG; Stan Miller, International Plant Protection Center, Oregon State University, Corvallis.]

The regulatory context of pesticides use and pest management and the unavoidable need to be informed of hazards and alternatives present a special case for this type of training. The status of pesticides registered for use in the US (and therefore eligible for use in our AID programs) presents a technical complexity that ADOs and environmental officers must deal with during project design and implementation. Current technical assistance in pesticides and pest management available through projects, PASAs and RSSAs is not sufficient to compensate for the lack of management capability in this area, according to interviewees.

The following presents a strategy that addresses the needs for short term training for:

- (1) pesticides management,
- (2) pest management in general, and
- (3) for managers of AID-supported NGO and PVO activities that involve pesticides use.

### 1. Pesticides management training.

Pesticides management refers to the selection, acquisition, transport, storage, application and monitoring of pesticides, and the disposal of containers and residuals.

Short term training in pesticides management is a real need for arid to sub-humid Africa in particular, where grasshopper and locust control is a continuing operation. Grain-eating birds, rodents, other insect pests and weeds are continuing problems in agriculture which require management, preferably without resort to toxic chemicals, but often there is no alternative.

Although technical backstopping in pest and pesticides management is provided through regional bureau PASAs (Africa) and RSSAs (ANE and LAC), the involved technical and scientific personnel consider that greater mission level competence is necessary to provide effective assistance.

In the case of massive aerial or terrestrial spraying programs funded at the multi-million dollar level by USAID in Sahelian

Africa, there has been a lack of mission capacity to monitor the effectiveness of these applications -- or to manage that monitoring effort, according to Carl Castleton and scientists at the International Plan Protection Center at Oregon State University. Also, where project managers in USAIDs oversee production projects or program support involving pesticides, they should have specialized training to give them the needed supervisory competence.

#### Training mode:

Short term training of up to three days including the use of video or slide tape tutorials could impart (1) the needed management and (2) technical skills training. Both levels are likely to be needed, according to the charge of the AID DH, FSN or PSC. FSNs and PSCs are likely candidates for the technical skills training.

One resource that could be used in training is a manual on grasshopper and locust control that will be produced in conjunction with an end-of-campaign workshop (Jan. 19-22, 1988) on the Grasshopper and Locust Control effort. The manual should be ready by May next year.

#### Target backstops:

(1) All environmental officers. (2) assistant ADOs, and project managers (DH and FSN) as well as PSCs involved in projects that employ pesticides.

Incentive: Certificate in pesticides management (or supervision thereof) or in pesticides application (specific skill).

## 2. Pest management training.

Pest management refers to the range of ways that pests important to agriculture and human health can be managed to reduce exposure and damage. Pesticides are but one of several approaches. A general knowledge of pest ecology and of some of the alternatives to pesticides should generally exist among ADO staff and some project development office staff. Pests include weeds as well as vertebrate and invertebrate organisms.

An awareness of the various effective approaches to pest management other than through synthetic chemicals should be a design and project implementation consideration in all agricultural projects that contemplate pest management. In addition to crop protection, forestry projects often require pesticides to protect nursery stock and transplanted seedlings -- dieldrin has been commonly used to ward off termites for instance. Its use on food crops is prohibited.

Primary health care projects that deal with vector-borne diseases and the control of vectors also require knowledge of pesticides. Rat control is especially tricky since rat poisons which are

decoagulants (i.e. cause hemorrhaging and death) are equally effective in humans.

A greater understanding of the ecology and population dynamics of certain key pests such as rodents and grain-eating birds could better equip mission personnel to respond to requests for assistance. Rodent "plagues" for instance are predictable and diminish through natural attrition.

A presentation of technical resources that are available to AID staff should be included in the training.

Training modes:

A two hour presentation in the SOTA ARD course should be considered. It could deal with concepts, practice and resources available for pest management, and should be supplemented by handouts for additional details. The economics as well as the technical aspects should be addressed.

Also two short term training events could be considered:

(1) one for health officers and DHs or FSNs involved in primary health care and environmental sanitation projects. focusing on management of disease vectors. No time estimate is made here.

(2) one for ADO personnel and project development officers, focusing on pests in agriculture and forestry. This course could focus on pest management practices and their implications for project design and implementation, drawing on case studies from AID and FAO. A one day workshop may suffice. However, each region would require slightly different subject matter focus and examples. Such a workshop could be planned for the regional ADO conferences.

Training Resources:

Forthcoming manual on Grasshopper and Locust Control (May, 1988). (See Carl Castleton, 647 8717).

A "good video" on grain-eating birds exists. Carl Castleton has details.

The Entomological Society of America (College Park, Md) has produced a slide tape on Integrated Pest Management.

Dr. Lloyd Knudson, Smithsonian Institution, has produced a slide tape on biological and environmental control of the snail vector of Schistosomiasis, and on its ecology.

FAO. 1986. Instructors Manual for Weed Management. (FAO Training Series No. 12).

Weed management materials and handouts already existing, prepared

by the International Plant Protection Center. Oregon State University.

### **3. The special case of AID-supported PVO and NGO projects.**

The increasing amount of AID support to NGO field projects entails the same considerations as AID project designs, including compliance with Reg. 16, although on a smaller scale and often with less precisely defined inputs and outputs. Yet pest management and pesticides use are issues in these small scale efforts.

Management and backstopping of these projects is often "farmed out" to other entities, e.g. a number of "umbrella" grant projects in Africa. AID staff normally have little direct contact with PVO field activities as a result. Nevertheless, pesticides management is an important technical issue for which the AID project officer will be responsible on a continuing basis as small grant proposals are reviewed.

PVOs and NGOs are especially involved in gardening and horticultural projects, and increasingly in agroforestry, in which highly toxic organo-phosphorus chemicals and persistent organo-chlorines may be used. AID financing may ultimately underwrite the use of these chemicals. However, PVO and NGO field workers and their project managers are poorly qualified to handle these chemicals.

AID should insist on special training for project managers and should produce or supply technical guides suited to the PVO/NGO audience for safe and effective use of pesticides and their alternatives.

If specially produced, such materials could be prepared collaboratively with backing from PM/TD, the regional bureaus and OFDA. PM/TD or S&T/Agr could contract out the work, perhaps through the CICP consortium. Regionally based NGOs, such as the Environmental Liaison Center in Nairobi, Environment and Development in Africa/Tiers Monde (ENDA/TM) in Dakar, Senegal, or Fundacion Natura in Ecuador might also be able to prepare materials specially tailored to NGOs.

## **Annex 5**

### **Generic and specific needs for knowledge and skills in natural resources and the environment among AID personnel**

#### **Generic needs:**

Mission personnel begin the project design process in preparing for the annual budget submission(ABS). Fairly complete project concepts are drafted and presented in summary fashion in the ABS. These concepts must be sufficiently complete to be justified and defended at the ABS reviews in AID/W. They are generated with little outside assistance except for short term services from S&T support projects or regionally based advisors. An approved ABS level project concept becomes the kernel and basic orientation for subsequent PID and PP design work.

The mission project officer, whether backstop 10, 14, 15 or 94, must have sufficient familiarity with the field to envision a project in its early design concept, and to draft scopes of work for pre-design studies or technical assistance, as well as for PID and PP design.

Sufficient competence must exist to discriminate among technical alternatives, development approaches, and other methods that may be proposed by host country colleagues, contractors and others. Where issues, controversy, or disagreements cannot be resolved the AID project officer must know where to go for help, and ultimately to successfully justify and defend a project paper.

The project officer must be able to manage technical work performed by others during design or implementation. Here again in addition to interpersonal skills, technical discrimination is needed, especially with regard to technologies or approaches that may be proposed or required in the course of project implementation. In their management of FSNs or PSCs, American DHs in backstops 10, 14 or 25 may not have to enter into technical detail, unless there is controversy. However, they must have sufficient grasp of various technical fields

to address such issues as the appropriateness of methods or approaches, the reasonableness of costs, the soundness of economic analyses, and so on.

## Needs for knowledge and skills related to environment and natural resources

A preliminary listing of knowledge and skills that ideally should be possessed by different backstops is presented in the table below.

Technical, social, economic and institutional aspects of natural resources management must all be addressed during design work as well as project management. Ideally, a project officer would be conversant in all these areas. This is unlikely. However, those with technical skills and background only are handicapped more than those with social sciences and managerial backgrounds only.

Needs for E/NR skills and knowledge vary according to backstop and position responsibilities. Backstop 30 should be the most well prepared, with a broad base of knowledge and skills plus professional competence in two technical areas: environmental assessments and pesticides management. Competence in both areas should also exist in every mission with capital development and agricultural development projects.

Backstops 10 and 14 should have considerable familiarity with natural resources and the environment and some working knowledge of problems and solutions relevant to the soils, water and forest resources of the host country or the region, particularly in their role of sustaining agricultural activities and rural livelihoods.

Food for Peace Officers should be sufficiently familiar with the kinds of technologies and approaches in soil conservation, forestry and agroforestry that can be supported through PL 480 to conceptualize, design and negotiate programs with the host government and associated implementing entities. Normally FFPOs can obtain technical advice and design assistance from a BS10 or 14, but there are exceptions, e.g. Guinea.

Program development officers (BS 12 or 11) and officers in charge of project development (BS 9 or 11) should possess a comprehension of the essential role played by various natural resources in rural and other development, of the basic aspects of renewability or sustainability, of the principles of natural resources economics, and the methods of economic analysis pertaining to natural resources.

All engineers should be capable of performing IEEs and commissioning EAs where necessary, of capital development projects.

In essence, what AID needs are many generalists in natural resources management, rather than a few technicians. Technical depth in one of the natural

resources fields is a desirable foundation for broader more general knowledge and skills, but not necessarily a sine qua non, as long as fundamentals are learned.

**E/NR-specific knowledge and skills needed by DHs :**

**\* Solid grasp of the values, concepts and principles concerning the basic nature and the management of different natural resources. yes**

**BS 30, 10, 12, and 14**

**\* Familiarity with the basic functioning of different ecosystems in different major life zones or biomes.**

**All backstops**

**\* Working knowledge of different methods of diagnosing natural resources problems and measuring or monitoring the impact of management interventions.**

**BS 30, 10, and 14**

**\* Working knowledge of AID policies, and programmatic directives concerning E/NR.**

**BS 30, 10, 12, 14, 94**

**\* Familiarity with various technologies and approaches employed in developed and developing countries in management of different natural resources.**

**BS 30, 10 and 14**

**\* Sufficient competence in economics and sociology to undertake preliminary economic and social analyses of proposed interventions.**

**BS 30, 10, 11, 12, 14, 94**

**\* Ability to conceptualize and analyze the social and economic developmental framework for natural resources management.**

**BS 30, 10, 11, 12, 14, 15, 94**

**\* Working knowledge of the major environmental and natural resources**

management problems and needs of the host country.

BS 30 and 12 (familiarity only)

\* Familiarity with various approaches that have been attempted in the mission's region to a given natural resources management situation, for example, forest and brush fire control, soil erosion control, salinization and siltation control, water conservation, and natural or plantation forest management.

BS 30, 10, 14, 15

\* Working knowledge of the various support projects available to missions for specialized assistance in design, programming, implementation and evaluation in E/NR.

BS 30, 10, 14, 15, 94

\* Familiarity with the approaches and experiences of other donors, bilateral or multilateral, in the host country and region, in the E/NR area.

BS 30, 10, 12 and 14

\* Working knowledge of the institutional mechanisms in the host country for effecting research and support in E/NR.

BS 30 and 10

**In-Service Training in Natural Resources  
and the Environment  
for AID Personnel**

**Annexes 6 to 11**

- Annex 6 Courses and Programs in Environment and Natural Resources in Selected U.S. Universities (as of 1984)**
- Annex 7 USDA Courses in Environment and Natural Resources in 1988**
- Annex 8 Television Trust for the Environment, Selection of Environmental Videos**
- Annex 9 International Short Course Offerings in Agroforestry, Forestry and Related Fields**
- Annex 10 Syllabus of a World Bank High Level Seminar on Land and Water Ecosystems Conservation**
- Annex 11 Lecture Outline on Environmental and Natural Resources Economics, for an AID-Sponsored Short Course in Kuala Lumpur**

## Annex 6

### Courses and Programs in Environment and Natural Resources

in Selected U.S. Universities  
(as of 1984)

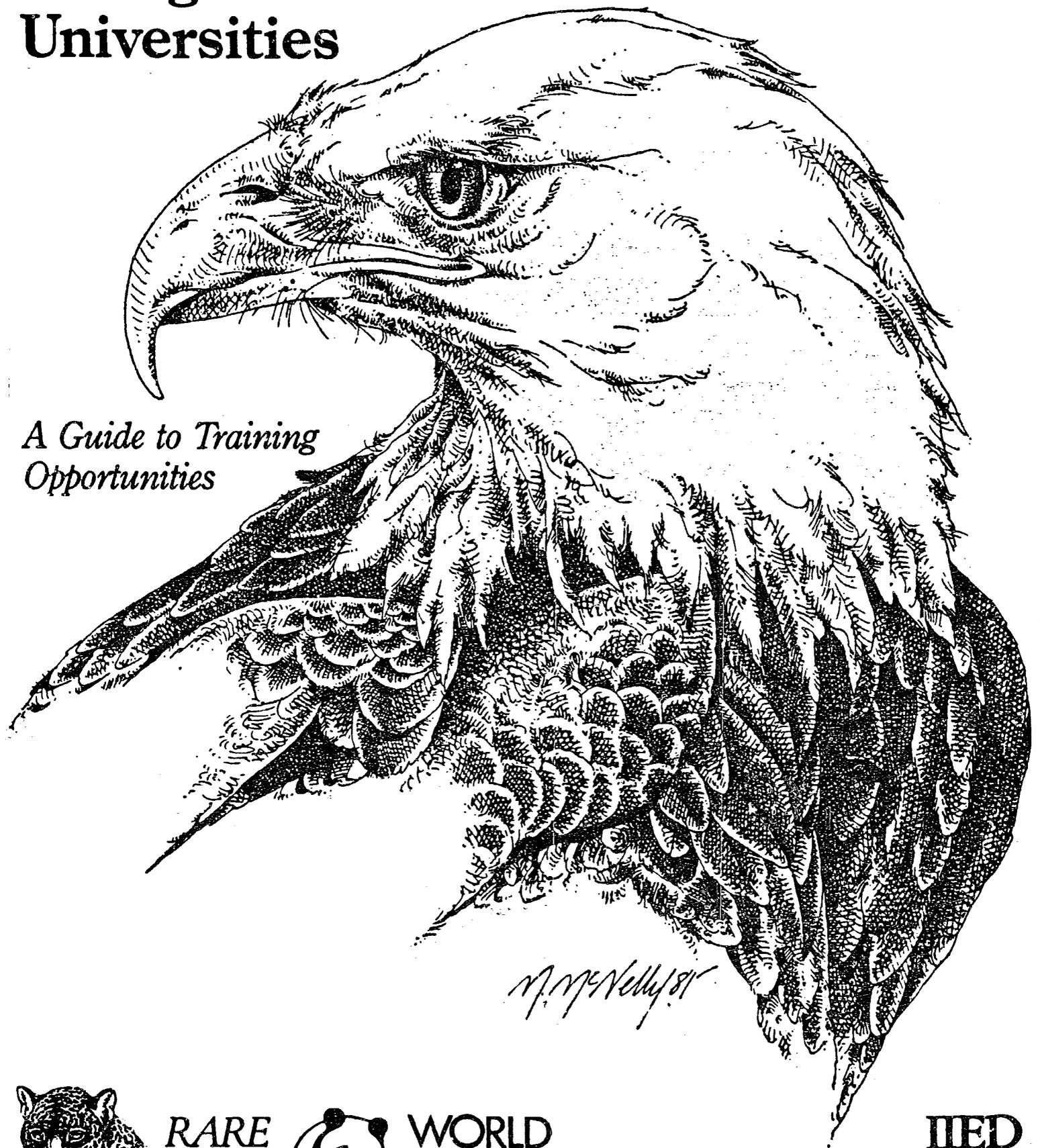
Auburn University	1
U. of Arizona	3
Colorado State University	8
Yale University	13
U. of Florida	18
U. of Georgia	24
U. of Maryland	30
Clark University	33
New Mexico State University	39
Cornell University	44
Duke University	48
North Carolina State University	53
U. of North Carolina	57
Oregon State U.	60
U. of Washington	66
U. of Wisconsin-Madison	71

Note: Information sent on 1987 programs and courses  
by several universities (see letters of transmittal)  
was forwarded to PM/TD.

*Return to Lou Higgins*

# Natural Resources and Environmental Management at North American Universities

*A Guide to Training Opportunities*



**RARE**



**WORLD  
WILDLIFE  
FUND-U.S.**

**IIED**

**INTERNATIONAL INSTITUTE FOR  
ENVIRONMENT AND DEVELOPMENT**

AUBURN UNIVERSITY  
Auburn, Alabama

I. CURRICULUM PROGRAM:

A. Undergraduate

agricultural engineering  
agricultural journalism  
agronomy and soils  
animal and dairy sciences  
botany  
entomology  
forest products  
forest management  
forest engineering

fisheries management  
food science  
horticulture  
microbiology  
marine biology  
plant protection  
poultry science  
wildlife management  
zoology

B. Postgraduate

agricultural economics (MAgr, MS)  
agricultural engineering (MS, PhD)  
agronomy and soils (MAgr, MS, PhD)  
animal and dairy science (MAgr, MS, PhD)  
botany (MAgr, MS, PhD)  
fisheries/aquaculture (MAgr, MS, PhD)  
forestry (MF, MS, PhD)

horticulture (MAgr, MS)  
microbiology (MAgr, MS, PhD)  
plant pathology (MAgr, MS, PhD)  
poultry science (MAgr, MS, PhD)  
wildlife management (MAgr, MS, PhD)  
zoology entomology (MAgr, MS, PhD)

II. ACADEMIC CONCENTRATIONS: (NIA)

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational program: (NIA)

B. Internship offered through private/public sector agencies: (NIA)

C. The Auburn Forest Engineering Program: Jointly administered by the Department of Forestry and Department of Agricultural Engineering, develops competence in both forestry and engineering. The School of Agriculture, Forestry, and Biological Sciences also furnishes the subject matter training in Agriculture for the curriculum for training teachers of Vocational Agriculture.

IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS: (NIA)

V. PROGRAM ASSOCIATIONS:

A. Involvement and/or technical skills provided through the consortia:

South-East Consortium for International Development (SECID): Institutions collaborate through SECID on international activities which utilize their main disciplinary skills of education, research, and extension. SECID provides the opportunity for member institutions' involvement in projects which would not be feasible to staff from a single institution.

B. Involvement with governmental agencies:

Title XII: Strengthening-grant funds to sustain and increase involvement in less developed nations' agriculture and inland fisheries activity.

## VI. CONTACTS:

Dr. F. Thompson, Head  
 School of Agriculture, Forestry  
 & Biological Science  
 Auburn University  
 Auburn, AL 36849  
 Telephone: (205) 826-4050

Contact for international students:  
 Evelyn W. Jordan  
 Foreign Student Advisor  
 304 Martin Hall  
 Auburn University  
 Auburn, AL 36849  
 Telephone: (205) 826-4744

## VII. ADDITIONAL INFORMATION:

- A. Accreditation/Certification: Society for American Foresters (SAF)
- B. Student body profile: (NIA)
- C. Faculty profile: Fall, 1983
  - 1. Number of full-time faculty (9 & 1/2 month) teaching positions: (NIA)
  - 2. Faculty by technical specialization:

- 27 Aquaculture
    - 2 Fisheries

- D. Future plans: (NIA)
- E. School setting:

Auburn University is located in the City of Auburn (pop. 28,471), 50 miles (80 km.) east of Montgomery, 160 miles (256 km.) north of the Gulf of Mexico.

Climate:           year-round mean temperature: 65 F (18.4 C)  
                     winter: 41 (5.1 C)  
                     summer: 70 (21.2 C)  
                     mean rainfall: 50 inches (127 cm.)  
                     relative humidity: 70 %

(Climate records taken from Montgomery, Alabama)

## Local Characteristics:

- 1. Land Use: Cropland with grazing land.
- 2. Forest/Vegetation types: Loblolly-short leaf pine, oak/hickory/pine (Quercus-Carya-Pinus). forest region occurs mainly on the sandy coastal plain which is relatively dry despite the ample annual rainfall. The pines and broad-leaved trees here are adapted to dry soils.
- 3. Land Surface Form: Irregular plains, gentle slope with open hills.

## F. Facilities:

The University is located on a 1,871 acre campus, with 71 major buildings. The University Library has a collection of 1,600,000 volumes, 1.5 million items in microformat, 15,000 serials and 10,000 journals. Computer facilities for students and faculty are also available.

- G. Special aid for foreign students: (NIA)

UNIVERSITY OF ARIZONA  
Tucson, Arizona

I. CURRICULUM PROGRAM:

A. Undergraduate

agriculture (BS)	plant sciences (BSAgr)
agri-mechanics and irrigation (BSAgr)	range management (BS)
agronomy (BSAgr)	soil & water science (BSAgr)
landscape architecture (BS)	watershed management (BS)
natural resource recreation (BS)	wildlife and fisheries science (BS)
horticulture (BSAgr)	

B. Postgraduate

ecology and evolutionary biology (MS, PhD)  
 horticulture (MS, PhD)  
 range management (MS, PhD)  
 renewable natural resources studies (MS, PhD)  
 soil and water science (MS, PhD)  
 watershed management (MS, PhD)  
 wildlife and fisheries science (MS, PhD)

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate academic program strengths which would be of interest to international students taught in the realm of natural resources/environmental management.

1. MS, PhD, Forest-Watershed Management: Emphasis on multi-resource management of forests, with areas of study in growth, yield, and quality of forest overstories, interrelationships among biophysical and socioeconomic aspects of management and land use, and simulation of impacts of land management activities and policies on forest and woodland ecosystems.
2. MS, PhD, Range Management, thesis and non thesis options: Design of study programs is flexible, depending on the students' interests. Options of study in soil science, watershed management, animal science, wildlife ecology, plant science and ecology.
3. MLA, Landscape Architecture, thesis: Students develop a program of research which culminates in a thesis; areas of study include desert and semi-arid landscape planning and design, perception and aesthetics; plants and planting design in arid regions; and technology innovation, assessment and evaluation.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational programs: (NIA)

B. Internship offered through private/public sector agencies:

College of Agriculture provides internship opportunities to qualified students who wish to receive training and practice with technical, business or government establishments.

C. Renewable Natural Resource Studies: Interdisciplinary program is appropriate for mid-career professionals interested in natural resources policy administration, planning, management and research.

D. Committee on Remote Sensing: Offers no graduate major at the present time but minor programs are available for doctoral students with majors in disciplines within the Colleges of Agriculture. Remote sensing concerns the collection of information related in some way to the earth's natural resources or environment. Data are primarily collected by satellite and aircraft systems in conjunction with localized ground-based surveys and measurements. The data are processed by digital computer or optical techniques to extract information of value to earth scientists and resource and environment managers at the local, state, and federal levels.

E. Agricultural Experiment Station: Responsible for the research program in agriculture and renewable natural resources. The program includes both basic and applied research

conducted on farms, orchards, ranches, rangelands, and forests in cooperation with farmers, ranchers, and officials of various state and federal agencies. The Station maintains close cooperative relationships with research agencies such as the Agricultural Research Service and the Forest Service of the United States Department of Agriculture.

- F. Office of Arid Land Studies: Administers the College of Agriculture's interdisciplinary doctoral program in arid lands resource sciences.
- G. Laboratory of Tree-Ring Research: Conducts a program of teaching and research in all aspects of dendro-chronology. Tree-ring specimens, numbering about 200,000 samples from living and dead trees, the Laboratory maintains a variety of specialized equipment and a series of active data banks containing processed tree-ring chronologies, relevant climatic and hydrologic records, and archaeological tree-ring dates and site information.
- H. Arizona Cooperative National Park Resources Study Unit: Engaged in research to support the natural science program of the National Park Service. In cooperation with the University of Arizona, the unit provides graduate research opportunities and instructional support in a broad array of natural resource problem areas.
- I. The Arizona Cooperative Wildlife Research Unit: Sponsored and supported jointly by the University of Arizona, the Arizona Game and Fish Department, the US Fish and Wildlife Service, and the Wildlife Management Institute. The facilities and personnel of the unit are available to graduate students who wish to pursue both class work and research programs leading to advanced degrees in wildlife biology.
- J. Boyce Thompson Southwestern Arboretum: Facilities for teaching and research, thirty acres of native and introduced plants from arid and semi-arid regions, together with about 1,000 additional acres of undisturbed fauna and flora.
- K. The Water Resources Research Center: Provides assistance to water-related research activities at the three state universities. Work includes the harvesting of additional water from arid and semi-arid watersheds; artificially recharging the groundwater aquifers; evaporation suppression; seepage control; urban hydrology; and operation and maintenance of the research facility on the Casa Grande Highway, and one undeveloped and three urbanized watersheds, all in or near Tucson.
- L. Programs in fisheries science are conducted in cooperation with the Arizona Cooperative Fishery Research Unit, which is supported by the University of Arizona, the Arizona Game and Fish Department and the US Fish and Wildlife Service. Research programs are diverse, ranging from field studies in lowland impoundments, large rivers and high mountain lakes and streams to many types of laboratory experiments.
- M. Agricultural Research Service and the Soil Conservation Service of the USDA, the United States Bureau of Mines, and the US Geological Survey, are located on or near the campus of the University. These research organizations work closely with the University, and a number of their personnel also hold University staff appointments.

#### IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

- 1. USAID; National Academy of Science; InterAmerican Institute of Agricultural Sciences/Brazil: Consult on range research and development, 1971-1984.
- 2. Unesco/Mexico: Initiate cooperative research programs in Montane forests, 1976-1982.
- 3. Unesco/Mexico: Development of a multi-resource inventory system for implementation on Montane forests, 1978-1982.
- 4. Unesco; UNDP; MAB/Chile: Natural resource and watershed management consulting, 1982.
- 5. USAID; Unesco/Philippines; Malaysia; Thailand; Indonesia; Sri Lanka: Three-week SE Asian regional training course in watershed management; environmental monitoring in humid and tropical ecosystems, 1979 and 1984.
- 6. USAID; East-West Center (Hawaii)/Pacific region and Asia: Problem analysis for

development projects, 1983.

7. USAID/India: Regional training course in watershed management held at the University of Roorkee, 1982-1983.
8. Universidad Autonoma De Baja California/Mexico: Short course on "plants for the landscape," 1983.
9. US State Department/Egypt: Assist university in development of wildlife/recreation academic programs; national park development, 1983-1984.
10. USAID/Honduras: Consultant for watershed conservation and water resource development, 1978-1979.
11. USAID/Honduras: Consultant for watershed conservation and water resource development, 1978-1979.
12. Colegio de Postgraduados/Mexico: Develop cooperative research on desertification and short course in watershed hydrology, 1978-1982.
13. King Abdulaziz University/Saudi Arabia: Curriculum development in arid land studies and meteorology, 1976-1983.
14. MAB; Unesco/Panama; Honduras: Regional training course in watershed resource management and environmental monitoring in humid and tropical ecosystems, 1982.
15. USAID/Pakistan; India: Conducted workshops on watershed management and soil stabilization, 1983.
16. US Fish & Wildlife Service/Mexico: Investigate status of endangered subspecies of mule deer and evaluate potential of the island for reintroduction of the sea otter, 1979.
17. Safari International; Yorkshire Television, Ltd./Paraguay: Habitat study of chacoan, collared and white-lipped peccary and jaguar, 1979.
18. Forests Commission/Australia: Consultation on wildlife recreation programs, 1982.
19. Lindbergh Foundation & New York Zoological Society/Paraguay: Research on rare wildlife species in the Chaco.
20. US Peace Corps/World: 4-week training programs in dryland forestry and agroforestry.

#### V. PROGRAM ASSOCIATIONS:

##### A. Involvement and/or technical skills provided through the consortia:

1. Consortium for International Development (CID): CID is a nonprofit corporation of 11 western universities. The objectives of CID are to (1) facilitate the involvement of member universities in leadership and in contribution to the planning and implementation of large specialized or integrated international development projects, (2) provide administrative support for project initiation, implementation, and evaluation as well as training for key project administrators, and (3) improve the opportunities for member institutions to collectively provide their expertise to developing countries.
2. Universities for International Forestry (UNIFOR): A consortium of eight American universities joined for the purpose of providing professional consultative and educational services in forestry and related sciences for human benefit in the developing countries of the world.
3. Title XII: The University of Arizona has applied for a "Strengthening Grant" to render technical assistance in the adaptation and application of agricultural and nutritional technology; increasing institutional and human resource skills in developing countries; and conducting/supporting long and short-term research with other universities and international centers.

##### B. Involvement with governmental agencies: (NIA)

## VI. CONTACTS:

Dr. Gordon S. Lehman, Chairman  
 Division of Forest - Watershed Resources  
 325 Biological Sciences East  
 University of Arizona  
 Tucson, AZ 85721  
 Telephone: (602) 621-7262

Contact for international students:  
 Dr. Jack Johnson, Head  
 International Programs  
 College of Agriculture  
 303 Agriculture  
 University of Arizona  
 Tucson, AZ 85721  
 Telephone: (602) 621-1900

## VII. ADDITIONAL INFORMATION:

A. Accreditation/Certification: Society of American Foresters (SAF); Society for Range Management (SRM); American Society of Landscape Architects (ASLA)

B. Student body profile: Fall, 1983

1. Number of students enrolled:

	US/Canada	Foreign
Undergraduates	22,790	700
Postgraduates	7,614	895
Total Campus	30,404	1,595

2. Number and geographical place of residence for foreign students:

195	Africa
369	Asia & Pacific
491	Middle East
301	South America
239	Developed Countries

3. Foreign postgraduate student specialization:

10	Watershed management, soil conservation
9	Range and wildlife management (productivity/utilization/carrying capacity)
7	Arid land forestry
3	Landscape architecture
1	Fire management
1	Range and wildlife management (grazing systems)
1	Recreation/national parks (habitat management)
1	Agriculture (hydrology)

C. Faculty profile: Spring, 1984

1. Number of full-time faculty (9 & 12 month) teaching positions: (NIA)

2. Faculty on overseas professional assignment by aggregate weeks/geographical area/technical specialization:

1	Philippines	Watershed management
3	Mexico	Landscape architect-forestry
4	Egypt	Recreation-national parks
6	Saudi Arabia	Watershed management
1	Niger	Arid land forestry

3. Faculty by technical specialization:

16	Plant Breeding	6	Consumer economics
39	Plant Production/Management	6	Int'l Economic Development
31	Plant Protection	4	Agricultural Statistics
8	Forestry	10	Geography
7	Animal Breeding	7	Energy
20	Animal Production/Management	27	Water
16	Animal Health	4	Wildlife
3	Animal Products	10	Environmental Studies
10	Animal Nutrition	15	Soil Science
15	Food Science	7	Range Management

26	Human Nutrition/Health	1	Fisheries
20	Home Economics/Human Ecology	2	Farm Mechanization
10	Education and Extension	3	Natural Resource Recreation
22	Policy Formation	7	Water Harvesting
6	Resource Economics	7	Women in Development

D. Future plans:

1. Increased emphasis on the arid land forestry graduate option.
2. Strengthening all aspects of international programs.

E. School setting:

The University is located in the City of Tucson (pop. 330,537), located 100 miles (160 km.) southeast of Phoenix, 150 miles (240 km.) northeast of the Gulf of Mexico, and 60 miles (96 km.) north of Mexico.

Climate:           year-round mean temperature: 67 F (19 C)  
                       winter: 52 F (11 C)  
                       summer: 82 F (29 C)  
                       mean rainfall: 11.13 inches (28 cm.)  
                       relative humidity: 37.5%

Local Characteristics:

1. Land Use: Desert shrubland grazed.
2. Forest/Vegetation type: Creosote bush-bursage (Larrea-Franseria).
3. Land Surface forms: Plains with low mountains.

F. Facilities:

The Main University Library houses more than 1.3 million books and bound volumes, and 3 million microforms, and 25,000 government documents.

G. Special aid for foreign students:

International Student Office: Generally responsible for coordinating services to international students and scholars. The Director works closely with students in the areas of adjustment to campus and community life and adjustment in academic procedures and requirements. Individuals are referred, when appropriate, to academic advisors, counseling staff, health staff and others.

## SCHEDULE OF INTERNATIONAL TRAINING COURSES, 1988

JANUARY 1988		JULY	
1. Agricultural Project Analysis with Microcomputer Applications (ISARD)	Jan. 4-21	1. Applied Management Skills for Economic Development (ISARD)	July 5-July 29
2. Microcomputer Workshop on Irrigation Data and Project Management (Dr. Tom Sheng)	Jan. 11-22	2. Income Distribution, Poverty and Development (HDDS)	July 4-29
3. Intensive English Program	Jan. 18-Mar. 9	3. Microcomputer Workshop on Irrigation Data and Project Management (Dr. Tom Sheng)	July 11-29
FEBRUARY		AUGUST	
1. Evaluation Processing of Nutritious Foods (Dr. Ronald Trabelhorn)	Feb. 22-Apr. 29	1. Microcomputer Assisted Watershed Survey and Planning for Developing Countries (ISFNR)	Aug. 1-19
2. Issue Culture for Crops Project Training (Dr. Murray Nabors)	Feb. 29	2. Modern Surface Irrigation Design and Management (CIIM)	Aug. 1-19
MARCH		3. Flow Regulation and Measurement in Irrigation Management (CIIM)	Aug. 22-Sept. 9
1. Micro-irrigation Design and Management (CIIM)	Mar. 7-25	4. Intensive English Program	Aug. 27-Oct. 19
2. Intensive English Program	Mar. 18-May 10	5. Issue Culture for Crops Project Training (Dr. Murray Nabors)	Aug. 30
APRIL		SEPTEMBER	
1. Evapotranspiration and Irrigated Water Requirements (CIIM)	Apr. 4-22	1. Monitoring, Evaluation, Feedback and Management of Irrigated Agricultural Systems (CIIM)	Sept. 26-Oct. 14
MAY		OCTOBER	
1. Intensive English Program	May 23-June 10	1. Development and Management of Training in Irrigated Agricultural Systems (CIIM)	Oct. 17-Nov. 4
2. Intensive English Program	May 13-June 25	2. Intensive English Program	Oct. 15-Dec. 11
JUNE		NOVEMBER	
1. Agricultural Production Management and Policy Analysis (ISARD)	June 4-July 1	1. Water Users Associations in Irrigation Management (CIIM)	Nov. 7-25
2. Agricultural Marketing in Developing Countries (SDA/IC/ISARD)	June 6-July 29	2. Irrigation Systems Rehabilitation (CIIM)	Nov. 28-Dec. 16
3. Irrigation Problems and Practices (ISARD) (Dr. Willard)	June 13-Aug. 15	JANUARY 1989	
4. Field Studies in Integrated Resource Management (ISARD)	June 20-July 8	1. Agricultural Project Analysis with Microcomputer Applications (ISARD)	Jan. 2-20
5. International Technical Aspects of Irrigation Rehabilitation (Dr. David)	June 20-July 23		
6. Intensive English Program	June 23-Aug. 7		

## GENERAL INFORMATION

### Colorado State University

Colorado State University is located in Fort Collins, Colorado, a small city of approximately 87,000 people. It is situated at the base of the foothills of the Rocky Mountains, providing a protected environment with spectacular scenery and numerous recreational opportunities. The university serves approximately 19,000 students each year. The campus encompasses more than 3,800 acres and employs 1,400 academic faculty and nearly 3,000 support staff.

### Colorado State University Academic Term Calendar

Spring Semester '88 — 1/21/88 to 5/13/88, Summer Sessions '88 — 5/16/88 to 8/5/88, Fall Semester '88 — 8/25/88 to 12/16/88, Spring Semester '89 — 1/19/89 to 5/12/89

### English

English proficiency is necessary for participation in programs. Translation is available through special arrangement only.

### Health Insurance

Comprehensive Health Insurance coverage is MANDATORY for all participants. The cost of health insurance will be billed to the sponsor if participants fail to produce evidence of insurance upon arrival. (USAID/HAC coverage does not meet CSU TITLE IX requirements.)

### Travel

Participants should fly to Colorado's Stapleton International Airport in Denver. Colorado Ground transportation from Denver to Fort Collins is available on two shuttle van services from the ground transportation desks opposite Door 5 on the Baggage Claim level at the airport. The cost is approximately \$13.00 one way. Participants should ask to be taken to the CSU campus, Aylesworth Hall, during working hours or directly to a hotel near campus after hours.

### For more information, contact:

Dr. Bruce Tracy, Associate Director of International Programs  
 Dr. James Oxley, Advisor to Training  
 Ms. Martha Denney, M.Ed., Coordinator of International Training

### Office of International Programs-Training

315 Aylesworth Hall, NE  
 Colorado State University  
 Fort Collins, Colorado 80523  
 U.S.A.

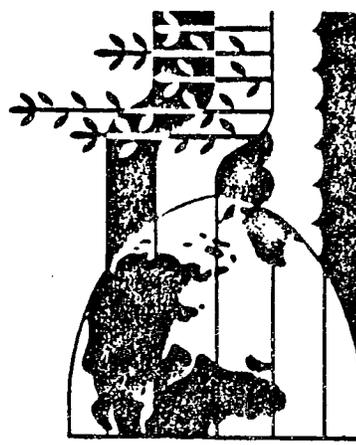
Telephone: (803) 491-7892  
 Telex: 9109309011 CSU CJD ITCN Attr: Intl. Training

# INTERNATIONAL TRAINING OPPORTUNITIES

at

# Colorado State UNIVERSITY

1988





## INTERNATIONAL PROGRAMS AT COLORADO STATE UNIVERSITY

Colorado State University's international involvement dates to the 1890's when the institution accepted its first foreign students. Activity in the new land-grant international development field increased steadily and by the late 1950's and early 1960's Colorado State was involved with the establishment of the Asian Institute of Technology in Thailand and the beginning of the U.S. Peace Corps.

The University's commitment to international development has continued with involvement in numerous development projects through the Agency for International Development, the World Bank and other development agencies. Colorado State in 1987 had more than one thousand foreign students and researchers and provided support services to more than 500 short-term scholars. The faculty supports international programs through three area studies programs, participation in international project activity, study abroad programs, collaborative research with colleagues around the world, and with the integration of international issues into their course curricula.

### International Training Support Services

The Office of International Training was established as part of Colorado State University's International Programs Office in 1980 to enhance and coordinate nondegree international training activities. It assists the nondegree International Schools and short courses by providing orientation programs and support services to participants.

International Training greets the newly arrived participants, finds them housing and helps them settle into their new surroundings. Orientation programs at the start of each course introduce the foreign visitors to Fort Collins and the University and provide important information on banking, insurance, health services, shopping and other necessities.

Another vital ingredient in the orientation is cross-cultural integration through discussion and exercises to prepare the international scholar for the experience of life in the United States.

In addition to the orientation programs, International Training continues to act as a liaison between the participant and the sponsor throughout the duration of the course. This service includes the issuance of identity cards, enrollment in various services offered by Colorado State, registration for academic credit, follow-through with the sponsors on issues such as payment, health claims, health insurance, reports, reimbursement of expenses, and other essentials to ensure a productive stay for the participant.

International Training arranges programs for short-term foreign visitors including tours of facilities of professional interest and meetings with professionals and researchers in the visitor's special field of interest.

### International Schools and Institutes

During the 1960's, the need to provide alternative educational opportunities for professionals from foreign countries became evident. Many individuals were faced with the need to update and expand their skills mid-career. U.S. project personnel working abroad found it difficult to place their counterparts at U.S. institutions because, as professionals, they often could not be away from their jobs long enough to complete a masters or Ph.D. degree.

Colorado State's International Schools grew from the need for short-term, nondegree technical training for mid-career professionals. Participants enroll for up to twelve months of specialized training. They may begin at any time during the year, however the beginning of the academic term is preferred. Eligibility requirements for participation in the International Schools include an undergraduate degree or equivalent professional experience and proficiency in English. Participants must have adequate financial support and health insurance that meets the University's minimum standard.

The Institutes, Colorado Institute for Irrigation Management (CIIM) and the Institute for Distribution and Development Studies (IDDS), were established in 1986 to provide a focal point for research, technical assistance and training in the areas of irrigation management and distributional issues respectively.

### International School for Agricultural and Resource Development

The International School for Agricultural and Resource Development (ISARD) serves the nondegree training needs of professionals and others responsible for designing, implementing, monitoring and evaluating development programs. Participants work with a faculty advisor to design a program to meet their specific needs. Instruction includes a combination of formal CSU courses, seminars, research projects and field trips. Internships with relevant federal, state and private agencies are also available. ISARD was formed in 1980, and has also offered a series of on-campus short courses and mobile short courses.

#### DATES:

Participants may begin at any time, start of term preferred. Specific dates for on-campus short courses are given in the individual brochure.

*Dr. David Seckler, Executive Director, and Dr. Ronald Timmermeier, Associate Director, ISARD, Rm. 301 Clark Bldg., Colorado State University, Fort Collins, CO 80523, (303) 491-7292, Telex 452014, ICARD*

### International School of Forestry and Resource Development

The International School of Forestry and Natural Resources (ISFNR) programs are designed to meet individual objectives using existing courses in the College of Forestry and Natural Resources. This school provides undergraduate and graduate-level nondegree training programs in watershed management, geology, wildlife management, and forestry for government officials, scientists, and other professionals. Special seminars, interim short courses and field trips are also arranged. This school is in its fourth year at Colorado State and previously operated under the name International School for Watershed Management.

#### DATES:

Participants may begin at any time, start of term preferred.

*Dr. Freeman Smith, Director, ISFNR, Rm. 102 Natural Resources Bldg., Colorado State University, Fort Collins, CO 80523, (303) 491-5443.*

### International School for Water Resources and Associated Programs

The International School for Water Resources and Associated Programs (ISWRAP) began in 1967 and schedules periodic courses and training trips in water resources engineering. Courses in the planning stage are dam analysis and design, water utility management, social and environmental impact analysis, computer-aided water management, hydrologic risk assessment and hydraulic engineering.

#### DATES:

Participants may begin at any time, start of term preferred.

*Dr. Neil Grigg, Director, ISWRAP, Rm. 210 Waterbury Bldg., Colorado State University, Fort Collins, CO 80523, (303) 491-5247.*

### Colorado Institute for Irrigation Management

The Colorado Institute for Irrigation Management (CIIM) was created at Colorado State in 1986 to serve as the university-wide entity for interdisciplinary and integrated training, research and technical assistance in the field of irrigation management. CIIM is governed by a Board of Directors that is chaired by the Vice President for Research, and assisted by a Technical Advisory Board of outstanding professionals in irrigation management.

*Dr. Marvin Jensen, Director, CIIM, 4th Floor University Services Bldg., Colorado State University, Fort Collins, CO 80523 (303) 491-2868*

### Institute for Distribution and Development Studies

The Institute for Distribution and Development Studies (IDDS) was established in 1986 to focus scholarly research, training and development assistance on the critical relationships between poverty, equity, and economic growth. Scholars and instructors affiliated with the Institute have addressed distributional issues extensively in Asia, Africa, and the United States. Their work has led to significant policy changes, redistributive programs and project redesign at the highest level in several countries.

*Dr. Jerry Eckert, Director, IDDS, Rm. B337 Clark Bldg., Colorado State University, Fort Collins, CO 80523, (303) 491-5549*

COLORADO STATE UNIVERSITY  
Fort Collins, Colorado

I. CURRICULUM PROGRAM:

A. Bachelor of Science

agricultural business	geology
agricultural economics	general agriculture
agronomy	horticulture
animal science	landscape architecture
bio-agricultural science	natural resource management
biological science	outdoor recreation
botany	plant pathology
entomology	range ecology
farm and range management	range forest management
fishery biology	statistics
food technology	watershed sciences
forest biology	wildlife biology
forest management science	wood science and technology

B. Postgraduate

Master of Science (both thesis and non-thesis)  
Doctor of Philosophy (dissertation)

agricultural economics	fishery and wildlife biology
agricultural engineering	forest and wood science (incl. MF)
agronomy	range science
animal science	recreation resources
applied ethics (incl. MA Appl Ethics)	watershed science and geology
botany and plant pathology	zoology and entomology
chemistry	

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate academic program concentrations which would be of interest to international students taught in the realm of natural resources/environmental management.

1. MS, PhD, Economics: Five primary fields of specialization are emphasized: economic theory and quantitative methods, social and political economics, international and development economics, natural resource and urban-regional economics, and agricultural economics.
2. MS, PhD, Fishery & Wildlife Biology: Included are programs in ecology and management of streams, lakes, and reservoirs; fish nutrition; taxonomy; fish physiology; pathology; population dynamics; fish culture; fish behavior; fishery operations planning; and larval fish classification and biology.
3. MS, PhD, Forest & Wood Science: Included are programs in silviculture, forest ecology, forest genetics and morphology, tree physiology, forest economics and marketing, forest biometry, forest fire science, multiple-use forest management, regional resource planning, natural resources administration, wood science and technology, wood anatomy, wood chemistry, and wood engineering.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational program:

Cooperative Education is a federal employment program which provides periods of study-related paid employment for students pursuing Baccalaureate degrees. Cooperative Education provides a blend of academic study and work experience which benefits the student because it lends relevancy to learning; provides realistic exposure to career opportunities; allows for early adaptation of the work environment; broadens exposure to people, places and situations; enhances potential for employment after graduation and helps pay educational expenses. The College of Forestry and Natural Resources has working agreements with the Environmental Protection Agency, Bureau of Land Management, US Forest Service, National Park Service, Corps of Engineers, Soil Conservation Service, and the US Fish and Wildlife.

B. Internships offered through private/public sector agencies:

Field internship in two concentrations: Environmental Interpretation and Park and Recreation Administration. Although the College maintains agency contacts for internships, the burden of securing the internship rests solely with the student. The College supports efforts which lead to a two-way flow of information and research results between the College and institutions or agencies abroad. The Natural Resource Ecology Laboratory undertakes ecosystem research and training in system approaches in ecology.

- C. International Non-Degree Training Programs: Training needs may consist of specialized study in new techniques and procedures, upgrading personnel, and/or updating professional knowledge. Watershed Management: provides non-degree training opportunities in watershed management, soil and water conservation, forestry, and other natural resources for officers and scientists from lesser developed countries. Programs are designed to meet individual needs and may include formal classroom work, independent study, study tours, and visits to organizations of interest as desired.
- D. The entire Colorado State University system operates on four separate campuses, and includes 11 research centers statewide, plus the Pingree Park Campus for research in forestry, engineering and biology. Also, there is the 800-acre Agricultural Campus for research in agronomy and animal sciences, and the Colorado State Forest Service Nursery.
- E. Total space assignment is +160,000 square feet which provides facilities for the instructional and research programs: general classrooms and laboratories; a College computer facility and shop; specialized laboratories in dendrology, resources planning, and fisheries biology. The Natural Resources Research Laboratory provides space for resource planning and specialized laboratory for fire science.
- F. Experiment Station: Research programs focus on problems related to agriculture, engineering, forestry, nutrition, consumer science, animal health and land use planning, to name a few. In some cases, research is conducted cooperatively with the USDA. Programs are integrated with undergraduate education and are particularly important in the University's graduate program. The CSU Experiment Station is Colorado's principal research agency with major focus on rural Colorado.
- G.- Colorado State Forest Service: One of four divisions of the University, helps manage 8 million acres of non-federal land in the state and operates a tree nursery of approximately 10 million trees of all types native to or adaptable to this region. The State Forest Service is involved in research programs in cooperation with the College of Forestry and Natural Resources. It assists state and private landowners in forest management and use, reforestation, fire protection, insect and disease control, and is the state agency responsible for controlling Dutch elm disease.
- H. Colorado Water Resources Research Institute: A statewide center for problem-solving water research with offices at CSU, the institute works closely with Colorado water users and state water officials to formulate research programs that respond to state water resources problems. Research is planned and supported in all of the research universities of the state. An external advisory committee representative of state and federal water agencies, industry, agriculture, local government and water user associations helps identify priorities and guide programs.
- I. Agriculture Institute: Established to coordinate agriculturally-related programs across research, extension and teaching. The Institute includes the Cooperative Extension Service and Experiment Station and involves most university colleges.

IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

1. University of the Republic of Uruguay: Memorandum of Understanding to set up, develop and implement joint research and extension projects in the areas of range science, student/faculty exchange, and publication of research reports and teaching materials.
2. University of the Andes/Venezuela: Agreement to develop, strengthen, and extend the professional education and investigation in the management of river basins, management of national parks and recreation, management of wildlife, remote

sensing and related fields, with special emphasis on average tropical environment.

3. Colegio de Postgraduados/Mexico: Memorandum of Understanding to train professionals and technicians on methodologies of agriculture, forestry, natural resources and rural development.
4. Baja California: Cooperative agreement for scientific and technological collaboration to achieve rational use and conservation of the natural resources of Baja California Sur and to achieve an exchange of experience, information training and education in the areas of natural resources management.
5. Autonomous University of Guadalajara/Mexico: Memorandum of Agreement between Colorado State University and Autonomous University of Guadalajara to enhance scholarly interaction of the two institutions through the promotion of systematic and continuing exchange of academic materials, of faculty and professional staff to participate in instruction and research and of students to pursue academic programs.
6. Agricultural University; Grassland Ecological Institute/Ghana: Agreement for the encouragement of cooperative research in agricultural production and human nutrition and the exchange of information, germplasm, students, and faculty.

#### V. PROGRAM ASSOCIATIONS:

##### A. Involvement and/or technical skills provided through the consortia:

1. Title XII: Strengthening grant in programs of soil and water management, crop and livestock production systems, animal health and medicine, genetic resources, economic development planning and policy analysis, rural development, extension, food science and nutrition.
2. Consortium for International Development (CID): A non-profit corporation of eleven western universities. The objectives of CID are to (1) facilitate the involvement of member universities in leadership and in contribution to the planning and implementation of large specialized or integrated international development projects, (2) provide administrative support for project initiation, implementation, and evaluation as well as training for key project administrators, and (3) improve the opportunities for member institutions to collectively provide their expertise to developing countries.
3. Universities for International Forestry (UNIFOR): A consortium of eight American universities joined for the purpose of providing professional consultative and educational services in forestry and related sciences for human benefit in the developing countries of the world.

##### B. Involvement with governmental agencies:

1. MOU (Memorandum of Understanding) with USAID.
2. Close cooperation is maintained with a variety of forestry and natural resource agencies. These include the Colorado State Forest Service, Colorado Division of Wildlife, Colorado Division of Parks, Roosevelt National Forest, Rocky Mountain Forest and Range Experiment Station, Soil Conservation Service, Fish and Wildlife Service, and the Agricultural Research Service. Cooperation with these agencies includes guest lectures, special seminars, and employment of students.

#### VI. CONTACTS:

Dr. Frank J. Vattano, Director  
General Environmental Studies Program  
Colorado State University  
Fort Collins, CO 80523  
Telephone: (303) 491-5421

Contact for international students:  
Dr. James Meiman  
Director, International Programs  
Colorado State University  
202 Administration  
Fort Collins, CO 80523  
Telephone: (303) 491-7194

#### VII. ADDITIONAL INFORMATION:

- A. Accreditation/Certification: Society of American Foresters (SAF)

## B. Student body profile: Fall, 1983

## 1. Number of students enrolled:

	US/Canada	Foreign
Undergraduates	15,748	(NIA)
Postgraduates	2,547	(NIA)
Total Campus	18,295	521

## 2. Number and geographical place of residence for foreign students:

95	Africa
176	Asia & Pacific
77	Middle East
95	Latin America
78	Developed Countries

## 3. Foreign postgraduate student specialization: (NIA)

## C. Faculty profile: Fall, 1983

## 1. Number of full-time faculty (9 &amp; 12 month) teaching positions: (NIA)

## 2. Faculty by technical specialization:

4	Plant Breeding	2	Resource Economics
3	Plant Protection and Management	1	Marketing and Consumer Economics
3	Plant Production and Management	2	Int'l Economic Development & Trade
6	Forestry	1	Agricultural Statistics
1	Animal Breeding	1	Climatology
2	Animal Production and Management	1	Energy
6	Animal Health	8	Water
2	Animal Nutrition	2	Wildlife
2	Home Economics and Human Ecology	4	Environmental Studies
6	Education and Extension	2	Soil Science
3	Rural Sociology	4	Range Management
1	Policy Formation & Management	1	Communications - Diffusion of Technology

## D. Future plans: (NIA)

## E. School setting:

The University is within the City of Fort Collins (pop. 64,632), the 833-acre Main Campus is 65 miles (104 km.) north of Denver.

Climate:           year-round mean temperature: 50 F (10 C)  
                       winter: 37 F (2.8 C)  
                       summer: 63 F (17.3 C)  
                       mean rainfall: 14 inches (37 cm.)  
                       relative humidity: 52%

(Climate data taken from Denver, 65 miles (104 km.) south of Fort Collins.)

## Local Characteristics:

1. Land Use: Irrigated land.
2. Forest/Vegetation type: Grama-buffalo grass (Bouteloua-Buchloe). The forest region is typified by cold winters and a short but warm growing season, with a summer dry period. Cone-bearing trees predominate.
3. Land Surface Forms: Irregular plains, more than 50% of area covered with sand.

## F. Facilities:

The University Library houses 4 million volumes and includes collections of periodicals, journals, newspapers, manuscripts, microfilms, phonorecorders, and other reference items. Computer facilities are accessible to students.

## G. Special aid for foreign students:

Office of International Education: Assists in planning visits of foreign experts and facilitates the use of foreign students and CSU faculty with international expertise in classes and in off-campus programs, including interdisciplinary studies programs; special courses such as World Interdependence; programs in international issues; activities involving American and foreign students; study abroad programs; fellowship and exchange opportunities; and community outreach programs. The Office of International Services: provides visa and immigration services to foreign students and visiting faculty. It also provides other support services, such as pre-arrival information, on campus orientation, assistance in housing, administration of scholarships, and advising on problems arising from living in the United States.

YALE UNIVERSITY  
New Haven, Connecticut

I CURRICULUM PROGRAM:

A. Postgraduate

environmental design (MED)  
public health (MPH)  
international development and economics (MS)  
forest science (MFS)  
forestry (PhD)

II. ACADEMIC CONCENTRATIONS:

Specific academic program concentrations which would be of interest to international students taught in the realm of natural resources/environmental management:

1. MF, Master of Forestry: Natural resource management and policy with special programs in tropical environments, international economics and wildlife. One year degree program is designed for individuals with a minimum of two years of full-time professional forestry experience. Areas of specialization in timber management, multiple use forestry, organizational administration, urban forestry, international forestry, and tropical forest management and administration. The program is designed to integrate knowledge of forestry, natural resources and society; extend knowledge in relevant fields; and to provide the opportunity for students to undertake independent problem solving and critical studies.
2. MES, Master of Environmental Studies: Terrestrial ecology with emphasis on the interrelationships among biological and physical factors. The program is designed for dealing with the understanding of multiple-use management of terrestrial systems. The program presents a one year program restricted to individuals with a minimum of two years of responsible, full-time professional experience. Two year program includes one summer program (technical skills), distribution requirements in quantitative analysis, physical/biological/socio-economic science; concentration requirement - specialized field of study; special project course; case studies.
3. PhD, DF, Doctor of Philosophy/Forestry: Human dimensions of natural resource issues with special emphasis on social and individual perceptions. Instruction and opportunities for research in most of the specialties of forestry and forest science. Designed to develop technical skills demanded in dealing with the resolution of specific biological and socio-economic conflicts in natural resource allocation, use, and conservation. Students are encouraged to select a large portion of their program of study from courses offered including anthropology, architecture, biology, biostatistics, economics, environmental health studies, geology, geophysics, history, law, organization and management, sociology, science. The PhD is most appropriate for people interested in the more basic aspects of the biological and physical sciences as applied to natural resource problems. These may range from mammalian behavior to genetic variation in tissue culture.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational programs:

Joint Master's Degree's: The school is supportive of curricula that work concurrently toward two degrees from different administrative units. Opportunities for development of joint degree programs exist within the Law School, the School of Organization and Management, and the Department of Epidemiology and Public Health.

B. Internships offered through private/public sector agencies:

Inter-session internships with non-profit and research organizations are frequently possible.

C. The School is in close cooperation with the Connecticut Agricultural Experiment Station and the Forest Insect and Disease Laboratory of the USDA Forest Service. There are also working arrangements with the Marine Biological Laboratory at Woods Hole,

Massachusetts, and the Institute of Ecosystem Studies of the New York Botanical Gardens. Research program and facilities for forest ecosystem studies are located at the USDA Forest Service's Experimental Forest at Hubbard Brook Experimental Watershed Ecosystem in New Hampshire.

- D. Lab and classroom facilities are available for instruction in mensuration, biometry, forest meteorology, industrial forestry, management, silviculture, remote sensing, sociology, economics, morphology, soils, ecology, physiology, and genetics. The forest library consists of 130,000 volumes with 325 periodicals and 800 serial publications in forestry and environmental studies. Foreign language materials are represented in the library's collection. The University's main library has a collection of over 4 million volumes.
- E. Forest research areas (8,900 acres) are available for investigation to all aspects of intensive management of eastern white pine and other conifers. Camp and accessory buildings are available for instruction and research in silviculture, ecology, wildlife ecology, and other phases of forestry and forest science.
- F. Tropical Resources Institute: Initial teaching and research activities are focused in Puerto Rico and the neo-tropics, but with time will expand to encompass projects in other tropical and subtropical regions. The major objective of TRI is to meet specialized research and educational needs of students seeking careers in research and management of tropical resources. Also, TRI makes courses and seminars related to the tropics available to University students, faculty and the surrounding community.

IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS: (NIA)

V. PROGRAM ASSOCIATIONS:

- A. Involvement and/or technical skills provided through the consortia: (NIA)
- B. Involvement with governmental agencies:

The School has a Memorandum of Understanding with the USDA Forest Service.

VI. CONTACTS:

Dr. John C. Gordon, Dean  
Yale University School of Forestry  
and Environmental Studies  
Sage Hall  
205 Prospect Street  
New Haven, CT 06511  
Telephone: (203) 436-0440

Contact for international students:  
Roberta D. Grossman  
Advisor to Foreign Students & Scholars  
Yale University  
Box 1001A Yale Station  
New Haven, CT 06520  
Telephone: (203) 432-4754

VII. ADDITIONAL INFORMATION:

- A. Accreditation/Certification: Society of American Foresters (SAF)
- B. Student body profile: Fall, 1983

1. Number of students enrolled:

	US/Canada	Foreign
Undergraduates	5,127	116
Postgraduates	4,581	567
Total Campus	9,708	683

2. Number and geographical place of residence for foreign students:

57	Africa
231	Asia & Pacific
41	Middle East
72	Latin America
282	Developed Countries

Massachusetts, and the Institute of Ecosystem Studies of the New York Botanical Gardens. Research program and facilities for forest ecosystem studies are located at the USDA Forest Service's Experimental Forest at Hubbard Brook Experimental Watershed Ecosystem in New Hampshire.

- D. Lab and classroom facilities are available for instruction in mensuration, biometry, forest meteorology, industrial forestry, management, silviculture, remote sensing, sociology, economics, morphology, soils, ecology, physiology, and genetics. The forest library consists of 130,000 volumes with 325 periodicals and 800 serial publications in forestry and environmental studies. Foreign language materials are represented in the library's collection. The University's main library has a collection of over 4 million volumes.
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V. PROGRAM ASSOCIATIONS:

- A. Involvement and/or technical skills provided through the consortia: (NIA)
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1. Number of students enrolled:

	US	Canada	Foreign
Undergraduates	5,127		116
Postgraduates	4,581		567
Total Campus	9,708		683

2. Number and geographical place of residence for foreign students:

57	Africa
231	Asia & Pacific
41	Middle East
72	Latin America
282	Developed Countries

## 3. Foreign postgraduate student specialization:

Anthropology	Policy & Institutions
Biology	Sociology/Land Tenure
Biometrics	Soil Science
Botany	Utilization
Business Administration	Watershed Management
Chemistry	Environmental Economics, Impacts, Policy & Design, National Park Management, Health & Sanitation
Communications	
Resource Economics	
Entomology	Fisheries - Marketing/Economics
Fire Management	Ecology - Animal, Plant and Forest
Geology	Range & Wildlife Management - Planning, Economics, Interpretation, Policy & Administration,
Harvesting	Policy/Administration,
Meteorology	Productivity & Utilization.
International Relations/Affairs	Recreation/National Parks - Law
Land Use Assessment/Planning	Enforcement. Habitat Management, Administration, Planning
Legal Studies	Forestry - Silviculture, Tree
Liberal Arts	Improvements/Genetics, Urban
Landscape Architecture	Forestry
Mapping	Industry - Environmental Impacts,
Management	Pollution, Alternate Resource Use.
Marketing	Energy - Conservation,
Mensuration	Fossil/Geothermal/Nuclear/Solar.
Natural resources	
Pathology	
Physiology/Toxicology	
Plant Science	

## C. Faculty profile: (NIA)

1. Number of full-time faculty (9 &amp; 12 month) teaching positions: (NIA)

2. Faculty by technical specialization:

1 Forestry Biology	1 Silviculture
1 Remote Sensing	1 Forest Genetics
1 Applied Microeconomics	1 History/Library Science
2 Forest Ecology	1 Ecology
1 Policy Science	1 Behavioral Ecology
1 Sociology	1 Biometeorology
1 Biometry/Forest Mensuration	1 Forest Entomology
1 Botany	1 Plant Pathology
1 Tree Physiology	1 Biology
1 Resource Management	1 Soil Science
	1 Natural Resource Economics/Policy

## D. Future plans:

The School plans on expanding its international forestry program to a more global orientation.

## E. School setting:

The University is located in the the City of New Haven (pop. 126,109) 74 miles (119 km) northeast of New York City and situated on Long Island Sound.

Climate: year-round mean temperature: 52 F (11 C)  
 winter: 30 F (-1 C)  
 summer: 74 F (23 C)  
 mean rainfall: 28 inches (58.4 cm.)  
 relative humidity: 77%

## Local Characteristics:

1. Land Use: Urban & Residential.
2. Forest/Vegetation type: Mixed deciduous hardwood and pine.
3. Land Surface Forms: Undulating hills. Seven feet above sea level but some parts are at a higher elevation.

F. Facilities:

The University Library houses 8 million volumes, 1.7 million microforms, 2.3 million manuscripts, 7.6 million government documents and 5.4 million maps.

G. Special aid for foreign students:

Yale University maintains an office of the Adviser to Foreign Students and Scholars for matters concerning foreign nationals in the United States. It assists foreign students with visa and general immigration procedures; issues documents needed to enter and extend authorized periods of stay; assists in acquiring documents for employment for spouses seeking employment; and arranges for the purchase of medical health insurance. In addition to this office, there is an active International Student Center that provides for social interaction among the many foreign students at Yale.



University of Florida  
Institute of Food and Agricultural Sciences  
School of Forest Resources and Conservation

Office of the Director  
Telephone: 904/392-1792

118 Newins-Ziegler Hall  
Gainesville, Florida 32611

December 8, 1987

Dr. Peter Freeman  
619 Uplands Place  
Alexandria, VA 22301

Dear Peter:

Attached is a description of our Agroforestry program with courses applicable to this field. I have highlighted courses relevant to a tropical ecology and natural resources certificate program. I am sure the listing is not all inclusive, but I wished to send this ASAP. This is a hectic period and I apologize for not having time to provide additional information.

If you desire additional information, please call me.

Sincerely,

Arnett C. Mace, Jr.  
Director

ACMjr/cmm

Attachment

UNIVERSITY OF FLORIDA  
Gainesville, Florida

I. CURRICULUM PROGRAM:

A. Undergraduate

agricultural and extension education (BS)	mechanized agriculture (BS)
agricultural engineering (BS)	microbiology and cell science (BS)
agronomy (BS)	plant pathology (BS)
animal science (BS)	plant science (BS)
botany (BS)	poultry science (BS)
dairy science (BS)	resource conservation (BS, FRC)
entomology and nematology (BS)	soil science (BS)
forestry (BS, FRC)	statistics (BS)
food and resource economics (BS)	vegetable crops (BS)
food science and nutrition (BS)	wildlife ecology (BS, FRC)
fruit crops (BS)	

B. Postgraduate

agricultural engineering (MS-thesis)  
 agricultural and extension education (MAG-non-thesis)  
 agronomy (MAG-non thesis, MS, PhD-thesis)  
 animal science (MAG-non thesis, MS, PhD-thesis)  
 botany (MAG, MS, PhD-thesis)  
 coastal and oceanographic engineering (MS-thesis)  
 dairy science ((MAG-non thesis, MS-thesis)  
 entomology and nematology (MAG-non thesis, MS)  
 environmental engineering sciences (MS, PhD-thesis)  
 food and resource economics (MAGR Mgmt. & Res. Devt., MS, PhD)  
 horticultural science (MAG-non thesis, MS,-thesis, PhD)  
 plant pathology (MAG-non thesis, MS, PhD-thesis)  
 poultry science (MAG-non thesis, MS-thesis)  
 soil science (MAG-non thesis, MS, PhD-thesis)  
 wildlife conservation (MS, PhD)  
 wildlife conservation in Latin America (MS)  
 wildlife management and natural resources (MS, PhD)

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate academic program concentrations which would be of interest to international students taught in the realm of natural resources/environmental management.

Forest Resources and Conservation (MFRC)

Areas of specialization:

forestry (genetics, physiology, pathology, nutrition, hydrology, ecology, system analysis, biometrics, silviculture, soils, management, economics, products and wetlands);  
 wildlife (biology, ecology and management);  
 range (ecology and management);  
 resource conservation (ecology);  
 fisheries and aquaculture (biology, ecology and management);  
 aquatic plants (limnology, ecology and management).

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational program:

International Studies: The program consists of a Center for Latin American Studies, a Center for African Studies, a Center for Tropical Agriculture, a Program in International Relations, and an English Language Institute for speakers of other languages.

B. Internship offered through private/public sector agencies: (NIA)

C. The Center for Tropical Agriculture: Seeks to stimulate interest in research and

curriculum related to the tropical environment and its development.

1. **Minor in Tropical Agriculture:** An interdisciplinary minor in tropical agriculture may be planned at both the master's and doctoral level by students majoring in agriculture, forestry, and other fields where knowledge of the tropics is relevant. The minor may include courses treating the characteristics of the tropics: its soils, water, vegetation, climate, agricultural production, and the language and culture of tropical countries.
  2. **Certificate Program:** A program for a specialization (with certificate) in tropical agriculture for graduate students in the College of Agriculture. The program provides course selection to broaden the normal degree requirements for those interested in specializing in tropical agriculture. Approved courses must be selected from four basic groups as follows: area studies, international economics, tropical ecosystems, and tropical agriculture.
  3. **Research:** The Center provides research grants to faculty members and their graduate students and assists in the coordination of interdisciplinary research funded elsewhere. Development assistance contracts in agriculture and related fields frequently have research components.
  4. **The Center sponsors conferences and seminars, publications, monographs and proceedings, library acquisition, and dissemination of knowledge in tropical agriculture.**
- D. **The English Language Institute:** Offers a noncredit, nondegree program in English as a second language for students with some knowledge of the language who wish to increase their competence. The Institute provides English and academic skills training appropriate to the level at which the students will ultimately be working.
- E. **The Center for African Studies:** Responsible for the direction and coordination of interdisciplinary instructional and research activities related to Africa. It cooperates with departments in administering and staffing a coordinated certificate program in African Studies.
- F. **The Center for Latin American Studies:** Responsible for directing and coordinating graduate training, research, and other academic activities related to the Latin American areas.
- G. **The University of Florida Marine Laboratory:** Facilities for research work by graduate students. Facilities include 20 x 40 foot research and teaching building (3 miles offshore), 10 room residence, and a 32 foot research vessel.
- H. **The University of Florida Cornelius Vanderbilt Whitney Marine Laboratory:** Research and instruction in marine biological sciences; research opportunities for graduate students are available through faculty members who use this laboratory.
- I. **Certificate (Minor) in Environmental Studies for Undergraduate Students:** The program provides course selection to obtain a broad knowledge of the environment, especially the inter-relationships between the activities of man and environmental quality. Students enrolled in one of the existing major programs in the College of Agriculture and for this minor will learn to apply their major discipline to the solution of environmental problems.
- J. **Conservation and Management Training Program:** Interdepartmental students who enroll in individual departments depending upon their specific interests, i.e., wildlife conservation (MS, PhD) - Department of Zoology; wildlife management & natural resources (MS, PhD) - School of Forest Resources and Conservation; wildlife conservation in Latin America (MS) - Center for Latin American Studies. The training program includes academic and field training curriculum in both the US and overseas countries (Argentina, Sri Lanka and Indonesia).
- K. **General classrooms, teaching laboratories, conference rooms, graduate carrels, specialized and common use research laboratories, offices, computer and analytical facilities.** Field facilities include pine flatwoods, sandhills, cypress swamps, native range, lakes, marshes and old-growth pine forests. Students use these areas for field laboratories, demonstrations and research activities.
- L. **A 6,000 acre sanctuary with ecosystems ranging from wetlands to sandhills, numerous fauna, flora and aquatic ecosystems provide a research and instructional site.** Instruction, research and extension activities are conducted in the 2,080 acres of flatwood forest land, a nursery, a small sawmill, a fisheries laboratory and 10

experimental fish ponds.

IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

The University of Florida Center for International and Tropical Agriculture has participated in programs of assistance and development in many major areas of the world: Africa, South America, Middle America, and Southeast Asia. The above institutions are related to programs throughout the University.

V. PROGRAM ASSOCIATIONS:

A. Involvement and/or technical skills provided through the consortia:

1. Organization for Tropical Studies (OTS) is a non-profit corporation established to promote the study of science in the tropics; to conduct organized programs of graduate training and research on tropical problems; and to serve as a national and international agency for coordinating and facilitating the work of individuals and groups in the tropics. Its central purpose is to acquire and disseminate a broad understanding of tropical environments and man's relationship to them by means of a sound program of teaching and research.
2. The South-East Consortium for International Development (SECID): The member institutions collaborate through SECID on international activities which utilize their main disciplinary skills of education, research, and extension. SECID provides the opportunity for member institution involvement in projects which would not be feasible to staff from a single institution.

B. Involvement with governmental agencies:

US Fish and Wildlife Service Cooperative Fish and Wildlife Research Unit  
Southeastern Forest Experiment Station  
- National Fisheries Research Laboratory

VI. CONTACTS:

Dr. Arnett C. Mace, Jr., Director  
School of Forest Resources  
and Conservation  
118 Newins-Ziegler Hall  
University of Florida  
Gainesville, FL 32611  
Telephone: (904) 392-1791

Contact for international students:  
Dr. Richard Downie  
Director, Office for International  
Student Services  
University of Florida  
1504 West University Avenue  
Gainesville, FL 32611  
Telephone: (904) 392-1345

VII. ADDITIONAL INFORMATION:

A. Accreditation/Certification: Society of American Foresters (SAF)

B. Student body profile: Fall, 1983

1. Number of students enrolled:

	US/Canada	Foreign
Undergraduates	30,829	612
Postgraduates	3,916	798
Total Campus	34,745	1,410

2. Number and geographical place of residence for foreign students:

124	Africa
508	Asia & Pacific
180	Middle East
523	Latin America
187	Developed Countries

3. Foreign postgraduate student specialization: (NIA)
- C. Faculty profile (Fall, 1983):
1. Number of full-time faculty (9 & 12 month) teaching positions: (NIA)
  2. Faculty by technical specialization:
 

33 Plant Breeding	10 Education and Extension
127 Plant Production and Management	4 Comm. - Diffusion of Technology
127 Plant Protection	22 Resource Economics
2 Plant Products	23 Marketing and Consumer Economics
38 Forestry	15 Int'l Economic Development
13 Animal Breeding	6 Agricultural Statistics
31 Animal Production & Management	8 Energy
89 Animal Health	10 Water
6 Animal Products	32 Soil Science
26 Animal Nutrition	2 Aquaculture
46 Food Science	9 Farm Mechanization
12 Human Nutrition & Health	1 Waste Management
15 Home economics & Human Ecology	3 Farming Systems
1 Honeybee	1 Community Development
1 Microbiology & Cell Science	

D. Future plans:

The School plans on expanding its international program through:

1. Recently submitting a proposal to establish an Undergraduate Program in Tropical Resource Management with the Department of Education which will involve cooperation of faculty associated with the School, the Florida State Museum, and University Center for International Programs, and Latin American/African Studies.
2. Increasing involvement with adjunct faculty from Florida State Museum and US Fish and Wildlife Service who are actively involved in international wildlife programs.
3. Increasing involvement in University's International Conservation Training Program under direction of adjunct faculty member associated with Florida State Museum, with emphasis on international wildlife conservation and management.
4. Plans for involvement in tropical forestry projects in Latin and Central American countries projected for the next few years.

E. School setting:

The University is located in the City of Gainesville (pop. 81,387), 140 miles (224 km.) southeast of Tallahassee, 70 miles (112 km.) from the Atlantic Ocean and 70 miles (112 km.) east of the Gulf of Mexico.

Climate:            year-round mean temperature: 67 F (19 C)  
                       winter: 59 F (15 C)  
                       summer: 76 F (24 C)  
                       mean rainfall: 51 inches (140 cm.)  
                       relative humidity: 75%

Local Characteristics:

1. Land Use: Cropland with pasture, woodland, and forest.
2. Forest/Vegetation type: Southern mixed forest (Fagus-Liquidambar-Magnolia-Pinus-Quercus).
3. Land Surface Forms: Flat plains (more than 50% of area covered by sand).

F. Facilities:

The University Library  
 Computer Laboratories

G. Special aid for foreign students:

The International Student Services Center assists international students in adjusting to the changing life style and study habits. Special services are provided related to foreign educational and cultural backgrounds; language, legal, employment, academic, and personal matters; US immigration and other governmental agency responsibilities as aliens; and currency exchange. The focus is on helping international students achieve their educational goals, while providing an insight into the culture of the United States through a program of social activities, orientation seminars, and community visits.

UNIVERSITY OF GEORGIA  
Athens, Georgia

I. CURRICULUM PROGRAM:

A. Undergraduate

agriculture (BS)	agricultural economics (BS Agr)
environmental health science (BS)	forest resources (BS)
agricultural engineering (BS)	landscape architecture (BLA)

B. Postgraduate

agricultural economics (MS, PhD)	forestry (MS)
agricultural engineering (MS)	forest resources (MFR, PhD)
agricultural extension (MAgr Ext)	entomology (MS, PhD)
animal nutrition (PhD)	food science (MS, PhD)
animal and dairy science (MS, PhD)	horticulture (MS, PhD)
agronomy (MS, PhD)	natural resource economics (MS, PhD)
botany (MS, PhD)	plant pathology (MS, PhD)
dairy science (MS)	plant protection/pest management (MPP&PM)
ecology (PhD)	poultry science (MS, PhD)

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate academic program concentrations which would be of interest to international students taught in the realm of natural resources/environmental management.

MS, thesis & non-thesis, PhD - Forest Resources: Graduate training and research are conducted in the general areas of forest biology and silviculture, forest biometrics and management, forest soils and water resources, forest policy, planning and administration, wildlife and fisheries, and wood technology.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational program: (NIA)

B. Internships offered through private/public sector agencies:

Cooperative program with 15 private, industrial forest land-owning companies in the southeast who manufacture pulp, paper, plywood, panel and sawtimber. The Plantation Management Research Cooperative undertakes mensuration, management and biometrics research for the timber industry and provides faculty and graduate students with research opportunities. The School maintains a program of internships for undergraduates each summer with industrial forestry companies. Generally designed for students who intend to seek permanent employment with the companies involved.

C. Center for Global Policy Studies: Serves as a mechanism for coordinating and promoting instruction, service, and research relative to global policy studies. The focus of the Center is on issues which are distinctly international or transnational in character, such as the unfinished task of organizing a durable peace in a nuclear world, the growing pressures of expanding population upon limited resources, and continuing threats to elemental human rights. One of the primary objectives of the Center is to enrich the quality of training of undergraduates in global policy studies. The Center administers the Certificate in Global Policy Studies which is available to qualified undergraduate students throughout the University. The Center also has a graduate level Certificate in Global Policy Studies.

D. Marine Sciences Program: Is responsible for the coordination and/or general management of the Marine Institute, Marine Extension Service, Marine Sciences Faculty, and the Georgia Sea Grant College Program.

The Marine Institute serves as a research facility for resident staff and for campus-based faculty members. Research has centered mainly on basic marsh ecology to provide an understanding of energy flow, cycling of minerals and nutrients through the marshes, and factors regulating the metabolism of the salt marsh ecosystem.

The Marine Extension Service helps to solve problems related to the state's marine

resources. The Marine Resources Center is the major marine education facility for schools and colleges in the state. At the Brunswick Extension Station, specialists work directly with the fishing and seafood processing industry to solve problems of resource management and utilization.

Sea Grant promotes the wise use of marine resources through a coordinated program of research, education and advisory services.

- E. Office of International Development: To develop opportunities for faculty and staff to become involved in the delivery of technology to developing countries, and to strengthen the domestic research, teaching and extension capabilities of faculty members.
- F. Museum of Natural History: Houses extensive collection of artifacts and specimens related to anthropology, botany, entomology, geology, mycology and zoology.
- G. Institute of Ecology: Work involves assisting governmental agencies and private enterprise in meeting the US environmental policy laws; provide short courses which emphasize the fundamental ecology and preparation of environmental impact studies; and provides public information designed to communicate scientific studies of ecology to the lay public.
- H. Botanical Garden: The 293 acre area comprises a broad section of the state's Piedmont. In addition to service and cultural activities, the Garden serves as an outdoor laboratory for university classes in plant sciences, environmental design and ecology.
- I. Institute of Natural Resources: Conducts and manages interdisciplinary research, academic and educational programs related to natural resources. The research, training and advisory efforts are focused on the integrative applications of the biological, physical and social sciences to the development, management, utilization and conservation of natural resources, especially land, water, minerals, fisheries, wildlife and energy. The focus of the Institute faculty is on synthesizing scientific research for analysis of complex natural resources policy and management issues. The Institute provides graduate research assistantships for studies related to these fields.

#### IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

1. US Agency for International Development (USAID), Title XII, Peanut Collaborative Research Program/Worldwide: To develop research programs for improving production and utilization of peanuts, in turn enhancing the food and cash income status of farmer and urban populations in host countries (1982-indefinite).
  - a) Niger; Mali; Upper Volta; Caribbean/International Peanut Evaluation Program: To improve peanut production in the host countries through the introduction of superior germplasm.
  - b) Institute for Agricultural Research, Ahmadu Bello University/Nigeria: To conduct research to obtain a better understanding of peanut viruses (etiology, epidemiology) and develop methods of control or resistance.
  - c) University of Ouagadougou/Upper Volta: To identify the major arthropod pests of peanut, determine their relationship with aflatoxin contamination, develop economic thresholds for these pests, and develop strategies/control measures to reduce losses to these pests.
  - d) Thailand; Philippines: To enhance the capabilities of land-grant-type institutions in the third world countries through training afforded by collaborative programs in developing the storage and utilization of peanut.
2. Southeast Consortium for International Development (SECID); University of Ouagadougou/Upper Volta: Agriculture human resource development project involving the government of Upper Volta in expanding and strengthening the capacity of the agricultural education system to produce sufficient numbers of skilled agricultural extension workers. The expansion of practical training facilities at the university and vocational levels, combined with US training programs for Voltaique participants will allow the government to increase its output of trained personnel at all levels of the agricultural extension system, 1979-83.

3. -USAID, SECID/Zaire: Designed to assist the Government of Zaire in its long-term effort to upgrade the professional staff of its Ministry of Agriculture. Over the course of this five-year project, approximately twenty-four Zairois students will complete their US training at the Master's or PhD level in such disciplines as agricultural economics, business administration and agricultural statistics. The US Department of Agriculture and SECID-with the University of Georgia as Lead Institution-collaborate in program design, placement, guidance and administrative support activities for these participants, 1978-1983.
4. SECID/Africa: Faculty of the school assigned to develop position papers on forest resource development and management.
5. SECID/Sri Lanka: This four-year resource management project provides technical assistance to the Forest Department of Sri Lanka in its efforts to conserve and stabilize watershed areas in the highland regions, and to enhance the renewable energy and commercial forest resource bases of the country. To meet these objectives, the project strategy calls for technical assistance and training in support of: reforestation and stabilization of 15,000 acres of patanas and abandoned tea lands for watershed protection in the Upper Mahaweli Catchment area (wet zone), and establishment and maintenance of 35,000 acres of fuelwood plantations on abandoned chena lands in the dry zone, 1981, 1985.
6. USAID/Sri Lanka/Reforestation and Watershed Management projects provides the Home Campus Coordinator, technical consultants, and the US short and long-term training.
7. National Science Foundation; Universidad Centro Occidental in Barquisimeto/Venezuela: Collaborative research project in plant pathology.
8. Federal University of Pernambuco/Brazil: Seminars and research on schistosomiasis; research in breeding sorghum cultivars for high acid soil, drought and salt tolerance.
9. The school has a written agreement with the Commonwealth Forestry Institute, Oxford University, to seek opportunities for mutual cooperation and participation in international development.

#### V. PROGRAM ASSOCIATIONS:

##### A. Involvement and/or technical skills provided through the consortia:

1. Organization for Tropical Studies (OTS): A non-profit corporation established to promote the study of science in the tropics; to conduct organized programs of graduate training and research on tropical problems; and to serve as a national and international agency for coordinating and facilitating the work of individuals and groups in the tropics. Its central purpose is to acquire and disseminate a broad understanding of tropical environments and man's relationship to them by means of a sound program of teaching and research.
2. Southeast Consortium for International Development (SECID) services offered through the consortium are short term consultancies for overseas projects; training in the US at undergraduate and graduate levels; consultants for design terms in the appraisal stage of projects; and to assist SECID for preparing technical responses to 'request for proposals'.

##### B. Involvement with governmental agencies: (NIA)

## VI. CONTACTS:

Dr. Darl Snyder  
Office of the Director  
111-114 Candler Hall  
University of Georgia  
Athens, GA 30602  
Telephone: (404) 542-7887

Contact for international students  
Dr. Richard F. Reiff, Director  
International Services & Programs  
214 Clark Howell Hall  
University of Georgia  
Athens, GA 30602  
Telephone: (404) 542-1557

## VII. ADDITIONAL INFORMATION:

## A. Accreditation/Certification: (NIA)

## B. Student body profile: Fall, 1983

## 1. Number of students enrolled:

	US/Canada	Foreign
Undergraduates	17,232	418
Postgraduates	6,092	733
Total Campus	23,324	1,151

## 2. Number and geographical place of residence for foreign students:

123	Africa
447	Asia & Pacific
54	Middle East
169	Latin America
258	Developed Countries

## 3. Foreign postgraduate student specialization:

1 Economics	1 Environmental - Policy/Regulation
1 Geography	1 Fish - Marine Aquaculture
1 Geology	1 Fish - Resource Based Management
1 Hydrology	1 Range/Wildlife Mgt. - Planning
1 Law/Legal Studies	1 Range/Wildlife Mgt. - Economics
1 Management	1 Range/Wildlife Mgt./Admin.
1 Natural Resources	1 Range/Wildlife Mgt.
1 Policy and Institutions	1 Agriculture - Management
1 Watershed Mgt./Soil Conservation	1 Agriculture - Hydrology
1 Watersupply	1 Industry - Environmental Impacts
1 Environmental - Economics	1 Energy - Conservation
1 Environmental - Impacts	1 Energy - Policy

## C. Faculty profile: Fall, 1983

## 1. Number of full-time faculty (9 &amp; 12 month) teaching positions: 2,308

## 2. Faculty by technical specialization:

16 Plant Breeding	12 Resource Economics
57 Plant Production & Management	1 Marketing & Consumer Economics
65 Plant Protection	1 Agricultural Statistics
9 Plant Products	2 Geography
56 Forestry	7 Energy
3 Animal Breeding	13 Wildlife
4 Animal Products	16 Environmental Studies
87 Animal Health	2 Soil Science
14 Animal Production & Management	2 Fisheries
9 Animal Nutrition	3 Farm Mechanization
22 Food Science	2 Pest Management
4 Education and Extension	2 Economic Modeling
11 Comm. - Diffusion of Technology	2 Data Processing/Computers

## D. Future plans:

It is proposed to establish a Center for International Forestry in the School of Forest Resources. The major thrusts are as follows:

1. The impact of international trading on the domestic forest resources and forest products industry.
2. The development and use of the forest resources of overseas countries based on technological developments resulting from research programs.
3. The manufacturing and marketing potential of forest products to and from overseas countries to develop international trade.
4. To provide the forest products industry with knowledgeable personnel to participate in policy-making with respect to overseas activities.
5. The training of forest managers from overseas countries in the methods of industrial forest management.

#### E. School Setting:

The University is located in the City of Athens (pop. 77,000), 60 miles (96 km.) east of Atlanta, 200 miles (320 km.) northwest of the Atlantic Ocean, and 260 miles (416 km.) from the Gulf of Mexico.

Climate:           year-round mean temperature: 61 F (16 C)  
                   winter: 50 F (10 C)  
                   summer: 72 F (22.3 C)  
                   mean rainfall: 50 inches (128 cm.)  
                   relative humidity: 72%

#### Local Characteristics:

1. Land-Use: Woodland and forest grazed.
2. Forest/Vegetation Type: Oak-hickory-pine forest (Quercus-Carya-Pinus). The forest region occurs mainly on the sandy coastal plain which is relatively dry despite the ample rainfall. The pined and broad-leaved trees here are adapted to dry soils.
3. Land Surface Forms: Irregular plains (50 to 75% of gentle slope is on upland, 100-300 ft.).

#### F. Facilities:

The University's library system houses +2 million volumes, 250 thousand map items, and 1 million microsheets. Computer facilities are available to students.

#### G. Special aid for foreign students:

The Office of International Services and Programs provides counseling and advising for international students and exchange visitors in the areas of immigration procedures, financial concerns, housing, university services, and personal matters. In order to assist the foreign student in adjusting to the University and local community, the office sends pre-arrival information to newly-accepted students and provides an orientation program when the student arrives on campus. The office sponsors other programs to promote cultural exchange such as the weekly International Coffee Hour, the Campus Friend Program, the Community Friend Program, International Week, International Day at the Capitol, and the Speakers Bureau. Several national groups such as the African Student Union, the India Student Association, and International Club are sponsored by the office. A bi-monthly newsletter which contains up-to-date immigration information, a calendar of upcoming events, and other items of interest is sent to all international students.

The American Language Program is specifically designed to help international students acquire a satisfactory command of written and spoken English. The American Language Program operates to help learners gain functional command of English in listening, speaking, reading, and writing. This is done to meet a number of student goals: (1) to pass the TOEFL and to have a successful academic experience in an American institution of higher learning; (2) to use English in business and other vocational pursuits; and (3) to satisfy language and cultural needs for social interaction with English speakers. Courses in this program are designed on an intensive ten-week schedule to help students to learn English in the shortest possible time. Classes meet for five hours a day, five days a week, throughout the entire ten weeks, including oral practice in the language laboratory. Conversation,

listening comprehension, reading/writing, grammar, and study of American culture patterns will be stressed. In addition, special classes in Advanced Pronunciation and TOEFL preparation are offered without charge to American Language Program Students.



THE UNIVERSITY OF MARYLAND

COLLEGE PARK CAMPUS

INTERNATIONAL PROGRAMS

College of Agriculture  
College of Life Sciences

Office of the  
Assistant Dean

December 3, 1987

Mr. Peter Freeman  
619 Upland Place  
Alexandria, Virginia 22301

Dear Mr. Freeman:

I am happy to enclose material describing our capabilities in the international development area. Our greatest international training strengths are in development management and crop protection. Our efforts in both areas are supported by centrally-funded projects. We, also, have strengths in agricultural and resource economics, horticulture, fisheries, farming systems research and extension. We would be happy to conduct training in the natural resource areas where we could call upon the resources of our Departments of Agricultural & Resource Economics, Conservation and Natural Resources and Economics.

I would be pleased to meet with you either on campus or at AID to further describe our programs.

Sincerely,

Dr. John R. Moore, Assistant Dean  
for International Programs

UNIVERSITY OF MARYLAND  
College Park, Maryland

I. CURRICULUM PROGRAM:

A. Bachelor of Science

conservation and resource development	agronomy
agriculture and extension education	animal science
agricultural chemistry	food science
agricultural engineering	horticulture
agriculture-general	

B. Postgraduate

Master of Science  
Doctor of Philosophy

agricultural and extension education	environmental management
agronomy	environmental microbiology
animal sciences program	environmental toxicology
botany	fisheries and wildlife management
economics	marine and environmental technology
entomology	marine and estuarine ecology
economics of aquatic resources	poultry science
environmental biology	recreation
environmental chemistry	zoology

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate academic program concentrations which would be of interest to international students taught in the realm of natural resources/environmental management.

1. Agricultural and Resource Economics, MS, PhD: Two areas of specialization, agricultural economics and resource economics. Study and research can include agricultural development, international trade, agricultural marketing, farm management and production, economics, agricultural policy, econometrics, land use, marine resources, water resources and environmental quality.
2. Economics, MS, PhD: Areas of specialization include economic theory, advanced economic theory, comparative economic systems and planning, econometrics, economic development, economic history, environmental and natural resource economics, history of economic thought, industrial organization, institutional economics, international economics, labor economics, monetary economics, public finance, public choice, and regional and urban economics.
3. Marine-Estuarine-Environmental Science, MS, thesis, PhD: Studies on the interactions of biological systems with physical chemical systems. Appropriate areas of emphasis will involve organisms living in marine estuarine or terrestrial environments and their interactions with chemical and physical influences. Possible areas of specialization might include marine and estuarine ecology, environmental biology, environmental chemistry, environmental microbiology, environmental toxicology, environmental management, marine and environmental technology, and fisheries and wildlife management.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational program:

Numerous opportunities exist for internships with Federal agencies in the Washington, DC area which can be used as accredited courses. Individual academic programs make their arrangements.

B. Internships offered through private/public sector agencies: (NIA)

C. Agriculture Experiment Station: Offices, laboratories and off-campus research farms (13,000 acres) to conduct research in the areas of natural resources and forestry, plants and crops, animals and poultry, economics and rural life, and general resource technology.

IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE/ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

1. University of Maryland (through the South East Consortia for International Development, SECID) has developed a program for Environmental Management Training in Africa.
2. University of Maryland has an agreement with the Suez Canal University which includes conservation of the Coral Reefs in Ram Mohammed Marine Sanctuary.
3. University of Maryland (through SECID) has participated in a Soil Conservation and Reforestation project in Sri Lanka.

V. PROGRAM ASSOCIATIONS:

A. Involvement and/or technical skills provided through the consortia:

South East Consortia for International Development (SECID); see above.

B. Involvement with governmental agencies:

Numerous speakers from Federal agencies, Congressional staffs and Maryland agencies provide unique interaction with current environmental policies.

Assistantships, at various times, funded by projects with Foreign Agricultural Service, the Environmental Protection Agency, National Marine Fisheries Service, Maryland Sea Grant Program, Maryland's Department of Natural Resources, the US Department of Interior and the Department of Agriculture.

VI. CONTACTS:

Dr. J. Havlicek, Chairman  
Department of Agriculture & Resource Economics  
University of Maryland, College Park  
College Park, MD 20742  
Telephone: (301) 454-4101

Contact for international students:  
Ms. Valerie Woolston  
International Education Services  
University of Maryland - College Park  
College Park, MD 20742

VII. ADDITIONAL INFORMATION:

A. Accreditation/Certification: (NIA)

B. Student body profile: Fall, 1983

1. Number of students enrolled:

	US/Canada	Foreign
Undergraduates	23,012	1,774
Postgraduates	2,365	712
Total Campus	25,377	2,486

2. Number and geographical place of residence for foreign students:

170	Africa
1,591	Asia & Pacific
94	Middle East
360	Latin America
252	Developed Countries

3. Foreign postgraduate student specialization: (NIA)

C. Faculty profile: Fall, 1983

1. Number of full-time faculty (9 & 12 month) faculty positions: (NIA)

## 2. Faculty by technical specialization:

12	Plant Products	1	Energy
26	Plant Protection and Management	1	Water
17	Plant Production	1	Wildlife
7	Forestry	19	Environmental Studies
5	Animal Breeding	5	Soil Science
7	Animal Production	2	Aquaculture
13	Food Science	8	Fisheries
14	Human Nutrition	3	Farm Mechanization
17	Education and Extension	3	Fish Diseases
19	Rural Sociology	4	Cultural Resource Management
38	Policy Formation	4	Econ. Nat'l. Res., Envir./Energy
3	Communications	3	Marine Microbiology
7	Resource Economics	3	Aquatic Pollution
14	Marketing and Consumer Economics	2	Regional Planning
9	Int'l. Economic Development	1	Social Impact Analysis
5	Agricultural Statistics	2	Stratification in Agri/Societies
7	Geography	2	Population Problems in Agricultural Societies

## D. Future plans: (NIA)

## E. School setting:

The University is located in the City of College Park (pop. 23,614), in central Maryland, 23 miles (37 km.) from Annapolis and 6 miles (9.6 km.) from Washington, D.C.

Climate:           year-round mean temperature: 55 F (12.9C)  
                       winter: 45 F (7.3C)  
                       summer: 65 F (17.9C)  
                       mean rainfall: 42 inches (105 cm.)  
                       relative humidity: 67%

(Data taken from Baltimore, 90 miles (144 km.) northwest of Princess Anne.)

## Local Characteristics:

1. Land Use: Urban area.
2. Forest/Vegetation types: Oak-hickory forest (Quercus-Carya-Pinus).
3. Land Surface Form: Irregular plains (50-75% of gentle slope is on the upland; 100-300 feet).

## F. Facilities:

The libraries on campus include nearly 1.5 million volumes, approximately 1.5 million microfilm units, 16,000 current periodicals/newspapers, 390,000 government documents, 63,000 maps and 35,000 audio-visual slides/films, etc.

## G. Special aid for foreign students:

Office of International Education Services will assist foreign students with immigration, housing, fees and problems relating generally to orientation and community life.



# CLARK UNIVERSITY

95<sup>th</sup> Main Street Worcester Massachusetts 01610-1477

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International Development  
and Social Change

Telephone (617) 793-7201 or 793-7537  
Cable Address: CENTED  
Telex address: 951829 CENTED WOR

November 16, 1987

Dr. Peter Freeman  
619 Uplands Place  
Alexandria, VA 22301

Dear Peter:

Enclosed are the materials on the International Development Program which I promised to send you. I've enclosed a sample publication on renewable resources in East Africa, a Clark Now which features ID; and some information on CENTED library holdings.

It was a pleasure to meet you last week. I look forward to further collaboration on "From the Ground Up".

Best wishes.

Sincerely,

A handwritten signature in cursive script that reads "Barbara".

Barbara P. Thomas  
Assistant Professor/Director  
International Development Program: Teaching

BPT:eo

CLARK UNIVERSITY  
Worcester, Massachusetts

I. CURRICULUM PROGRAM:

A. Undergraduate

international development & social change (BA)  
environment, technology & assessment (BA)

B. Postgraduate

environmental affairs (MA)  
geography (PhD)  
international development and social change (MA)

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate academic program concentrations taught in the realm of natural resources/ environmental management.

1. Environmental Affairs, MA: Resource management, planning, impact assessment and policy analysis in the context of international development. An interdisciplinary program which emphasizes policy questions involving the environment and the impact of science and technology on the environment. The goal of the program is to produce individuals who are able to deal with technical issues in a social and political context and who do so with an awareness of the short- and long-range limitations of the natural environment.
2. Geography, PhD: Research tends to focus in "clusters": Humanistic approach to geography, hazard and resource management, international development, urban, social and regional analysis, political economy, cartography and remote sensing, geomorphology and climate research, and cultural ecology.
3. International Development & Social Change (MA): Focus on women in development and concentration in risk analysis and hazard management. Emphasis in acquiring basic skills of economics and social analysis and a generalized orientation toward development and social change. Students participate in designing their own interdisciplinary curriculum for the study of development problems. A student may design their own course sequence, subject to approval by an appropriate faculty member. Emphasis is on development planning; resource management, development administration, health administration, rural development, regional planning and women in development.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational program: (NIA)

B. Internships offered through private/public sector agencies:

Both graduate and undergraduate majors are required to complete an internship related to international development. Students receive credit for these internships. Choices are numerous, and students should plan in advance with a faculty advisor for an internship relevant to their interests. An internship placement service is not provided, but information is available to students. The student must initiate arrangements: faculty and staff will help facilitate plans.

- C. Fellows Program in Management for International Development: Designed to offer a small group of mid-career scholars and practitioners - primarily from the Third World - opportunities to develop knowledge and skills in the area of management for international development. Fellows participate for either a semester or a full academic year of courses, research, practicum or internship, and enjoy interaction with colleagues at Clark University in an academic environment. The Program offers an unusual opportunity to explore innovative approaches to improving management effectiveness within a development context. Coursework is on a variety of related topics, including the fundamentals of organization and management theory, human resources, financial and information systems, development management, as well as project planning, implementation and evaluation. Focus is on environment and resource management, regional or area planning, local or rural development, or institutional concerns in managing within both the private and public sectors.

Generally, Fellows come to Clark as mid-career scholars, para-statal employees government civil servants, or private sector leaders in related fields. Candidates have a minimum of five years experience in work related to management for international development, and fluency in English is required. To date, the program has included Fellows from Sudan, Uganda, Panama, the Dominican Republic, Costa Rica, and Jamaica.

- D. Documentation Center: A comprehensive documentation center on resource issues in developing countries facilitates research on environment, resource management, and international development. Established in 1976, the Center contains extensive country specific collections on Eastern and Southern Africa as well as selected materials from other parts of the developing world. Journals related to African affairs as well as vertical files on topics of current research, and good collections of developing country government publications are available. In addition, the collection houses general development literature. The Documentation Center is supported and augmented by the University's Goddard Library. (450,000 volumes and 2,300 periodicals) as well as by the Center for Technology Environment and Development's excellent research holdings.
- E. Cartographic Laboratory: The ID Program works closely with Clark's Cartographic Laboratory - one of the nation's best university laboratories. The lab produces general and specialty maps for use in the field and to accompany reports and publications as well as charts, tables and graphs. The Cart Lab can produce according to specific requirements of international development projects, including full color maps. Facilities are available for contract work with non-Clark organizations. The lab continues to expand its facilities for work with satellite imagery and currently uses a micro-computer system for computer-generated mapping.
- F. Map Library: The Map and Aerial Photograph Library houses a collection of over 125,000 maps along with gazetteers, atlases, and aerial photographs. As a US government repository, the map library receives maps published by many federal agencies. In addition to maintaining the present collection, the map library is actively acquiring new maps with an annual accession rate of 4,000 sheets. Accessions tend to reflect Clark research interests and as a result, the Library has an increasing focus on Africa and Latin America. The Library is expanding into the area of remote sensing with appropriate annexation of a satellite imagery collection and the necessary equipment for its interpretation.
- G. Seminars, Colloquia, and Workshops: Special seminars provide fora for colleagues to exchange views and knowledge on pertinent issues. For example, an international conference on the perception and management of pests and pesticides was held in 11/80 and a co-sponsored follow-up workshop was held in Nairobi in 6/1982. In the subject area of regional planning, two workshops were held in 1982: "Workshops on Rural-Urban Linkages and Area Development," and "Resource Based Area Planning." In June, 1983, the University co-sponsored a workshop held at the USAID offices in Washington on planning in rural regions, and in 1984, co-sponsored a workshop on Rural-Urban Linkages with the Settlement Studies Center in Rehovoth, Israel.
- H. Workshop on Effective Management of Environmental Resources: Under sponsorship of Exxon Education Foundation, the ID Program conducts cross-disciplinary workshops on effective management of environmental resources. Through these workshops graduate students from developing countries who are currently studying in North American universities come together from a variety of development-related disciplines. The participants are able to address critical problems of environment and resource management in developing countries, with special emphasis on coordination and collaboration among different sectors and ministries. The first seminar took place in June, 1982 at Clark University and included thirty students from twenty different countries. The second seminar in June, 1983 also had thirty students from twenty different countries. The third seminar in June, 1984 had twenty-eight participants from twenty-two countries.

#### IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

1. "Environmental Impact of Development" in collaboration with the Institute for Environmental Studies, Sudan.

2. "Workshop on Combating Desertification in Africa," in cooperation with the Institute of Environmental Studies (Sudan), The Economic Commission for Africa, the United Nations Sahelian Office, the United Nations Environment Programme, and the Government of the Democratic Republic of Sudan.
3. "Water for Human Needs" in collaboration with the Institute for Environmental Studies, Sudan and the University of North Carolina (USA).
4. "Environmental Considerations in Regional Planning" in collaboration with BRALUP (Bureau of Resource Assessment in Land Use Planning) in Tanzania (BRALUP is now the Institute of Resource Assessment).
5. "Energy and Environmental Management" in collaboration with the Somali National Academy of Science and the Somali National University and Volunteers in Technical Assistance (VITA).
6. "Environment Enhancement and Resource Management: Decentralized Efforts to Arrest Desertification" in collaboration with the National Environment Secretariat of Kenya and the University of Tennessee (USA).
7. "Resource Degradation and Development Planning in Semi-Arid Environments" in collaboration with the Agricultural and Rural Development Authority (ARDA), Government of Zimbabwe (Harare, Zimbabwe).
8. "Utilization of Natural Resource Data for Resource Management Planning" in collaboration with Direction Nationale des Eaux et Forets du Mali (Project Inventaire des Ressources Terrestres du Mali).
9. "Symposium on Drought in Botswana" in collaboration with the Botswana Society, the University College of Botswana, the Government of the Republic of Botswana.
10. "Proceedings of the National Seminar on Environment and Development" in collaboration with the Environmental Trends and Issues Project of the University of Zambia, Department of Geography.
11. Environmental Training and Resource Management in Africa (ETMA): Training in cooperation with the School of Public Health at the University of North Carolina, the Southeast Consortium for International Development (SECID) and the Agency for International Development (AID), the Clark International Development Program has conducted environmental training seminars in a number of African countries. Training is directed toward improving the environmental information base, identifying priority environmental problems, and their solutions, and monitoring environmental trends. The training format includes both short and medium-term training courses.
12. Kenya: In cooperation with the National Environment and Human Settlements Secretariat, NEHSS, Ministry of Environment and Natural Resources, district resources assessment profiles are currently being produced in four districts per year. A district seminar and a district-level plan of action for resource management follow production of each profile. Monitoring of land degradation in Kiambu District is yielding data on soil loss and siltation related to land use and climate/rainfall changes. ETMA is also assisting the National Environment and Human Settlements Secretariat, to incorporate environmental considerations into Kenya's national planning as well as to prepare materials to explain how projections of resources trends will affect individual farmers and pastorals.
13. Coastal Management Project in Kenya: The ID Program has prepared a case study on agricultural runoff in the watershed of the Athi-Galana-Sabaki River in Kenya for the National Park Service. This system is Kenya's second largest river draining a sizable portion of the nation's productive land. Severe siltation threatens coastal fisheries, coral reefs, beaches and mangroves. The case study will analyze the system to determine possible interventions which will minimize negative impacts on the coast.
14. Pesticides Management: In May, 1983 the General Service Foundation located in St. Paul, Minnesota awarded a grant for a proposal entitled "Perception and Management of Pests and Pesticides." The grant will support dissemination activities, primarily with an international focus, on findings arising from work since 1978 on pest and pesticide management. The principal means of dissemination is an international network of researchers interested in ways in which small farmers can decrease dependence on chemical pesticides.

15. Sudan: Resource Management activities in Sudan focus on long-term environmental change in selected semi-arid sites. Research staff are developing trend analysis based on historical information, interviews with local residents, available maps and remotely sensed data. Work is undertaken in collaboration with the Department of Geography and the Institute of Environmental Studies, both of the University of Khartoum.
16. Tanzania: Resource management activities focus on resource mapping as part of regional planning, on the development of an environmental information system at the Bureau of Resource Assessment and Land Use Planning (BRALUP), on assisting Tanzania's newly-emerging environmental protection unit, and on low-cost approaches to problems in environmental health.
17. Regional Development in Rwanda, Burundi and Kivu Province of Zaire: The International Development Program, with sponsorship from AID, prepared a regional reconnaissance of Rwanda, Burundi, and Kivu Province of Zaire to examine these areas as a single region. The study, conducted in 1981 and 1982, ascertained the extent to which a shared resource base exists for donors to prepare a regional development strategy. The analysis pays special attention to regional transportation linkages, regional water resource systems, the relationship between food and energy needs and population growth, pressures on resources, particularly land, and the development of alternative livelihood possibilities.
18. Area Development: A Cooperative Agreement between AID and Clark University, in collaboration with the Institute for Development Anthropology (IDA) Binghamton, New York, currently provides a structure for research, and field assistance in area studies and regional development. Special expertise from Clark, IDA, and their colleagues in an extensive network helps assess the existing and potential uses of the natural and human resource base, urban-rural linkages, and new lands settlement/resettlement.

The Cooperative Agreement also provides support needed to strengthen AID Washington's capabilities for responding to the needs of AID field missions for technical assistance in the form of state of the art papers in areas of resource pressures, urban/rural development, and regional development, consulting services to AID missions for short-term applied research projects, short term assistance in project design, long-term field applications of adaptive research, evaluation, information dissemination and training, and networking.

The cooperative agreement, which began in October, 1981, is designed to test methodologies for identifying appropriate planning units for area development, aid in the development of institutional capabilities within host countries, and provide evaluation assistance in determining the impact and effectiveness of area development programs. Projects sponsored under this cooperative agreement, which are current or under active discussion, are located in Zimbabwe, Panama, Niger, Ecuador, Pakistan, Indonesia, and Sri Lanka.

19. Renewable Resources in Africa: Under sponsorship of the United States National Park Service, Department of Interior, the ID Program members are examining the renewable resource base and projecting trends in critical resource scarcities in five eastern African countries: Uganda, Kenya, Tanzania, Rwanda, and Burundi. Water, forests, grasslands, soil, arable lands, and wildlands are being examined for patterns and trends with special emphasis on the impact of demographic change. The project will identify where resource depletion is creating economic, ecological, and social stress. Scheduled for completion in 1983, the project's final publication will include a short report illustrated with maps, charts, graphs, and other visual material.
20. Under the sponsorship of US-AID, the ID program at Clark analyzed food, population, and energy relationships, stressing trends within the various ecological and food systems of that region. A three volume study was completed in December of 1980. It includes an extensive annotated bibliography and a map of Agricultural Livelihood Systems in Eastern Africa.

#### V. PROGRAM ASSOCIATIONS:

- A. Involvement and/or technical skills provided through the consortia: (NIA)

B. Involvement with governmental agencies:

The International Development Program of the University is involved in a number of on-going research activities with US Agency for International Development, the US National Park Service, the Exxon Foundation, the General Services Foundation, and the United Nations Sudan-Sahelian organization.

VI. CONTACTS:

Dr. Richard Ford	Contacts for international students;
Dr. Barbara P. Thomas	Office of International Programs
Co-Directors	18 Beaver Street
International Development Program	Clark University
Clark University	Worcester, MA 01610
Worcester, MA 01610	Telephone: (617) 752-4606
Telephone: (617) 793-7691	

VII. ADDITIONAL INFORMATION:

A. Accreditation/Certification: (NIA)

B. Student body profile: Fall, 1983

1. Number of students enrolled:

	US/Canada	Foreign
Undergraduates	22,050	101
Postgraduates	588	86
Total Campus	2,638	187

2. Number and geographical place of residence for foreign students:

23	Africa
37	Asia & Pacific
28	Latin America
26	Middle East
73	Developed Countries

3. Foreign postgraduate student specialization:

2	Biology	2	History
9	Chemistry	4	International Development
1	Comparative Literature	8	Management
18	Economics	1	Math
8	English	8	Physics
3	Environmental Affairs	3	Psychology
22	Geography	8	Special Graduates

C. Faculty profile: (NIA)

1. Number of full-time faculty (9 & 12 month) teaching positions: (NIA)

2. Faculty on overseas professional assignment by specialization:

1	Anthropology	1	Water Supply
1	Zoology	1	Chemistry
1	Law/Policy	1	Resource Economics
1	Program Implementation/Planning	1	Education
1	Environmental Economics	1	Geography
1	Environmental Impacts	1	Hydrology
1	Environmental Policy and Regulation	1	International Relations/Affairs
1	Environmental Design	1	Land Use Assessment/Planning
1	Coastal Zone Management	1	Mapping
1	Health and Sanitation	1	Management
1	Animal Ecology	1	Natural Resources
1	Plant Ecology	1	Physical Sciences
1	Range and Wildlife-Planning	1	Physiology/Toxicology
1	Range and Wildlife-Economics	1	Critical Science

1	Industry/Environmental Impacts	1	Policy and Instruction
-1	Industry/Appropriate Technology	1	Remote Sensing
1	Industry/Ultimate Resource Use	1	Sociology
1	Environmental Impacts	1	Soil Science
1	Appropriate Technology	1	Watershed Management/ Solar Conservation
1	Energy Conservation	1	Business
1	Energy-Fossil/Geothermal/ Nuclear/Solar	1	Botany
1	Biology		

D. Future plans: (NIA)

E. School Setting:

The University is located in the City of Worcester (pop. 175,000), 45 miles (72 km.) west of Boston, and 175 miles (282 km.) north east of New York City.

Climate:           year-round mean temperature: 47F (7.9C)  
                       winter: 38F (3.4C)  
                       summer: 56F (12.2C)  
                       mean rainfall: 47 inches (119 cm.)  
                       relative humidity: 32%

Local Characteristics:

1. Land-Use: Cropland with pasture, woodland and forest.
2. Forest/Vegetation Type: Northern hardwoods (Acer-Betula-Fagus-Tsuga). The region is typified by a short growing season and low temperatures.
3. Land Surface Forms: Plains with high hills (500-1000 feet; more than 75% of gentle slope is in lowland).

F. Facilities: (NIA)

G. Special aid for foreign students:

The Office of International Programs assists students with various administrative procedures, visas, and other US government regulations. It also helps students find housing and provides numerous other services which will help them adjust to an American university and their new environment.

NEW MEXICO STATE UNIVERSITY  
Las Cruces, New Mexico

I. CURRICULUM PROGRAM:

A. Bachelor of Science:

agricultural biology	general agronomy
agricultural business management	horticulture
agricultural and extension education	pest management
animal science	range science
environmental and resource economics	recreational area management
farm and range management	soil science
fishery science	wildlife science
general agriculture	

B. Postgraduate

agricultural economics (MS)	biology (MS, PhD)
agronomy (MS, PhD)	fishery and wildlife science (MS)
animal and range science (MS, PhD)	horticulture (MS)

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate academic program concentrations which would be of interest to international students taught in the realm of natural resources/environmental management.

1. MS, PhD, thesis, Animal Science & Range Science: Emphasis in the field of research, extension teaching, production, and conservation.
2. MS, PhD, thesis, Crop and Soil Science: Emphasis on either crop science, soil science, or general agronomy. The crop science division places special emphasis on the genetics and improvement of cotton, alfalfa, and grasses, and on weed science. The soil science division emphasizes soil and water problems, salinity, soil-plant relations and soil classification.
3. MS, thesis, Fishery & Wildlife Science: Emphasis is placed upon detailed studies of game and non-game wildlife and their habitats. Research may be conducted in areas such as behavior, population dynamics, terrestrial and aquatic ecology, experimental management, and influences of environmental disturbance. A program of study is developed for each student with course requirements dependent on background interest, needs and abilities.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

- A. Co-op educational program: (NIA)
- B. Internships offered through private/public sector agencies: (NIA)
- C. Agricultural Experiment Station: Conducts basic and applied research concerned with the biological, physical, and economic phases of food and fiber production, processing, and distribution. Energy, environment, and natural resource concentration aspects of these broad disciplines offer opportunities for postgraduate students to undertake research in both the laboratory and the field.
- D. Energy Institute: Conducts and coordinates geothermal energy research and development projects focused on resource exploration and assessment, technology demonstration and commercialization, and environment monitoring.
- E. New Mexico Environmental Institute: To assist in developing a greatly expanded environment research and education program for New Mexico.
- F. Solar Energy Institute: To accelerate the development, implementation, and commercialization of solar energy for the benefit of the citizens of New Mexico. This is achieved through applied research, demonstration, field testing and monitoring.
- G. Water Resources Research Institute: To encourage water resources research, to assist through the research program, in the training of personnel, and to transfer research results to those involved in the state's water problems.

- H. **Offices and Laboratories:** The Animal and Range Sciences Department provides 47 faculty and 6 technician offices, 14 secretarial offices and/or stations, 70 student carrels, 2 conference rooms, reference room, seminar room, audiovisual area and 2 rooms for storage, copiers, printing, etc., with a total usable square footage of 12,300. The laboratory space of 14,500 square feet is planned by discipline. Disciplines and individual rooms are nutrition (fiber, perchloric acid instrument, Kjeldahl, solvent, general microbiology, rumen microbiology and a specific teaching laboratory), physiology (histology, physiology and endocrinology), genetics, range science (herbarium, physiology, ecology, brush control and watershed), products (dairy, poultry and wool) and utility areas (photo processing, sterile rooms, post mortem, data processing, chemical storage, sample preparation and walk-in coolers and freezers). There are two table-and-chair type classrooms covering a total of 2,200 usable square feet.
- I. **Jornada Experimental Range:** Located 25 miles north of Las Cruces and is operated by the Science and Education Administration-Agricultural Research, USDA. Ecologically, it is part of the arid, Semidesert Grassland-Desert Shrub association with average annual precipitation of 9 inches. The experimental area consists of 190,000 acres, divided into 20 pastures, grazed by Hereford, Brangus and Santa Gertrudis cattle. Also, an area of about 48,000 acres, primarily in the San Andres Mountains, is available for research, but no livestock are permitted on the area at present. This latter area may be used for a big game-livestock relations study in the future. The Jornada has continuous weather, plant and stocking records dating back to 1915 to serve as a data base for publications and research. Research is in cooperation with the University and other federal and state agencies.
- J. **Clayton Livestock Research Center:** The United States Forest Service issued to New Mexico State University a Special Use Permit for 320 acres of land, approximately five miles east of Clayton, to be used as the site of the Clayton Livestock Research Center. The primary purpose for establishing the Clayton Livestock Research Center was to study methods of decreasing sickness and death loss in shipped-in or recently weaned cattle. Disease, nutrition and management of pre-feedlot light-weight cattle are emphasized.
- K. **Fort Stanton Experimental Ranch:** Research on Fort Stanton involves many phases of range management and ecology, range nutrition and livestock management, wildlife management, and some aspects of soil science. There are usually 300-400 cows and 100-200 yearling cattle on this range. An office-laboratory-bunkhouse (3,600 square feet) serves as headquarters for the ranch.

#### IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE/ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

1. US Agency for International Development (USAID); Consortium for International Development (CID); Ministry of Natural Resources/Honduras: Agricultural Research Project: To expand the capability of the natural agricultural research program to alleviate the technological constraints affecting traditional and agrarian reform farmers (1983-1984).
2. USAID; CID; Ministry of Education/Yemen: Secondary Agricultural Institute: To develop a training center to produce mid-level agricultural graduates (1980-1985).
3. USAID/Ministry of Agriculture/Egypt: To increase the grain legumes by improving the research and extension capabilities of the Egyptian Government as it relates to their crops (1980-1985).
4. USAID: Title XII Matching Formula Strengthening Grant Program: To improve the University's capability for development assistance work (1979-1984).
5. USAID/Niger: Integrated Livestock Production Project: Collaborative assistance to Niger in livestock production (1983-1987).
6. USAID/University of Asuncion; Ministry of Agriculture/Paraguay: Institution building and technical assistance in livestock research and extension (1964-1979).
7. USAID; CID/Peru: The school provided technical advice in irrigation techniques to execute a (technical assistance) program for the improvement of water and land resource use in the highland areas (1978-1980).
8. University of Chiapas/Mexico: To upgrade faculty at the Mexican universities

through teaching graduate courses in agricultural, business and economics (1978-1981).

#### V. PROGRAM ASSOCIATIONS:

##### A. Involvement and/or technical skills provided through the consortia:

Consortium for International Development (CID): A non-profit corporation of eleven western universities. The objectives of CID are to (1) facilitate the involvement of member universities in leadership and in contribution to the planning and implementation of large specialized or integrated international development projects, (2) provide administrative support for project initiation, implementation, and evaluation as well as training for key project administrators, and (3) improve the opportunities for member institutions to collectively provide their expertise to developing countries.

##### B. Involvement with government agencies:

1. Instituto Nacional de Investigaciones Agrícolas (Mexico): Memorandum of Agreement for agricultural scientific research.
2. US Department of Agriculture Office of International Cooperation & Development (USDA/OICD): Memorandum of Understanding for cooperation in identifying and carrying out international projects.
3. Centro de Bachillerato Tecnológico Industrial y De Servicios No. 4 (Mexico): Letter of Agreement, for immediate and long-range cooperative activities.
4. Universidad Estadual Paulista (Brazil): Memorandum of Agreement for scholar and student exchange.
5. Agency for International Development (AID)/Board for International Food and Agricultural Development (BIFAD): Memorandum of Understanding for training, strengthening, developing institutions that serve agriculture and rural life in developing countries.
6. Universidad Autónoma de Chiapas (UNACH) (Mexico): Memorandum of Agreement for joint teaching effort to promote faculty development and training at UNACH.
7. General Directorate of Regional Technological Institutes (Mexico): Letter of Understanding for accelerated development in fields of basic and applied research.
8. Universidad Federal de Paraíba (Brazil): Letter of Understanding for identifying activities that would be mutually beneficial to both institutions.
9. La Universidad Autónoma de Chihuahua (Mexico): Memorandum of Understanding for cooperation in all fields of mutual interest.
10. La Universidad Autónoma de Chihuahua (Mexico): Memorandum of Understanding for solar and research education.
11. Instituto Nacional de Investigaciones Agrícolas SARH - INIA (Mexico): Memorandum of Agreement for collaborative work in agricultural research.
12. University of Helwan (Cairo, Egypt): Memorandum of Agreement for academic and cultural cooperation.
13. Department of Mathematics, Universidad del Norte (Antofagasta, Chile): Memorandum of Understanding for cooperative research activities, especially in the fields of applied statistics, mathematics, education & numerical analysis.
14. Winrock International: Memorandum of Understanding for collaboration in Agriculture Research, Education, Extension, and Development Projects.
15. El Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico): Memorandum of Understanding for exchange of information on projects for faculty and technological exchange relating to Engineering fields.

## VI. CONTACTS:

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 Center for International Programs  
 New Mexico State University Box 3567  
 Las Cruces, NM 88003  
 Telephone (505) 646-3841

## VII. ADDITIONAL INFORMATION:

A. Accreditation/Certification: Northcentral Association of Schools and Colleges.

B. Student body profile: Fall, 1984

1. Number of students enrolled:

	US/Canada	Foreign
Undergraduate	10,510	234
Postgraduate	297	237
Total Campus	10,807	471

2. Number and geographical place of residence for foreign students:

130	Africa
66	Asia & Pacific
121	Middle East
125	Latin America
29	Developed Countries

3. Foreign postgraduate student specialization:

11	Agribusiness
10	Agricultural Production
118	Agricultural Sciences

C. Faculty profile: (NIA)

1. Number of full-time faculty (9 & 12 months) teaching positions: 600

2. Number of faculty on overseas professional assignment by geographical area and technical specialization:

12	Plant Breeding	3	Home Economics/Human Ecology
12	Plant Production & Management	9	Education & Extension
16	Plant Protection	5	Communications - Diffusion of Technology
2	Forestry	3	Resource Economics
7	Animal Breeding	18	Marketing & Consumer Economics
5	Animal Production & Management	2	International Economic Development
6	Animal Health	5	Agricultural Statistics
5	Animal Products	7	Water
14	Animal Nutrition	11	Wildlife
2	Food Science	2	Soil Science
3	Human Nutrition & Health		

D. Future plans: (NIA)

E. School setting:

The University is located in the the City of Las Cruces (pop. 45,068), in south central New Mexico, 235 miles (376 km.) south of Santa Fe and 35 miles (56 km.) north of Mexico.

Climate: year-round mean temperature: 60 F (15 C)  
 winter: 44 F (6.7C)  
 summer: 75 F (23.4 C)  
 mean rainfall: 12 inches (32 cm.)  
 relative humidity: 49%

Local Characteristics:

1. Land Use: Urban/rural area.
2. Forest/Vegetation types: Trans-tobosa shrub savanna (Flourensia-Larrea). The area is part of the arid, semidesert grassland-desert shrub.
3. Land Surface Form: Plains with low mountains (1000-3000 feet; more than 75% of gentle slope is in lowland).

F. Facilities:

The University library system houses 750 thousand bound volumes, 65 thousand US Government documents, 500 thousand microforms, 35 thousand maps and currently receives 6,500 serials and periodicals. Computer facilities are available to students.

G. Special aid for foreign students:

Center for International Programs: Assists international students with the administrative aspects of their programs; their personal needs and extra-curricular activities; development of inter-cultural experiences for staff, students and community; development and implementation of curricular offerings relevant to students with international interest; facilitate the identification, planning, implementation and evaluation of overseas technical assistance projects and activities; and identify/implement international research activities.

CORNELL UNIVERSITY  
Ithaca, New York

I. CURRICULUM PROGRAM:

A. Bachelor of Science

agricultural and biological engineering	environmental sciences
animal science	natural resources
applied economics and business management	plant sciences
biology	

B. Postgraduate

agricultural economics (MS, PhD, MPS)	food science & technology (MS, PhD, MFS)
agri. engr. (MS, PhD, MEng, MPS)	genetics (MS, PhD)
agronomy (MS, MPS, PhD)	geological sciences (MS, PhD)
animal breeding (MS, PhD)	int'l. agri. & rural development (MPS)
animal science (MS, MPS, PhD)	landscape architecture (MLA)
botany (MS, PhD)	natural resources (MS, MPS, PhD)
city and regional planning (MRP, PhD)	plant breeding & biometry (MS, MPS, PhD)
civil/environmental engr. (MS, MEng, PhD)	plant pathology (MS, MPS, PhD)
entomology (MS, PhD)	plant protection (MPS)
environmental toxicology (MS, PhD)	vegetable crops (MS, MPS, PhD)
horticulture (MS, PhD, MPS)	zoology (MS, PhD)

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate program concentrations which would be of interest to international students taught in the realm of natural resources/environmental management.

1. Master of Professional Studies-Human Ecology (MPS): For practicing professionals in fields related to human ecology who want further study pertinent to their profession. Applicants may choose:
  - (a) design and environmental analysis
  - (b) human development & family studies
  - (c) human service studies
  - (d) nutrition
2. Master of Professional Studies - International Development (MPS): Provides interdisciplinary study for experienced practitioners in international development. Areas of concentration are international nutrition, international planning, international population, science & technology.
3. Master of Regional Planning (MRP): Offered in the field of city and regional planning. Provides training for a professional career in planning at the city, regional or national level. Areas of concentration include: planning theory and system analysis, regional science, urban and regional theory, urban planning history, environmental planning and design, international development planning, regional economics and development planning, social and health systems planning.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

- A. Latin American Studies Program: Problem oriented research and application of relevant data that includes the disciplinary perspectives of anthropology, archaeology, economics, linguistics and sociology. In addition to specific geographical concentrations, research is under way on problems generally characteristic of developing nations, the processes and consequences of rapid agricultural development, urbanization, population problems, science and technology, politics, and the presence of the United States in Latin America.
- B. Program in International Education: Facilitates the academic exchange of US and foreign students and scholars, supports increased international content in departmental and interdisciplinary course offerings and provides orientation for students studying or doing fieldwork abroad.
- C. Program on International Studies in Planning: Supports teaching and research on regional and urban issues, emphasis is placed on problems of regional underdevelopment and urban growth, population shifts in the balance of the urban and rural sectors, the

rapid expansion of cities and attendant immigration, and differences and inequities between subnational regions are areas of special concern.

- D. Rural Development Program: Supports programs of research, publication, guest speakers, and scholars in residence. Extensive research is underway in a number of developing countries on issues related to the identification and analysis of elements of rural participation in development activities.
- E. South Asia Program: Postgraduate level students may become associated with University-sponsored research in South Asia or carry on independent research abroad. Current research includes agricultural development and its ramifications in India, religion, cultural exchange, rural development and communications. Instruction in the major languages of the region is an integral part of the graduate training of the program, which is also strengthened by exceptional library resources, regular interdisciplinary courses on the countries of the region, and informal seminars/visiting lecturers series.
- F. Center for Environmental Research: Interdisciplinary organization intended to promote and coordinate a comprehensive program in the planning, development, management, and use of water, land and air resources. Its responsibilities are to undertake and support water-resources research and other environmental research in engineering, in the physical, biological, and social sciences, and in the humanities, to encourage and contribute to graduate students in environmental resources and their control, to encourage new combinations of disciplines in research and training that can be brought to bear on environmental problems; to disseminate the results of research, to collect and maintain a central source of information on environmental issues, and to seek external funding that will enable it to better meet its responsibilities.
- G. The Institute for Comparative and Environmental Toxicology: Provides an opportunity for participation in collaborative research efforts in comparative and environmental toxicology.
- H. Program in Science, Technology, and Society: Through its teaching and research, the program analyzes the social issues and public policy questions that emerge from the scientific and technological development and expertise. Present activities can be divided into four areas: social and political studies of science and technology; science, technology and public policy; biology and society; and the humanistic interplay between science, technology and society.

#### IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

1. Council for Agricultural Planning and Development/Taiwan: Training of postgraduate students at Cornell in the field of agriculture planning and development, 1983.
2. USAID/Worldwide: Water Management Synthesis II Project funded through the US Agency for International Development. A contract to 3 lead US universities through the Consortium for International Development for small-scale irrigation projects in several countries, including Bangladesh, Peru, India, Indonesia, Sri Lanka, Niger, and Bolivia. Involves mainly the faculty providing technical assistance on irrigation-related matters to USAID missions, assisting with training programs, setting up workshops and seminars, and carrying out special studies related to irrigation, 1982-1987.
3. Brazil: Cooperative research support project in tropical soils.

#### V. PROGRAM ASSOCIATIONS:

- A. Involvement and/or technical skills provided through the consortia: (NIA)
- B. Involvement with government agencies: US Agency for International Development.

## VI. CONTACTS:

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 Cornell University  
 Ithaca, New York 14853  
 Telephone: (607) 256-5243

## VII. ADDITIONAL INFORMATION:

- A. Accreditation/Certification: (NIA)  
 B. Student body profile: Spring, 1984

## 1. Number of students enrolled:

	US/Canada	Foreign
Undergraduate	12,102	371
Postgraduate	4,052	1,126
Total Campus	16,154	1,497

## 2. Number and geographical place of residence for foreign students:

97	Africa
732	Asia & Pacific
105	Middle East
193	Latin America
370	Developed Countries

## 3. Foreign postgraduate student specialization:

67	Architecture, Art & Planning	39	Human Ecology
335	Arts & Sciences	17	Industrial & Labor Relations
452	Engineering	111	Management
60	Hotel Administration	23	Law
350	Agriculture & Life Sciences	27	Nutritional Sciences

## C. Faculty profile:

1. Number of full-time faculty (9 & 12 months) teaching positions: 1, 550  
 2. Number of faculty on overseas professional assignment: (NIA)

## D. Future plans:

The University anticipates new courses, increases foreign research activity by faculty and graduate students, more undergraduate student exchange arrangements, and the possibility of increasing work with foreign postgraduate students.

## E. School setting:

The University is located in the City of Ithaca (pop. 28,732), in west central New York, 140 miles (225 km.) west of Albany and 175 miles (282 km.) northwest of New York City.

Climate: year-round mean temperature: 46 F (9 C)  
 winter: 24 F (-5 C)  
 summer: 67 F (21 C)  
 mean rainfall: 35 inches (95 cm.)  
 relative humidity (NIA)

## Local Characteristics:

1. Land Use: Cropland with pasture, woodland and forest.
2. Forest/Vegetation types: Northern hardwoods (Acer-Betula-Abies-Tsuga-Fagus).
3. Land Surface Form: Open low mountains (500-1000 feet); 50-75% of gentle slope is on upland.

## F. Facilities:

The University Library System houses over nearly 5 million volumes, 55 thousand journals and periodicals, maps, microtexts, documents and newspapers. Computer facilities are available to students.

## G. Special aid for foreign students:

International Student Office: Students can consult the staff on questions they may have. This office works closely with academic advisors, sponsors and with persons involved in a variety of student and community programs that enrich the cultural life at Cornell. Ithaca families participate in the Host Family Program, in which foreign students are invited to share in some aspects of American family life.

DUKE UNIVERSITY  
Durham, North Carolina

I. CURRICULUM PROGRAMS:

A. Undergraduate

biology (BA, BS)	chemistry (BA, BS)
botany (BA, BS)	marine science (BA, BS)

B. Postgraduate

biochemistry (PhD)	pathology (MS, PhD)
botany (AM-non thesis, MS-thesis, PhD)	forestry (MF)
chemistry (MS, PhD)	policy science (MA)
forestry and environmental studies (MA-non thesis, MS-thesis, PhD)	civil and environmental engineering (MS, PhD)

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate level academic concentrations which would be of interest to international students taught in the realm of natural resources/environmental management:

1. MS, PhD, MEM (Master of Environmental Management) with emphasis in water and air resources: Concerned with the management of renewable natural resources and their interaction with other land-related resources. Emphasis is placed on the effects of land resource management on water quality and quantity, and on air quality. Consideration is also given to the effects of air quality on land-related resources, particularly plant and animal communities. The program covers: (1) basic hydrologic and atmospheric processes, (2) methods of quantitative analysis, and (3) methods of decision making and management. The basic processes include those associated with watershed hydrology; water quality; general meteorology and climatology; and atmospheric emissions, transport and deposition. Plant and animal physiology, limnology, ecology, and ecotoxicology are also studied. Quantitative analysis techniques include statistics, probabilistic and deterministic modeling, optimization and stimulation. Training in decision making and management includes courses in water and air resource management, economics, and risk analysis. Students in the program may concentrate on water resources, air resources, or a combination of the two.
2. MS, PhD, MEM with emphasis in resource economics & policy: Program emphasizes skills needed by professionals to analyze natural resource and environmental policy and to test the potential outcome of new policy under consideration by decision-making bodies. Decision making in natural resource and environmental policy requires mastery of three broad areas of knowledge: (1) the basic sciences pertaining to a natural resource or an environmental phenomenon; (2) the relevant disciplines in the social sciences; and (3) the quantitative methods required to synthesize information and arrive at a decision. Courses relevant to natural resources and the environment may be part of the student's undergraduate background or planned as part of the master's degree. For the natural resource decision maker, the most important social sciences are economics, public policy, and law. Economics includes production economics, the economics of public goods and externalities, public finance, and the allocation of natural resources. Public policy includes political science, public administration, and the social sciences that relate to societies, governments, and natural resource allocation. Quantitative methods, an essential of this program, include statistical inference, methods of optimization, and decision theory.
3. MS, PhD, MEM with emphasis in resource ecology: Concerned with the application of ecological theory to management of both terrestrial and aquatic ecosystems. The program advocates an integrated management scheme - one which takes into account the needs of society, economic constraints, environmental ethics, and political reality. Guidelines for ecosystem management are based on: (1) the recognition of a hierarchical order of study (organism, population, community and ecosystems); (2) the prevention of irreversible losses of ecosystem processes; (3) the recognition and understanding of connections among various ecosystems; and (4) the maintenance of ecosystem integrity for future generations. The program focuses on applied ecology. Students are taught to answer as well as anticipate questions about actual environmental and ecological management problems. Problem solving is based on the best possible scientific description

of ecological processes and on the use of appropriate data bases. Quantitative methods are used to describe basic biophysical processes, to test hypotheses, and to predict the response of ecosystems to disturbance. Mathematical and conceptual models are also used to clarify ecosystem organization.

### III. SUPPORTIVE RESEARCH AND EDUCATIONAL OPPORTUNITIES

#### A. Co-op educational program:

Candidates for professional degree may arrange an internship of three to six months duration. The internship must contribute substantially to the educational objectives of the student. With approval, students may use a part or all of the intern experience to fulfill the masters subject requirements.

#### B. Internships offered through private/public sector agencies: (NIA)

C. Research Triangle Park: Numerous industrial and governmental organizations have established research facilities in the Research Triangle Park. Government facilities include the National Environmental Research Center of the Environmental Protection Agency, the Forestry Sciences Laboratory of the US Forest Service Southeastern Forest Experiment Station, and the National Institute of Environmental Health Science of the Department of Health, Education and Welfare. These laboratories provide opportunities for student research and internships.

D. Neighboring Universities: Through a reciprocal agreement, Duke students may supplement their education in forestry and environmental studies by taking courses in related fields at the University of North Carolina in Chapel Hill, North Carolina State University in Raleigh, and North Carolina Central University in Durham.

E. The Senior Professional Program: Intended to provide working professionals with an opportunity to update managerial skills or to earn a professional master's degree with a minimum period of residence. The program offers symposia, managerial seminars, intensive courses, and regular University courses for qualified professionals.

F. Integrated Case Studies in Natural Resource Analysis: Involvement of students in natural resource analysis.

G. Duke University Marine Laboratory: Research facilities include a running seawater (PVC) system, tanks, water tables, aquaria, autoclaves, ovens, plant presses, refrigerated centrifuges, darkrooms, auditorium, library, reference collection and computer facilities. The Duke University of North Carolina Consortium operates a 131-foot research vessel for coastal zone research, concentrating on Nova Scotia and the Caribbean. Students are admitted to degree programs in regular degree departments, not the Marine Laboratory. The program operates year-round, provides course work in the marine sciences, has an active seminar program and facilities supporting dissertation research.

H. Center for Environmental Engineering: Focuses on environmental problems, to provide orientation and educational opportunities in technical and environmental subjects and to promote interdisciplinary environmental engineering research. The Center sponsors a visiting speaker program, graduate and faculty seminars, and coordinates postgraduate and undergraduate courses in environmental engineering.

I. Indian Ocean Studies Program: The purpose is to encourage both scholarly research and graduate training on the political, historical, economic, and socio-cultural development of the countries in the region. The Indian Ocean region is defined as the littoral and island countries of South and East Africa, the Arabian peninsula and Persian Gulf, South and Southeast Asia, and Australia. The Program tries to encourage and to coordinate systematic training for graduate students in the culture, society, histories, and economics of the various countries and/or areas within the Indian Ocean. The program sponsors a regular agenda of visiting speakers and scholarly presentation in its faculty/graduate student seminar, in addition to research symposia and conferences.

J. Center for Resource & Environmental Policy Research: Committed to the study of public policies on natural resource and the environment. The Center offers a forum for the examination of public and private responsibilities for natural resources and the environment, and provides a means to link the specialized knowledge of academia with the information needs of government and industry. Semester-long courses at the Center are designed primarily for full-time students desiring a strong conceptual foundation in resource and environmental policy analysis. Intensive courses lasting from one to

three weeks are assigned primarily for midcareer professionals seeking supplementary course work, certificates of achievement, or advanced degrees.

- K. The Duke Forest: Consists of approximately 8,300 acres of land, a variety of timber types, plant species, soils, topography and past land use conditions are represented. Elevations range from 260 to 760 feet. Several basic objectives are emphasized: (1) demonstration of timber management techniques, (2) experimental forest for research in the sciences associated with timber growing, (3) and development of the area as an outdoor laboratory for research in a wide range of scientific disciplines.

#### IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE/ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

Southeast Consortium for International Development (SECID); Virginia Polytechnic Institute & State University; Western Carolina University/Nepal: Resource conservation and utilization project which involved: constructing nurseries and silviculture research plots; developing improved range and pasture management practices; constructing drinking water and irrigation facilities; introducing a new fuel-efficient version of a traditional Nepali woodstove; conducting surveys, inventories, and mapping to facilitate planning and assessment; demarcation and replanting of flood plain land; installing physical and vegetation barriers for gully control; improving roads, slopes and trails; establishing a network of weather stations to supply data for planning; constructing catchment ponds and fish ponds for watering livestock, reducing soil slippage and providing a food source; training Junior Technicians and Junior Technical Assistants in range/pasture management; distributing forage crop and fodder tree seedlings; distributing "minikits" of vegetable and cereal crop seedlings to encourage farmers to use better varieties and practices; conducting horticultural research trials to test integrated cropping systems, alternative rotations, and feasibility of different varieties of food crop; opening livestock sub-centers for animal health services such as vaccination, disease treatment, castration, and salt block distribution; setting up a bio-gas rice mill, husker, and oil expeller; introducing solar dryers, solar water heaters, windmills, bio-gas units, and other alternative energy technologies; selection and training of Nepalese professionals in the technical and supervisory skills required to carry out resource management, 1980-1986.

#### V. PROGRAM ASSOCIATIONS:

1. Duke University Center for International Studies: Students and faculty participate in seminars and other educational offerings of the center.
2. The Delta Group: Support for graduate women seeking assignments in technical development programs, an annual series of educational programs focusing on technical projects in Asia, Africa and Latin America, assistance in locating opportunities for technical internships and longer term assignments, aid in formulating individual or team proposals to development agencies and international organizations, and a network with other Women in Development programs.
3. The South-East Consortium for International Development (SECID): A non-profit organization of 33 academic and research institutions in the southern and eastern regions of the US. The member institutions collaborate through SECID on international activities which utilize their main disciplinary skills of education, research, and extension. SECID provides the opportunity for member institution involvement in projects which would not be feasible to staff from a single institution.
4. Organization for Tropical Studies (OTS): OTS is a non-profit corporation established to promote the study of science in the tropics; to conduct organized programs of graduate training and research on tropical problems; and to serve as a national and international agency for coordinating and facilitating the work of individuals and groups in the tropics. Its central purpose is to acquire and disseminate a broad understanding of tropical environments and man's relationship to them by means of a sound program of teaching and research.

## VI. CONTACTS:

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 International Office  
 210 East Building  
 Duke University  
 Durham, NC 27708  
 Telephone:(919) 684-2767

## VII. ADDITIONAL INFORMATION:

A. Accreditation/Certification: Society of American Foresters (SAF)

B. Student body profile: Fall, 1982

1. Number of students enrolled:

	US/Canada	Foreign
Undergraduate	6,123	117
Postgraduate	3,561	208
Total Campus	9,684	325

2. Number and geographical place of residence for foreign students:

16	Africa
95	Asia & Pacific
34	Middle East
35	Latin America
145	Developed Countries

3. Foreign postgraduate student specialization: (NIA)

C. Faculty profile: (NIA)

D. Future plans: (NIA)

E. School Setting:

The University is located in the City of Durham (pop. 100, 831) in north central North Carolina, 20 miles (32 km.) northwest of Raleigh and 180 miles (288 km.) west of the Atlantic Ocean.

Climate: year-round mean temperature: 60 F (15 C)  
 winter: 49 F (9.5 C)  
 summer: 70 F (21.2 C)  
 mean rainfall: 45 inches (115 cm.)  
 relative humidity: 72%

(Data taken from Raleigh, 25 miles (40 km.) southeast of Durham.)

Local Characteristics:

1. Land Use: Urban area, surrounded by woodland and forest with some cropland and pasture.
2. Forest/Vegetation Types: Northern hardwoods-fir forest (Acer-Betula-Abies-Tsuga). Forest region favors a complex mixture of both cone-bearing and broad-leaved deciduous trees.
3. Land Surface Form: Irregular plains (100-300 feet; 50-75% of gentle slope is on upland).

F. Facilities:

The University Library System houses 3.2 million volumes; the collection includes 7.4 million manuscripts, 82 thousand maps, 651 thousand rolls or sheets of microtext, and receives 10 thousand periodicals, 11 thousand serials and 166 newspapers regularly. Access to computer facilities are provided.

G. Special aid for foreign students:

International House: Sponsors programs and activities (social and cultural programs for foreign students). The International Association helps to foster mutual exchange toward international understanding. The Host Family Program offers all foreign students the opportunity to become acquainted with an American family. The International Wives Club provides a structure for the international women to meet with American women in an informal atmosphere. The Speaker's Bureau provides an opportunity for an international student to share a home, culture and customs with members of the Durham community. English as a second language classes are held at the house twice a week.

G. Special aid for foreign students:

International House: Sponsors programs and activities (social and cultural programs for foreign students). The International Association helps to foster mutual exchange toward international understanding. The Host Family Program offers all foreign students the opportunity to become acquainted with an American family. The International Wives Club provides a structure for the international women to meet with American women in an informal atmosphere. The Speaker's Bureau provides an opportunity for an international student to share a home, culture and customs with members of the Durham community. English as a second language classes are held at the house twice a week.

NORTH CAROLINA STATE UNIVERSITY  
Raleigh, North Carolina

I. CURRICULUM PROGRAM:

A. Bachelor of Science

forestry  
natural resource management  
wood science and technology

pulp and paper science and technology  
recreation resource administration

B. Postgraduate

agriculture (MAg, non-thesis)  
biological/agricultural engineering  
(MBAE, non-thesis)  
forestry (MF, non-thesis)  
recreation resources (MRR, non-thesis)  
wildlife biology (MWB, non-thesis)  
wood and paper science (MWPS, non-thesis)  
agricultural economics (MS)  
agricultural education (MS)  
animal science (MS, PhD)  
biochemistry (MS, PhD)  
biological/agricultural engineering (MS, PhD)  
botany (MS, PhD)  
crop science (MS, PhD)  
ecology (MS)

entomology (MS, PhD)  
food science (MS, PhD)  
forestry (MS, PhD)  
marine, earth and atmospheric sciences  
(MS, PhD)  
plant pathology (MS, PhD)  
poultry science (MS)  
recreation resources administration  
soil science (MS, PhD)  
toxicology (MS, PhD)  
wildlife biology (MS)  
wood and paper science (MS, PhD)  
zoology (MS, PhD)

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate academic program concentrations which would be of interest to international students taught in the realm of natural resources/environmental management.

1. MAgr, MS, PhD, Crop Science: Emphasis in the fields of plant breeding, crop production and physiology, forage crops ecology, weed control and plant chemistry.
2. MS, PhD, Marine Science: Areas of specialization are biological, chemical, geological and physical oceanography; geophysical fluid dynamics and marine meteorology. Sponsored research is being conducted in continental shelf, Gulf Stream and equatorial dynamics, geophysical fluid dynamics, sediment transport and water column biology. Postgraduate students are actively involved in the conduct of the research which often forms the basis of their theses. Research projects range from theoretical studies to international field experiments.
3. MAgr, MLS (non-thesis), MS, PhD (thesis), Plant Pathology: Areas of strength in forest pathology, mycology, nematology, virology and general plant pathology.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational program:

Cooperative Education Programs: Designed to be an integral part of a student's educational program. The program is designed to enrich and expand classroom learning by providing sponsored work assignments in industry, business and government. The work experience is selected in terms of its relationship to a student's major and/or career goals and provides for alternating semesters of study and full-time work.

B. Internships offered through private/public sector agencies: (NIA)

C. Southern Forest Research Center: Designed to apply science skills from the University to research questions posed by forest industries. Projects include: tissue culture; practices on site productivity and bioeconomic modeling.

D. Water Resource Research Institute: To promote multidisciplinary attack on water problems, to develop and support research in response to the needs of the state, to coordinate research and educational programs dealing with water resources and to provide a link between the state and federal water resources agencies and related

interests of the University. The Institute has sponsored a graduate minor in water resources which offers a strong water resources program with a major in any of the basic disciplines contributing to water resources planning, conservation, development and management.

- E. **Biology Field Laboratory:** Comprised of a 20-acre pond, 180 acres of varied vegetation types and a laboratory building. The area is designed for research projects by faculty and students in the studies of ecology, toxicology, plant physiology/behavior and limnology.
- F. **Highlands Biological Station:** Research at pre- and post-doctoral work in botany, zoology, soils and geology. An area of high rainfall (elevation 3,823 feet), with laboratory facilities, library, dining, and dormitory facilities.
- G. **Pesticide Residue Research Laboratory:** Conducts research in pesticide residues in animals, plants, soils and water. The laboratory serves as the focal point for residue research involving interdepartmental cooperation, current research on persistence and decomposition in soils and plants, absorption and translocation in plants, distribution in environment and contamination of streams, estuaries and ground water.
- H. **Southeastern Plant Environmental Laboratories (Phytotron):** Designed for research dealing with the response of biological organisms to their environment. Facilities which provide environmental control make possible the simulation of climates found in tropical, temperate and northern zones. Research includes plant biology, ecology, experimental taxonomy and air pollution studies.
- I. **Reproductive Physiology Research Laboratory:** Includes environmental control rooms involved in studies on reproduction. Facilities available for surgery, in vitro growth of embryos, isotope labeling in embryo metabolism and transfer of embryos between females. Research is generally associated with identification of factors influencing early prenatal development, endocrine control of ovarian function or some aspect of elucidation and control of aberrations in mammalian reproduction.
- J. **The Forest Resources Extension Program:** Serves landowners, industries and public agencies in the areas of forestry recreation, wildlife and wood and paper. Its primary responsibility is promoting the application of new ideas developed through research and experience. In cooperation with the Continuing Education Division, short courses are offered in a number of fields to provide industry and government employees an opportunity to keep abreast of modern developments in forest and forest related disciplines.

#### IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE/ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

- 1. **Compania Nacional de Reforestacion/Venezuela:** To provide programs in education, research and extension designed to enhance the values of forest resources; establishment and management of fast growing plantations; assist in formal education of Venezuelan Nationals in the field of forestry; aid in developing a research program and forest technology.
- 2. **US Agency for International Development (USAID)/Central America:** Research on wood drying, 1979.
- 3. **USAID/Nepal:** Develop plans for a school of renewable natural resources, 1979.
- 4. **Peanut Collaborative Research Support Program (CRSP); Institute of Plant Breeding/Philippines:** Peanut varietal improvement; development of varieties resistant to diseases, insects, and tolerant to the constraints of the environment, 1982-83.
- 5. **CRSP; Department of Agriculture; Khon Kaen & Kasetsart Universities/Thailand:** Breeding research in developing peanut cultivars with higher yield and disease resistance, and suitable for a rice cropping system under rain fed conditions; other research included management of arthropods on peanut in Southeast Asia and chizobla and mycoorhizae influence on nitrogen fixation and growth of peanut.

## V. PROGRAM ASSOCIATIONS:

## A. Involvement and/or technical skills provided through the consortia: -

1. Central American and Mexico Coniferous Resource Cooperative (CAMCORE): To prevent the reduction of and eventual loss of proven and potentially valuable coniferous species in Central America and Mexico. Members are from the private and public sector of the US, Latin America, Central America and South Africa. Seed collection and testing of several species of Central American pines; establishment of preservation banks; short courses on forest management; nursery management and tree improvement.
2. Universities for International Forestry (UNIFOR): A consortium of eight American universities joined for the purpose of providing professional consultative and educational services in forestry and related sciences for human benefit in the developing countries of the world.
3. Southeast Consortium for International Development (SECID): The 33 member institutions collaborate on international activities which utilize their main disciplinary skills of education, research, and extension. SECID provides the opportunity for member institution involvement in projects which would not be feasible to staff from a single institution.
4. Organization for Tropical Studies (OTS): A consortium which maintains field research and teaching facilities in Costa Rica. Each year OTS sponsors courses in tropical biology that are open to postgraduate students with biological science backgrounds. These 8-week courses, offered in winter and summer, are taught in Costa Rica and make use of a network of field stations located throughout the country. The OTS facilities in Costa Rica also provide a unique opportunity for tropical research by postgraduate students and faculty. The principal field station, located in the northeastern Atlantic lowlands, has laboratory and housing facilities and provides access to a 3,500 acre tract owned by OTS; 65% of this tract is undisturbed lowland tropical wet forest. Another station is located at mid-elevation in southeastern Costa Rica near the Panamanian border. OTS also utilizes various other sites, including a seasonally dry area in the northwestern part of the country and a high-elevation area at 10,000 feet in the Talamanca range.

## VI. CONTACTS:

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 North Carolina State University  
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 Raleigh, NC 27695-7112  
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## VII. ADDITIONAL INFORMATION:

## A. Accreditation/Certification: Society of American Foresters (SAF)

## B. Student body profile: Fall, 1983

## 1. Number of students enrolled:

	US/Canada	Foreign
Undergraduates	17,569	193
Postgraduates	4,238	632
Total Campus	21,807	825

## 2. Number and geographical place of residence for foreign students:

91	Africa
409	Asia & Pacific
150	Middle East
89	Latin America
86	Developed Countries

## 3. Foreign postgraduate student specialization: (NIA)

## C. Faculty profile:

## 1. Number of full-time faculty (9 &amp; 12 months) teaching positions:

## 2. Faculty by technical specialization:

76	Plant Breeding	7	Communication/Diffusion of Technology
57	Plant Production & Management	4	Resource Economics
89	Plant Protection	6	Marketing & Consumer Economics
15	Animal Breeding	3	International Economic Development
30	Animal Production & Management	35	Agricultural Statistics
30	Animal Nutrition	5	Water
32	Food Science	5	Wildlife
24	Education & Extension	35	Soil Science
9	Rural Sociology	8	Fisheries
2	Policy Formation	7	Farm Mechanization

## D. Future Plans: (NIA)

## E. School Setting:

The University is located in the City of Raleigh (pop. 149,777), in north central North Carolina, 160 miles (256 km.) west of the Atlantic Ocean.

Climate:           year-round mean temperature: 60 F (15 C)  
                       winter: 49 F (9.5 C)  
                       summer: 70 F (21.2 C)  
                       mean rainfall: 45 inches (115 cm.)  
                       relative humidity: 73%

## Local Characteristics:

1. Land Use: Urban area, surrounded by cropland with pasture, woodland and forest.
2. Forest/Vegetation Types: Northeastern hardwoods, fir forest (Acer-Betula-Abies-Isuga).
3. Land Surface Form: Irregular plains (100-300 feet; 50-75% of gentle slope is on upland).

## F. Facilities:

The University library houses over 1 million books and bound journals, 2 million microforms, and a half million government publications. Students are provided access to computer facilities.

## G. Special aid for foreign students:

Host Family Program: Many Raleigh families have volunteered to welcome new international students. These host families do not provide housing or financial support. Instead they invite students to their homes two to four times per semester to visit and get acquainted. Friends of NCSU International Students have provided an excellent opportunity for students and families to gain a better understanding of each other's cultures.

UNIVERSITY OF NORTH CAROLINA  
Chapel Hill, North Carolina

I. CURRICULUM PROGRAM:

A. Undergraduate

biology (BS)  
environmental science and engineering (BS)  
recreation administration (BA);

B. Postgraduate

Thesis:

biology (MA, MS, PhD)	environmental sciences & engineering (MS, MSEE, MSPH, PhD)
botany (MA, MS, PhD)	marine sciences (MS, PhD)
city and regional planning (MRP, PhD)	pathology (MS, PhD)
ecology (MA, MS, PhD)	

II. ACADEMIC CONCENTRATIONS: (NIA)

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational program: (NIA)

B. Internships offered through private/public sector agencies: (NIA)

C. Institute of Latin American Studies: To encourage and stimulate study and research on, and the teaching of, Latin American subjects, serve as a campus medium for interdisciplinary communication of Latin American Studies, and promote the exchange of scholars and students.

D. Institute of Marine Sciences: The facilities of the Institute are made available to faculty and students of the University with research interests in marine biology, physical and chemical oceanography, and related fields. The Institute staff contributes to graduate education programs in the University through lectures, seminars, formal coursework, and in providing laboratory facilities for visiting classes or resident graduate students. Special facilities are available for physical, chemical, and ecological experimentation and analysis. The collections and library holdings are specialized but serviceable for the research activities of the Institute. The Institute vessel is primarily designed for estuarine and in-shore marine collecting and sampling. Deep water oceanography research can be carried out on the research vessel operated by the Duke/UNC Oceanographic Consortium.

E. Institute for Environmental Studies: To foster and coordinate research, teaching, and service in environmental health, science and policy.

F. Water Resources Research Institute: Encourages, coordinates, and supports multidisciplinary research in response to the state and regional water resources problem. It coordinates University programs in water resources with other universities, private industry, and the state and Federal water resource agencies; sponsors seminars, short courses, and symposia; and furthers the University graduate program in water resources.

G. Center for Urban and Regional Studies: Research and service activities of the Center are carried out by a core staff and by faculty research associates, and graduate students supported at least in part by research grants and contracts. Research is conducted in new community development, housing market dynamics, urban activity systems, urban preferences, coastal zone management, water-related land development, environmental management and protection.

IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS: (NIA)

## V. PROGRAM ASSOCIATIONS:

## A. Involvement and/or technical skills provided through the consortia:

1. Organization for Tropical Studies (OTS): A non-profit corporation established to promote the study science in the tropics; to conduct organized programs of postgraduate level training and research on tropical problems, and to serve as a national and international agency for coordinating and facilitating the work of individuals and groups in the tropics. Its central purpose is to acquire and disseminate a broad understanding of tropical environments and man's relationship to them by means of a sound program of teaching and research.
2. South-East Consortium for International Development (SECID): The member institutions collaborate through SECID on international activities which utilize their main disciplinary skills of education, research, and extension. SECID provides the opportunity for member institution involvement in projects which would not be feasible to staff form a single institution.

## B. Involvement with government agencies: (NIA)

## VI. CONTACTS:

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## VII. ADDITIONAL INFORMATION:

## A. Accreditation/Certification: (NIA)

## B. Student body profile: Fall, 1983

## 1. Number of students enrolled:

	US/Canada	Foreign
Undergraduate	14,498	60
Postgraduate	5,206	293
Total Campus	19,704	353

## 2. Number and geographical place of residence for foreign students:

30	Africa
119	Asia & Pacific
23	Latin America
43	Middle East
138	Developed Countries

## 3. Foreign postgraduate student specialization: (NIA)

## C. Faculty profile: (NIA)

## D. Future plans: (NIA)

## E. School setting:

The University is located in the city of Chapel Hill (pop. 32,421), in north central North Carolina, 30 miles (48 km.) northeast of Raleigh, 185 miles (296 km.) west of the Atlantic Ocean.

Climate: year-round mean temperature: 60 F (15 C)  
winter: 49 F (9.5C)  
summer: 70 F (21.2 C)  
mean rainfall: 45 inches (114 cm.)  
relative humidity: 72%

(Data taken from Raleigh, 30 miles (48 km.) southwest of Chapel Hill.)

Local Characteristics:

1. Land Use: Woodland and forest with some cropland and pasture.
2. Forest/Vegetation types: Northern hardwoods-fir forest (Acer-Betula-Abies-Tsuga). Southeastern forest region occurs mainly on the sandy coastal plain which is relatively dry despite the ample annual rainfall. The pines and broad-leaved trees here are adapted to dry soils.
3. Land Surface Form: Irregular plains (100-300 feet; 50-75% of gentle slope is on upland).

F. Facilities:

The University Library contains 2.8 million volumes and 1.7 million microforms, and receives over 39 thousand periodicals/serials annually. Computer facilities are accessible to students.

G. Special aid for foreign students:

International Center: Assists students and faculty from other countries in their adjustment to life in Chapel Hill. This office advises individuals and University departments on legal matters pertaining to international students and faculty. Activities such as a special orientation, Host Family Program, Campus Friends Program, "Discourse" discussion series, and various cultural programs are planned to help international students gain as much as possible from their stay here; to encourage interaction between US and international students, and to promote them as resources during their stay in the US.

OREGON STATE UNIVERSITY  
Corvallis, Oregon

I. CURRICULUM PROGRAM:

A. Undergraduate

agricultural and resource economics (BS)	fisheries science (BS)
agricultural education (BS)	food science and technology (BS)
agricultural engineering (BA, BS)	forest engineering (BS)
agricultural engineering technology (BA, BS)	forest management (BS)
agriculture-general (BS, BAgr)	forest products (BS)
animal science (BS)	horticulture (BS)
biology (BS)	poultry science (BS, BAgr)
botany and plant pathology (BS, BS)	rangeland resources (BS)
civil engineering-forest engineering (BA, BS)	resource recreation management (BA, BS)
crop science (BS)	soil science (BS)
entomology (BA, BS)	

B. Postgraduate

agriculture and resource economics (MS, PhD)	forest engineering (MF, MS, PhD)
agricultural engineering (MA, MS, AE)	horticulture (MS, PhD)
animal science (MS, PhD)	ocean engineering (MOcE)
botany and plant pathology (MA, MS, PhD)	poultry science (MS, PhD)
crop science (MS, PhD)	rangeland resources (MAgr, MS, PhD)
entomology (MA, MS, PhD)	resource economics (MS, PhD)
fisheries (MAgr, MS, PhD)	soil science (MS, PhD)
food science & technology (MS, PhD)	wildlife science (MS, PhD)
forest science (biology) (MS, MF, PhD)	zoology (MS, PhD)
forest products (MS, PhD)	

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate level academic program concentrations in the realm of natural resources/environmental management.

1. MF, MS, PhD, thesis, Forest Management: Dissertation fields in hydrology, economics, biometry, management, wood science and technology, ecology, genetics, tree physiology, and silviculture.
2. MS, PhD, thesis, Agricultural and Resource Economics: Dissertation fields in farm management and production economics, natural resource economics, marine economics, economics of rural development, and marketing and price analysis.
3. MS, PhD, thesis, Oceanography: Dissertation fields in biological, chemical, geological, and physical oceanography.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational program:

Cooperative Education Internships: Provides field experience, internship, or externship to blend academic study with work experience. Annually, over 800 students participate in 400 business and agencies through the US.

B. Internships offered through private/public sector agencies:

Internships available in the fields of agriculture, forestry and oceanography.

C. Prospective or currently enrolled international students are eligible for a nonresident tuition waiver based on financial need and ability to perform educational or community service of 80 hours.

- D. **Agricultural Experiment Station:** To conduct research dealing with a variety of agricultural conditions in Oregon and in many parts of the world. Research is concentrated in the agricultural, biological, environmental and social sciences. Basic and applied research programs include management and utilization of natural resources, production and protection of crops and animals, food and feed products and processes, marketing, rural community development, and environmental protection.
- E. **Climate Research Institute:** To conduct research programs, with emphasis on the design, testing, and application of mathematical physical climate models, on the assembly and analysis of climate data, and on the study of the mutual impacts of climate and people.
- F. **Energy Research and Development Institute:** To promote and coordinate energy related research and development activities within the University; to enhance educational and training programs in energy related areas; to promote conservation of energy and development of energy resources; to disseminate pertinent research related information; and to develop disciplinary and interdisciplinary research and training program.
- G. **Environmental Health Sciences Center:** To facilitate and encourage research, training, and support of qualified graduate students; sponsor conferences, symposia, and meetings for both student training and public communication; and to serve as an interdisciplinary resource group on problems relating to people's health and the environment. Examples of specific areas of interest include toxicology of environmental chemicals, solid waste and chemical waste disposal, environmental engineering, and mathematical modeling of environmental engineering.
- H. **Environmental Remote Sensing Application Laboratory:** To engage in the development and application of remote sensing technology for gathering, analyzing, and using information needed for programs in natural resource management, agriculture, land use planning and development, and environmental monitoring. Educational programs include workshops on aerial photographic interpretation, computer assisted analysis of satellite data, and use of information generated from data bases acquired by satellite and aircraft.
- I. **Forest Research Laboratory:** The program supports research of graduate students in forest genetics, economics, policy, physiology, biometrics, hydrology, engineering, ecology, silviculture, entomology, pathology, recreation, soils and wood science.
- J. **International Plant Protection Center:** To develop and administer effective plant protection programs in developing countries. Principal programs involve development and evaluation of weed control systems. The Center publishes research programs and conducts a training component, and coordinates with Federal and international agencies.
- K. **Marine Science Center:** A 49-acre site which conducts research and instruction in agricultural and resource economics, agricultural engineering, botany, and oceanography. The instruction program focuses on agriculture and on marine biological aspects of tidal, estuarine, and nearshore marine environments. The OSU Marine Science Center houses the management of the Collaborative Research Support Program (CRSP). The CRSP in aquaculture is a long-term program which intends to join the resources of the US Land Grant institutes with their research counterparts in developing countries to investigate the dynamics of pond fish culture systems. The long range goal is to increase availability of low-cost, high quality animal protein in developing countries through pond aquaculture. When fully implemented, CRSP will support projects in Thailand, Indonesia, the Philippines, Panama, Honduras, Jamaica, Rwanda and Sierra Leone.
- L. **International Forestry Science Program:** Establishes and coordinates cooperative programs in forestry education and research among Oregon State University and foreign institutions, and provides resources for individuals, companies, agencies, and institutions involved in international forestry. The program increases educational opportunities through exchange of students, faculty and scientists; broadens fundamental knowledge through the sharing of ideas and expertise in forest science; and improves relations for the international trade of forest products and technology. The program is particularly strong in the areas of reforestation, nursery management, tree improvement and genetics, silviculture of plantations and young stands, ecosystem analysis, and in the extension of research results.
- M. **Global Studies Center:** Provides extensive inservice training and other workshops and conferences are provided to elementary and secondary educators throughout the State. The Center receives daily news wire copy from InterPress, a Third World news agency and provides regular briefings and background papers to regional news outlets. Several radio and television shows are also produced. In addition to coordinating numerous public forums on global issues for the general public, the Center provides material and

staff support to the Governor's Commission on Foreign Language and International Studies.

- N. Latin American Affairs Certificate: The certificate program in Latin American Affairs offers students a broad knowledge and understanding of the history and current situation in Latin America. The program allows students with majors in any discipline to complement their professional studies; certificates are awarded concurrently with the undergraduate or postgraduate degree. Proficiency in Spanish or Portuguese is required. In addition, students must take at least 30 hours of approved coursework from various departments including: History, Anthropology, Agricultural and Resource Economics, Geography, Economics, Political Science, and Sociology.
  - O. Sea Grant International Programs: Designed to enhance the ocean and coastal resources research and capabilities of developing foreign nations, and to promote the international exchange of information and data on the assessment, development, use and conservation of these marine resources.
  - P. Women in Development Group (WID): the OSU Women in Development Group is open to male and female students, family, staff, and general public interested in the role of women in development. Focus is on women as agents and beneficiaries, acting in both developed and developing countries. The geographic areas of prime concern to the group are Central America, the Near East, and the Pacific Rim.
  - Q. Office of International Agriculture: Takes leadership in the development and monitoring of long-range goals for a program in international agriculture; provides innovation, leadership, and management in proposing and selecting interdisciplinary programs consistent with the long-range goals; stimulates involvement in international programs of departments and personnel of the College of Agricultural Sciences.
- IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE/ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS):

Linkages between the school and foreign institutions include:

- 1) Wheat Research and Training Centers/50 countries/Rockefeller/USAID, 1970-82.
- 2) Ford/India: Economics of resource use on the Indian subcontinent, 1974-1980.
- 3) USAID/LDC's in Winter Rainfall Regions: Moisture conservation and utilization in low winter rainfall areas of LDC's, 1975-1980.
- 4) Ford/India: Research and education in natural resource economics, 1976-1980.
- 5) USAID/Costa Rica, Philippines, Thailand: Weed control systems for utilization for representative farms in developing countries, 1976-1982.
- 6) NMFS/International Waters: Foreign fishery observer program, 1978-1980.
- 7) International Sea Grant/OSU Catholic University of Valparaiso/Chile: Inter-American Conference of Science and Technology of Oceans, 1979.
- 8) UNESCO/Chile: Fresh water reservoirs and lakes, 1979.
- 9) Chile International Sea Grant/Chile: Aquaculture course and seminar on salmonids, 1979.
- 10) CSIRO/Australia, So. Africa: Systematics and biology of arthropods in biological control of flies in dung, 1979-1981.
- 11) USAID/50 countries: Cereal breeding, 1979-1981.
- 12) NSF/Taiwan: Control of infectious diseases of fish, 1979-1982.
- 13) Chile/International Sea Grant OSU: Population biology, 1980.
- 14) UNESCO/Chile: Limnology seminar, 1980.
- 15) International Sea Grant/Chile: Aquaculture course, 1980.
- 16) International Sea Grant Chile Universities/Chile: Techniques of modeling and evaluation of commercial fisheries, 1980-1981.

- 17) International Potato Research/Peru: Chemical protection of potato seed and seed pieces from Plant Parasitic Nematodes, 1980-1982.
- 18) Kuwait Institute for Scientific Research/Kuwait: Evaluation of potential for expanding sport fishing industry, 1981-1982.
- 19) WHO/Upper Volta: Stream ecology for black flies, 1981-1982.
- 20) USAID/Sierra Leone, Rwanda, Nigeria, Brazil, Honduras, Jamaica, Panama, Indonesia, Thailand, Philippines: Evaluation of potential aquaculture projects, to increase availability of low-cost, high-quality animal protein in pond aquaculture development.
- 21) USAID/CID/North Yemen: Design, analysis, development, implementation and review of agricultural sector projects, poultry extension, and horticulture extension, 1980-1985.
- 22) IRRI/Indonesia: Rice production, 1976-present.
- 23) USAID/CID/Egypt: Egypt water use project, 1977-1982.
- 24) USAID/Ecuador, Costa Rica, Dominican Republic, Jamaica, Bolivia, Morocco, Thailand, Philippines: Remote sensing in agriculture, 1979-1984.
- 25) World Bank/India: Seed production, 1980.
- 26) USAID/Cape Verde: Crop management, 1982.
- 27) USAID/Tunisia: Dryland agriculture and small farmer irrigation systems research, 1980-1985.
- 28) Instituto Nacional de Investigaciones Agrícolas/Mexico: establishment of cooperative programs wheat breeding and genetics research.

#### V. PROGRAM ASSOCIATIONS:

##### A. Involvement and/or technical skills provided through the consortia:

1. Consortium for International Fisheries and Aquaculture Development (CIFAD): The Consortium was established in 1979 to provide a more effective, coordinated program of fisheries and aquaculture research and technical assistance to developing nations of the world. CIFAD members are committed to working together in a complementary manner by using skills in research, training, and extension to assist other nations with fisheries problems. Funding of projects is through organizations such as the Agency for International Development, Asian Development Bank, World Bank and others providing aid to the less-developed nations. Through its computerized data bank of staff from member institutions and cooperating entities, CIFAD provides immediate access to information on each individual's scientific expertise, language capabilities, experience, and availability for short or long-term assignments.
2. Consortium for International Development (CID), is a nonprofit corporation of eleven western universities. The objectives of CID are to: (1) facilitate the involvement of member universities in leadership and in contribution to the planning and implementation of large specialized or integrated international development projects, (2) provide administrative support for project initiation, implementation, and evaluation as well as training for key project administrators, and (3) improve the opportunities for member institutions to collectively provide their expertise to developing countries.

##### B. Involvement with governmental agencies:

The University has a general Memorandum of Understanding (MOU) with the Office of International Cooperation and Development of the US Department of Agriculture. This MOU facilitates cooperative efforts for development of training and research programs throughout the United States and abroad.

## VI. CONTACTS:

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## VII. ADDITIONAL INFORMATION:

A. Accreditation/Certification: Society of American Foresters (SAF)

B. Student body profile: Fall, 1983

1. Number of students enrolled:

	US/Canada	Foreign
Undergraduate	13,384	359
Postgraduate	2,710	671
Total Campus	16,094	1,030

2. Number and geographical place of residence for foreign students:

80	Africa
367	Asia & Pacific
194	Middle East
183	Latin America
206	Developed Countries

3. Foreign postgraduate student specialization:

1 Mensuration, Inventory	1 Ecology/Plant
1 Natural Resources	1 Range & Wildlife Mgt/Policy & Admin.
1 Remote Sensing, Photogrammetry	1 Range & Wildlife Mgt/Human Dimensions
1 Ranger, General Management	1 Forestry - Forest Products
1 Sociology	1 Forestry - Pulp & Paper
1 Watershed Management, Soil Conservation	1 Forestry - Silviculture
1 Law/Policy	1 Forestry - Tree Improvements/Genetics
1 Program Implementation/Planning	1 Forestry - Plantation Establishment
1 Environmental/Economics	1 Forestry - Economics/Biometrics/Policy
1 Environmental/National Park Management	1 Industry - Environmental Impacts
1 Fisheries/Human Dimensions	

C. Faculty profile: (NIA)

1. Number of full-time faculty (9 & 12 months) teaching positions: (NIA)

2. Number of faculty on overseas professional assignment: (NIA)

3. Faculty by technical specialization:

10 Plant Breeding	8 Marketing & Consumer Economics
39 Plant Production & Management	7 Int'l Economic Development
20 Plant Protection	2 Agricultural Statistics
106 Forestry	9 Water
5 Animal Breeding	16 Environmental Studies
6 Animal Production & Management	9 Soil Science
27 Animal Nutrition	7 Range Management
159 Food Science	14 Aquaculture
12 Human Nutrition & Health	1 Fisheries
28 Home Economics/Human Ecology	1 Farm Mechanization
91 Education & Extension	2 Waste Management
12 Rural Sociology	57 Irrigation
9 Communications- Diffusion of Technology	2 Entomology
9 Resource Economics	18 Remote Sensing

D. Future plans: (NIA)

The University plans to expand its international programs through instruction, continuing education and research.

E. School setting:

The University is located in the City of Corvallis (pop. 42,000), in northwest Oregon, 30 miles (48 km.) south of Salem and 40 miles (64 km.) east of the Pacific Ocean.

Climate:           year-round mean temperature: 52 F (11.2 C)  
                   winter: 41 F (5.1C)  
                   summer 63 F (17.3 C)  
                   mean rainfall: 41 inches (104 cm.)  
                   relative humidity: 74%

(Data taken from Salem, 30 miles (48 km.) north of Corvallis.)

Local Characteristics:

1. Land Use: Cropland with pasture, woodland and forest.
2. Forest/Vegetation types: Cedar-hemlock-Douglas fir-Oregon oakwoods (Tsuga-Tsuga-Pseudotsuga-Quercus) Pacific coast forest region has a mild climate and abundant precipitation along the coasts. Here are dense forests, primarily of cone-bearing trees. Southward and inland the warmer, drier climate favors mixtures of cone-bearing trees on mountain slopes and broad-leaved trees at lower elevations.
3. Surface Land Form: Tablelands, moderate relief (300-500 feet; more than 75% of gentle slopes is in lowland).

F. Facilities:

The University library contains over one million volumes, 340 thousand government documents, 930 thousand microform pieces, 5,900 periodicals are received currently, 171 thousand maps, and 17 thousand serials. Access to computer facilities are available to students.

G. Special aid for foreign students:

Office of International Education: To promote policies, programs, and activities that will contribute to a broader understanding among nations and peoples, the University combines on-campus activities with programs of study, research, teaching, and technical assistance in many areas of the world.

International Student Organization (ISO): Represents over 1,000 foreign students enrolled at OSU and is involved in a variety of activities on campus. Regular meetings discuss common problems facing foreign students such as housing, rising tuition and culture shock. Students, their countries, and their values are introduced to the University and community groups as opportunities arise. With support from the National Association of Foreign Student Affairs, foreign students from OSU become advisors to participants in High School Model United Nations programs. Each Spring, the ISO sponsors its major event of the year, International Night.

English Language Institute: Offers multilevel intensive English language courses in vocabulary and reading, structure, speech, writing, listening comprehension, and study skills, as well as cultural and social orientation to the American university community. The primary function is to help provide students with the level of broad language skills necessary for competent study at an American college or university. The academic experience is supplemented by social, cultural and recreational activities. Also, the conversant program furnishes an opportunity for at least one hour a week of conversation with native speakers. Students are also provided with assistance in evaluating language skills, identifying deficiencies, and designing the supplemental course work necessary to overcome these deficiencies while continuing in their university programs.

UNIVERSITY OF WASHINGTON  
Seattle, Washington

I. CURRICULUM PROGRAM:

A. Undergraduate

biology	landscape architecture
botany	marine affairs
environmental health	oceanography
environmental studies	pulp and paper technology
fisheries science	quantitative science
food science	social management of technology
forest engineering	urban planning
forest resource management	wood and fiber science
forest science	zoology
international studies	

B. Postgraduate

botany (MS, PhD)	marine affairs (MMA)
chemical engineering (MS, PhD)	oceanography (MS, PhD)
environmental chemistry (MS, PhD)	pathology (MS, PhD)
environmental engineering (MSE, MS, PhD)	urban planning (MUP, PhD)
fisheries (MS, PhD)	water and air resources (MS, PhD)
forest resources (MS, MFR, PhD)	zoology (MS, PhD)
landscape architecture (MLA)	

II. ACADEMIC CONCENTRATIONS:

Specific postgraduate academic program concentrations which would be of interest to international students taught in the realm of natural resources/environmental management.

1. Forest Resources, MS, MFR, PhD (thesis and non thesis option): The programs cover the following areas: forest industries management, quantitative resource management, forest resource management, forest economics and finance, sociology and leisure studies, land use planning and resource policy, resource and environmental interpretation, outdoor recreation management, silviculture, forest soils, forest genetics, forest entomology, forest pathology, forest ecology, tree physiology, forest hydrology and meteorology, wildlife science, ecosystem analysis, wood science, pulp and paper technology, forest engineering, wood utilization and technology, and urban horticulture.
2. MS, PhD, Fisheries: Areas of study within fishery science include fish physiology, fish taxonomy, population dynamics, management of freshwater and marine fisheries, ecology and life history of fishes, invertebrate fisheries, diseases of fish and shellfish, aquaculture, fish genetics, radiation ecology, marine acoustics, biological impact studies, and water quality studies. In food science, students may specialize in the chemistry, microbiology, or biochemistry of foods and in advanced study of food processing methods.
3. MS, PhD (thesis and non-thesis options), Zoology: Programs of study are available in the areas of comparative physiology, cell biology, developmental biology, ecology, endocrinology, invertebrate and vertebrate morphology and neurobiology. An interdisciplinary program is offered in developmental biology and other areas as well.

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

- A. Co-op educational program: (NIA)
- B. Internships offered through private/public sector agencies: (NIA)
- C. Midcareer Education: A program has been established in the college for professionals in the field who, on a part or full-time basis, take graduate work at midcareer to prepare themselves for new or broader responsibilities. Under this program, courses can be taught in a more flexible time arrangement to meet the constraints of participants and can be tailored to specific career needs.
- D. Cooperative Academic Programs with the School of International Studies: these programs

have been established to permit students pursuing a Master of Science in Forest Resources to obtain a field of specialization in International Studies or joint degrees in Forest Resources and International Studies; students may also pursue a Masters of Arts in International Studies with a major field in some aspect of forest Resources.

- E. The Institute of Forest Resources: The research branch of the College of Forest Resources which coordinates cooperatively-sponsored research programs with federal, state, and private agencies. Research related to resource management studies is presently conducted in the following program areas: (1) management and productivity of forest stands, (2) multi-resource management and planning, (3) forest protection in resource management, harvesting, and wood processing, (4) wildlife management, (5) impacts on forest ecosystems and biological processes, (6) forest policy and decision-making in forest management and forest industry.
- F. Friday Harbor Laboratories: The principal marine science field station, 80 miles (128 km.) north of Seattle and located in the San Juan Archipelago of Puget Sound, the area offers a biological preserve of 484 acres of wooded land with about two miles of shoreline. The laboratories are close to sea- waters that range from oceanic to those highly dilated by streams, some with depths to a thousand feet, other with bottoms varying from mud to rock, and water movements ranging from those of quiet bays and lagoons to those of swift tideways. During spring, summer and autumn, the laboratories offer opportunities for independent and supervised research, as well as a varied program of instruction for graduate and undergraduate students. Throughout the year, use of the laboratories' facilities for research in various areas of marine science is encouraged.
- G. Institute for Environmental Studies: An interdisciplinary educational unit established to develop environmentally related programs in teaching, research, and public services. Internships available for doctoral and post- doctoral work in environmental decision making.
- H. The Fisheries Center: Contains classroom, laboratories and research materials (library) in fisheries, food science, oceanography and wildlife science. The collection of fishes and invertebrates now totals +200 thousand specimens. Other laboratories provide for the study of the physiology, biochemistry and behavior of fish and the effects of pollutants on fish.
- I. The Forest Resources library houses 26,000 bound volumes and thirty-three thousand pamphlets, reports, and monographs, twenty-five hundred periodicals and indexes to current literature in forestry and supporting sciences and material published in the fields of forestry and pulp and paper technology. The herbarium supplements forest resources students' fieldwork in dendrology. Containing representative plant material from all parts of the United States, the collection includes dried, mounted specimens of shrubs, hardwood trees, and conifers. Fruit specimens and a complete cone collection of American conifers are maintained apart from the mounted collection.  
  
Research tools include: optical equipment, electronic instrumentation for a wide variety of uses, gas chromatographs, spectrophotometers, physical test equipment, and an electron microscope facility. Laboratories are designed to study soil chemistry and soil physics, hydrology, polymerchemistry, meteorology, tree physiology, genetics, wood and extractives chemistry, physics of fibrous composites, applied mechanics, wood process technology, pathology, entomology, recreation, horticultural physiology, and horticultural plant materials.
- J. The University Arboretum, a two-hundred-acre collection of trees and shrubs growing in a natural setting contains some fifty-two hundred different kinds of woody plants that are available for research and academic study.
- K. Fisheries Research Institute: Primary objective is to provide practical training and financial support for fisheries students, and in particular, to provide a wide spectrum of opportunities for thesis research by graduate students. This research program not only makes substantial contributions to basic fishery biology and applied research but also responds to the needs of the industry, state, and nation. The research projects covered by the Institute include fisheries biology and ecology, resource assessment and enhancement, productivity and food chain dynamics, and the effects of man's impact on the aquatic environment and its resources.
- L. Washington Cooperative Fishery Research Unit: Formed to provide expertise in the area of recreational fisheries. Actively involved in aspects of the anadromous fisheries programs and promote research funds for graduate student projects, most of which are oriented toward practical management situations in the area of recreational fisheries.

- M. The Institute for Food Science and Technology: operates both as a degree-granting department and a research institute. The Institute is involved in overseas development programs through its membership in the Consortium for the Development of Technology (CODOT). This involves managing overseas trainees in the USA, offering special training programs and participating in research, development, institution building, and operates jointly in international food development projects.
- N. Institute for Maritime Studies: the Institute has an active program of research and advisory services to state and local agencies concerned with coastal planning and resource management. In addition to membership on formal committees, the faculty and staff of IMS often talk informally with community groups and visitors about current issues in marine affairs. Research at the Institute utilizes data on the ocean environment and knowledge of multiple ocean and coastal uses, the economics of ocean and coastal resources, and policy sciences. Its objective is to improve government and industry decision-making, provide for rational and economic use of ocean and coastal zone and their resources, and minimize conflicts between users. This research examines present public or private policy on resource management and seeks to find new approaches to policy planning of multiple-resource management. IMS research work does not normally include laboratory work.
- O. Applied Physics Laboratory: members of the Laboratory serve on numerous formal planning and review committees, teams and groups. Some of these committees have a strong role in defining national and international goals for technology development. On an informal basis, members of the staff participate in community affairs, offering their expertise in ocean engineering and other areas.
- P. Washington Sea Grant: Through its specialists and field agents, Sea Grant serves its constituents by providing current useful information and technical assistance in workshops, short courses, lectures, publications, and individual contacts. Private enterprises and resources management agencies are provided with economic data and analysis in the marine area. And, through the Communications Program, specialized audiences and the general public receive information and/or publications about significant marine topics.

#### IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE/ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS:

Linkages between the school and foreign institutions include:

1. Kasetsart University/Thailand: Training of faculty, short courses in computers, the development of computer simulation models for timber management and utilization, joint research of continuous inventory plots, remote sensing.
2. Bogor University/Indonesia: Training of faculty and research in comparative ecosystems, forest policy and forest product flows.
3. COMDEFOR/Honduras: Offering of a series of short courses in forest management, road construction, harvesting techniques and the use of aerial photos joint research in growth and yield.
4. University of Vienna/Austria: Joint research in forest policy analysis, pulp and paper and the development and use of qualitative models.
5. FAO/Italy: A study in the utilization of tropical hardwoods and the development of the forest product industry, and a methodology for studying the local socioeconomic impacts of a broad spectrum of forest industries.
6. Food and Agricultural Organization-UNDP: Develop a training program and write an accompanying manual on fish feed development, 1979-1993.
7. National Marine Fisheries Service/Mexico: Investigate causes of infant mortality in gray whales, 1978.
8. US Department of Agriculture/Israel: Investigate diseases of cultured fishes, 1982.
9. United Nations Development Program/Argentina: To develop appropriate technology for recovery and utilization of food processing wastes and byproducts.
10. National Science Foundation/Brazil: To understand how the Amazon River and its floodplain interact with respect to the cycling of carbon and nutrient elements to

support such a rich and abundant fauna, 1981-1984, renewal expected.

11. Chile: Develop a plan for culture and management of salmon.
12. US Agency for International Development/Indonesia: Develop a center of excellence in fisheries and marine science including developing facilities, training faculty, establishing library and aquaculture program, doing collaborative research in tropical marine biology, 1979-1984.

#### V. PROGRAM ASSOCIATIONS:

##### A. Involvement and/or technical skills provided through the consortia:

1. Organization for Tropical Studies (OTS): is a non-profit corporation established in 1963 to promote the study of science in the tropics; to conduct organized programs of graduate training and research on tropical problems; and to serve as a national and international agency for coordinating and facilitating the work of individuals and groups in the tropics. Its central purpose is to acquire and disseminate a broad understanding of tropical environments and man's relationship to them by means of a sound program of teaching and research.
2. Universities for International Forestry (UNIFOR): A consortium of eight American universities joined for the purpose of providing professional consultative and educational services in forestry and related sciences for human benefit in the developing countries of the world.

##### B. Involvement with governmental agencies:

1. Title XII money: work in India in the area of biometrics.

#### VI. CONTACTS:

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#### VII. ADDITIONAL INFORMATION:

- A. Accreditation/Certification: Society of American Foresters (SAF)
- B. Student body profile: Fall, 1983

##### 1. Number of students enrolled:

	US/Canada	Foreign
Undergraduates	21,749	422
Postgraduates	11,176	865
Total Campus	32,925	1,287

##### 2. Number and geographical place of residence for foreign students:

82	Africa
545	Asia & Pacific
170	Middle East
59	Latin America
431	Developed Countries

##### 3. Foreign postgraduate student specialization: (NIA)

## C. Faculty profile: Fall, 1983

1. Number of full-time faculty (9 & 12 months) teaching positions: (NIA)

2. Faculty by technical specialization:

2	Plant Breeding	2	Climatology
12	Plant Protection	3	Energy
35	Forestry	2	Water
9	Food Science	2	Wildlife
12	Human Nutrition & Health	7	Environmental Studies
3	Home Economics & Human Ecology	7	Soil Science
5	Rural Sociology	1	Range Management
21	Policy Formation	10	Aquaculture
7	Resource Economics	30	Fisheries
1	International Economic Development	1	Waste Management
2	Geography		

D. Future plans: (NIA)

E. School setting:

The University is located in the City of Seattle (pop. 491,897), in midwest Washington, bordering Puget Sound.

Climate: year-round mean temperature: 51 F (10.6 C)  
 winter: 44 F (6.1 C)  
 summer: 59 F (14.5 C)  
 mean rainfall: 40 inches (101.6 cm.)  
 relative humidity: 73%

Local Characteristics:

1. Land Use: Urban area.
2. Forest/Vegetation Types: Cedar-hemlock-Douglas fir forest (Thuja-Tsuga-Pseudotsuga). Pacific coast forest region has a mild climate and abundant precipitation along the coasts. Here are dense forests, primarily of cone-bearing trees.
3. Land Surface Form: Tablelands, moderate relief (300-500 feet; 50-75% of gentle slope is on upland).

F. Facilities:

The University library houses +4 million volumes, including archival materials and manuscripts, maps, newspapers, microforms, research reports, media materials and government publications. Access to computers is provided for students.

G. Special aid for foreign students:

English as a Second Language Center: provides instructional resources for non-native speakers of English. During the academic year courses are offered for international students who are officially enrolled in degree programs at the University (with credit). The Center also offers non-credit courses open to any student. Individual tutoring without charge and lending library with books on grammar, idioms, pronunciation vocabulary, listening comprehension, reading and writing is also available.

International Services Office: provides assistance to the international student including such matters as general orientation of new students to the campus and community; advice and counsel for educational, financial, and personal problems; dissemination of important information through newsletters; and assistance in meeting US Immigration and Naturalization Service regulations on such matters as extension of stay, change of status, transfer of schools and work permits.

# *IES* Institute for Environmental Studies

University of Wisconsin-Madison

1007 WARF Building, 610 Walnut St.  
Madison, Wisconsin 53705  
(608) 262-5957  
Telex No: 265452 UOFWISC MDS

23 December 1987

**COPY**

Ms. Dorothy Young  
Training Division  
Office of Personnel Management  
Bureau of Management  
U.S. AID  
Washington, D.C. 20523

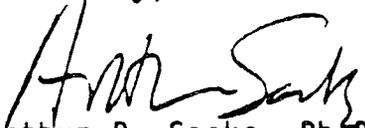
Dear Ms. Young:

Dr. Peter Freeman asked me to forward to you material describing the instructional and research programs of our Institute. The material enclosed details our many programs and activities.

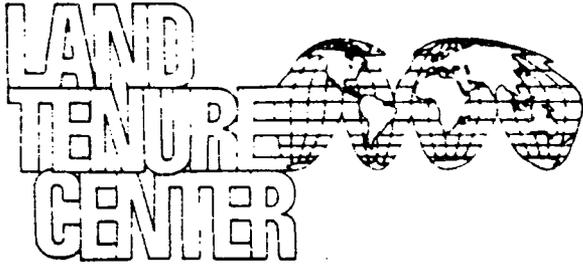
Dr. Freeman indicates that U.S. AID is exploring potential centers which could provide long-term non-degree training (up to one year) in natural resource management and environmental studies for AID personnel. The Institute for Environmental Studies at UW-Madison is recognized as one of the strongest institutions in this area in the United States. We would be pleased to discuss opportunities to accommodate AID's training needs.

Should you have any questions about IES, please contact me.

Sincerely,

  
Arthur B. Sacks, Ph.D.  
Director

ABS:sih  
xc: Dr. Peter Freeman ✓



LAND TENURE CENTER  
University of Wisconsin-Madison  
1300 University Avenue  
Madison, WI 53706

Cable Address: LANTENCEN, Madison, WI  
Telephone: 608/262-3657  
Telex: 265452—Attn: Land Tenure

21 December, 1987

Mr. Peter Freeman  
619 Upland Place  
Alexandria, VA. 22301

Dear Mr. Freeman:

Thank you for your call concerning non-degree training opportunities at the Land Tenure Center for USAID personnel. As promised, I am sending you a copy of the syllabus for the Land Tenure in Africa course which we teach every Spring semester. The course has a very strong policy orientation, and draws heavily on materials that were developed in the course of LTC research undertaken for USAID missions. I am also enclosing a paper prepared by John Bruce and myself on tenure and resource management.

Let me know if I can be of any further assistance.

Sincerely yours,

Steven W. Lawry

Enclosures

## Forestry

Graduate study leading to a Masters or Doctorate in forestry economics combines a common base in economic theory, quantitative methods and resource economics with additional depth in forestry economics and policy. The Masters degree generally requires two years of study and culminates in a thesis or its equivalent in the form of one or more substantial papers or reports. The program offers students the flexibility to design a Masters program that meets their intellectual and career interests.

The Doctoral program usually requires three to five years of study. Students also must prepare an acceptable thesis. Students in the Doctorate program take coursework in the same general areas as those in the Masters program, but are also required to develop a substantial understanding of a second area of interest in the form of a minor. The Doctoral degree training stresses development of research skills that can be used either in an academic setting or to help answer pressing questions of public policy.

The core faculty for this program include:

**BUONGIORNO** Joseph, Professor, International work in Austria, Iraq, Indonesia, Italy, France, and Malaysia. Major interests: Long term forecasting of production, consumption and trade of forest products among developed and developing countries; national and international forestry sector planning and modeling, especially of the pulp and paper sector; economics of forestry investment and management decisions.

**SHER** Jeffrey C., Associate Professor, International work in Zambia. Major interests: Sources, rates and implications of technological change for forest industries; analysis of the economic impact of institutional factors, such as taxes and forestry practice laws, on forest management decisions; economics of utilization and preservation of wildlife in developing countries.

## THE UNIVERSITY OF WISCONSIN

The University of Wisconsin-Madison is ranked the top land grant research institution in the United States and has one of the largest contingents of faculty with international experience. There are major programs in Ibero-American Studies, South Asian Studies, Southeast Asian Studies and African Studies. In addition, the Institute of Environmental Studies provides an interdisciplinary focus for research and teaching, including graduate programs in Land Resources, Water Resources Management and Environmental Monitoring.

For 20 years, the University has been involved in building research, extension and teaching institutions in Africa, Asia and Latin America. It has established long term programs in Nigeria with the University of Ife, the Agricultural Secondary Schools, and the University of Calabar; in Brazil with the Brazilian Agricultural Research Corporation and the University of Rio Grande do Sul; and in Indonesia with the Higher Agricultural Education Project and the Institut Pertanian Bogor.

The College of Agricultural and Life Sciences contains 23 departments offering the full gamut of work in the physical, biological and social sciences. Excellent programs exist in forestry, wildlife ecology, agronomy, soils, entomology, plant pathology, nutrition, meat and animal science, dairy science, rural sociology, agricultural economics, genetics and veterinary science. The Land Tenure Center has a long and distinguished record of working with developing countries on questions of land tenure and agrarian reform. The Center's library is considered one of the most complete in the world.

## *Graduate Study in Economic Development and Natural Resources*



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## THE PROBLEMS

As tropical agriculture expands into marginal lands, it becomes increasingly difficult to support growing populations. Farming these lands also threatens the long-term viability of the food systems in these countries. Settlers fell trees for firewood, plow up wild lands and crop hillsides intensively. Swidden systems—traditional rotation methods designed to let land rest between crops—are forced into shorter cycles. The devastation resulting from continued population pressure and food shortages becomes more severe.

As agricultural production intensifies, growers tend to rely more on pesticides and fertilizers. If not properly managed these chemicals can endanger agricultural workers and consumers alike. They also threaten the productivity of ocean fishing grounds which provide food and work for many coastal residents as well as much-needed foreign exchange.

As worldwide demand for natural resources continues to rise, poor nations are becoming more vulnerable to concessionaires. The rise in petroleum prices poses a serious problem to all but a few fortunate energy exporters. Finally, as some nations make the gradual transition from an agricultural to an industrial society, we see other equally serious forms of environmental result.

For approximately 30 years the leaders of the developing world—and those universities that have helped shape the direction of agricultural development—have focused on producing more food. While that problem has not been entirely solved, a number of respected scholars are now convinced that another problem is equally pressing—that of irreversible damage to the natural resource base of these agricultural societies.

The University of Wisconsin has received federal funds over the past several years for training faculty in several areas of importance to the developing world. A major part of this effort has focused on natural resources and economic development. The University now offers a graduate study program which emphasizes the important relationship between economic development and natural resource use. The program is offered to students from both developing and industrialized countries.

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## THE PROGRAM

Students can choose from two graduate programs. One, emphasizing the broad areas of economic development and natural resources, is administered by the Department of Agricultural Economics. The other focuses specifically on forestry economics and is administered by the Department of Forestry. Students may also obtain a major in one department and a minor in the other.

### *Agricultural Economics*

Graduate study leading to the Master's or Doctorate degrees in the Department of Agricultural Economics involves coursework emphasizing economics, quantitative methods, agricultural development and natural resource economics. The Master's program normally requires two years to complete, while the Doctorate normally requires an additional two to three years.

In addition to economic theory and quantitative methods, the student could select courses from among the following: Natural Resources and Time, Natural Resources and Markets, Natural Resource Valuation, Benefit-Cost Analysis, Agricultural Data Systems, Agricultural Development, The Peasant in Latin America, African Agricultural Development, Public Finance in LDC's and International Trade.

The following core faculty are involved in the program:

BARROWS, Richard L., Professor. International work in Sierra Leone, Botswana, Tanzania, Nicaragua, Columbia, Taiwan. Major interests: Land resources and policy, land use and small farm development.

BISHOP, Richard C., Professor. International work in Indonesia, People's Republic of China. Major interests: Natural resource economics with emphasis on fisheries and wildlife; resource valuation methods.

BROMLEY, Daniel W., Professor. International work in India, Philippines, Sudan, Dominican Republic, Haiti, Thailand. Major interests: Water resources; forestry and range management; economics of public decision making.

HARKIN, Duncan, Professor. International work in India, Philippines. Major interests: Natural resources and economic development; economics of forestry; mining and energy.

SEGERSON, Kathleen, Assistant Professor. Major interests: Natural resource economics; environmental quality.

SHAPIRO, Kenneth, Professor. International work in Tanzania, Burkina Faso, Mali. Major interests: Livestock and grazing; agroforestry.

Other faculty with whom students can work include:

<i>Professor</i>	<i>International Experience</i>
Buse, Rueben	Brazil, Peru
Campbell, Gerald	Peru
Carter, Michael	Peru, Dominican Republic
Chavas, Jean-Paul	Madagascar, Burkina Faso
Johnson, A. C.	Brazil, The Gambia, Swaziland
Kanel, Don	Chile, Mexico, Dominican Republic, Botswana
Pulver, Glen	Brazil, Indonesia
Saupe, William	Brazil, Portugal
Strasma, John	Chile, Dominican Republic, El Salvador
Thiesenhusen,	Chile, Colombia,

UNIVERSITY OF WISCONSIN - MADISON  
Madison, Wisconsin

I. CURRICULUM PROGRAM:

A. Bachelor of Science

agricultural business management	communication
agricultural economics	administration
agricultural education	dairy science
agricultural	food science
engineering	forest science
agricultural extension education	horticulture
agricultural	landscape architecture
journalism	plant pathology
agricultural mechanization and mgmt	poultry science
agronomy	rural sociology
bacteriology	soil science
biochemistry	wildlife ecology

B. Postgraduate

water resources mgmt (MS) thesis	forest biology
land resources (MS, PhD)	forest management
agronomy thesis (MS)	wood & fiber science
wildlife ecology	recreation area management
soil science	environmental interpretation

II. ACADEMIC CONCENTRATIONS: (NIA)

III. SUPPORTING RESEARCH AND EDUCATIONAL OPPORTUNITIES:

A. Co-op educational programs: (NIA)

B. Internships offered through private/public sector agencies: (NIA)

C. Land Tenure Center: Provides an academic focus to students who wish to pursue advanced study of development issues within an interdisciplinary framework: LTC administers the PhD in Development Studies program. Students from as many as twenty-two foreign countries and the US have enrolled. Several hundred students in other degree programs have been associated with LTC over the years.

D. Center for Biotic Systems: For the study of ecosystems and biological aspects of the environment. The center conducts research into the functioning of watersheds, ecology of lake ecosystems influenced by urban and rural landscapes, and crop yield modeling studies of the effects of (1) climate change and (2) soil erosion and the resulting loss of cropland.

E. Center for Climate Research: Aims at an understanding of the world pattern of climate; its causes, mechanisms, and evolution in time; and the impact of climate on ecosystems. Studies include the effects of climate change on food production, the dynamics of past climates, the cultural impacts of climatic changes, and the interaction between tropical and latitude circulation (utilizing data from satellites) and the dynamics of the seasonal cycle.

F. Environmental Remote Sensing Center: Directs its efforts at (1) developing methods of monitoring large areas of the environment quickly and accurately, and (2) interpreting, scoring, and delivering environmental data with maximum efficiency. Particular emphasis is placed on the use of remote sensing methods for data collection.

*Land Into Studies*  
G. Center for ~~Geographic Analysis~~: Concerned with geographic aspects of the man-environment system, especially land and water interactions. Projects include a study of the economic aspects of the US-Canadian efforts to improve Great Lakes water quality, nutrient enrichment, analysis of institutional economies, quantifying the role of climatic variation as a factor affecting the transportation and storage of sediments in watersheds between stream runoff and sediment yield, the study also aims to quantify the influence of watershed topography and geology on sediment delivery ration.

H. Marine Studies Center: Research is directed toward an understanding of ocean and Great

Lakes environments, the solution of marine resource problems, and the study of marine resource policy.

- I. An electrophoretic lab is available for genetics research, and an autoanalyzer system for automated measurement of nutrient content in plants, soils and water. Other analytical equipment is available in the Soils Department and at the State Health and Soils Testing Laboratories. Associated facilities on campus include the Biotron for controlled-environment research and the US Forest Products Laboratory (USDA Forest Service) which carries on much research on decomposition of wood and other forest residues.

IV. DOMESTIC AND OVERSEAS INVOLVEMENT IN NATURAL RESOURCE ENVIRONMENTAL ACTIVITIES OVER THE PAST FIVE YEARS: (NIA)

V. PROGRAM ASSOCIATIONS: (NIA)

VI. CONTACTS:

Dr. Steven Smith, Associate Dean and Director  
116 Agricultural Hall  
1450 Linden Drive  
University of Wisconsin-Madison  
Madison, WI 53706  
Telephone: (608) 262-3037

Contacts for international students:  
Anne Corry, Director  
Office for Foreign Students & Faculty  
University of Wisconsin-Madison  
Madison, WI 53706  
Telephone: (608) 262-2044

VII. ADDITIONAL INFORMATION:

A. Accreditation/Certification: Society of American Foresters (SAF)

B. Student body profile: Fall, 1983

1. Number of students enrolled

	US/Canada	Foreign
Undergraduates	28,470	726
Postgraduates	21,998	1,764
Total Campus	50,468	2,492

2. Number and geographical place of residence for foreign students:

265	Africa
1,272	Asia & Pacific
234	Middle East
316	Latin America
405	Developed Countries

3. Foreign postgraduate student specialization: (NIA)

C. Faculty profile: (NIA)

D. Future plans: (NIA)

E. School setting: The University is located in the city of Madison (pop. 169,614).

Climate: year-round mean temperature: 44 F (6.7 C)  
winter mean temperature: 35 F (1.74 C)  
summer mean temperature: 53 F (11.8 C)  
mean rainfall: 28 inches (72 cm.)  
relative humidity: 72%

Local Characteristics:

1. Land Use: urban area (surrounded by mostly cropland).
2. Vegetation/Forest Type: bluestem prairie (Andropogon-Stipa).

3. Land Surface Forms: irregular plains (100-300 feet; 50-70% of gentle slope is in lowland).

F. Facilities:

The University's collection totals over 3.3 million volumes, current newspapers and over 250 magazines. Students have access to computer facilities.

G. Special aid for foreign students: (NIA)



# Courses in Agriculture and Rural Development, 1988

Programs in the United States for Foreign Agriculturalists

*Courses Also Available Overseas*

Offered by the U.S. Department of Agriculture in cooperation with the U.S. Agency for International Development and U.S. Universities



120-1	Problems and Practices of Irrigation Systems	<i>Presents the agronomic and engineering aspects of onfarm water management and maintenance. Covers both new and rehabilitation of existing irrigation systems.</i>	8 weeks	June 13–Aug. 5
120-5	Soil Testing, Soil Classification, and, Fertility Management	<i>Principles of soil testing, analysis, classification, and soil fertility, and their application in soil management systems. Includes extensive laboratory and field work.</i>	8 weeks	June 13–Aug. 5
120-25	Water Management and Runoff Farming Methods for Small-Scale Agriculture	<i>Design, development, operation, and maintenance of water harvesting facilities. Focuses on increasing agricultural production in arid and semiarid areas. Considers hydrological, agronomic, and horticultural aspects of water harvesting.</i>	4 weeks	July 11–Aug. 5
130-3	Seed Improvement	<i>Techniques for producing superior seed and for handling seed to maintain quality. Includes extensive work in a seed-testing laboratory and visits to commercial seed companies.</i>	9 weeks	May 30–July 29
130-5	Plant Quarantine	<i>Operation of national plant import inspection and quarantine programs. Includes port inspection techniques, regulations, and treatment procedures.</i>	6 weeks	Aug. 15–Sept. 23
130-8	Integrated Pest Management	<i>Concepts and principles of integrated pest management using newly developed models; relationships between research and pest control tactics and strategies.</i>	6 weeks	June 6–July 15
130-11	Vegetable Crop Production and Marketing	<i>Production, harvesting, conditions affecting quality, product standards, grading and handling, storage, and shipping methods for different vegetable crops.</i>	8 weeks	June 27–Aug. 19
150-2	Grain Storage and Marketing	<i>Basic fundamentals of grain storage and marketing. Includes grain drying, storage, handling, transportation, and marketing from farm to final consumption.</i>	7 weeks	June 6–July 22
150-7	Post Harvest Loss Reduction of Perishable Crops	<i>Examines the causes and extent of postharvest food losses and determines where they occur in the marketing channels. Identifies appropriate techniques to reduce food losses and increase</i>	5 weeks	Aug. 22–Sept. 23

## COURSES FOR FOREIGN AGRICULTURALISTS

Course number	Course title	Course description	Duration	Dates
<b>ANIMAL SCIENCE AND NATURAL RESOURCES</b>				
120-8	Resource Development of Watershed Lands	<i>Management alternatives and strategies for effectively developing and using water resources to increase food and fiber production.</i>	6 weeks	June 6–July 15
120-10	Land Use Planning for Community Forestry and Natural Resource Development	<i>Reviews the principles, assumptions, and methods useful in setting objectives, analyzing data, and evaluating land use alternatives. Emphasis on analyzing the social and economic impact of the alternative land uses.</i>	6 weeks	June 13–July 22
130-4	Range Management and Forage Production	<i>Gives overview of rangeland development. Explains the roles of range inventories, range improvement techniques, grazing systems, and range management plans.</i>	9 weeks	May 30–July 29
130-9	Intensive Poultry Production Systems	<i>Principles of poultry nutrition, disease control, selection and breeding, and egg and meat production. Emphasizes use of poultry flocks to increase income and the level of protein in diets.</i>	7 weeks	May 16–July 1
130-10	Small Ruminant Production Techniques	<i>Management of sheep and goat herds for meat, milk, and wool production. Covers both confinement and grazing systems, animal land ratios, breeding, feeding, nutrition, health, and marketing</i>	6 weeks	June 13–July 22
170-8	Tree Establishment in Arid Areas for Fuelwood and Conservation	<i>Project development and forestry practices for afforestation and reforestation. Focuses on planning, designing and management of tree plantations for fuelwood production and conservation/erosion control. Considers plant species adaptable to specific uses and seeding and planting techniques, including nursery operations.</i>	4 weeks	July 18–Aug. 12

# NOVA

December 1, 1987

Produced for PBS by  
WGBH  
125 Western Avenue  
Boston  
Massachusetts  
02134  
617.492.2777

Peter Freeman  
619 Upland Place  
Alexandria, Virginia 22301

Made possible by  
grants from  
Public Television Stations,  
Allied Corporation  
and the  
Johnson & Johnson  
Family of Companies.

Dear Mr. Freeman:

Enclosed are WGBH's transcript catalog and the Television Trust for the Environment's catalog of which we spoke on the telephone today.

NOVA programs produced before 1985 can be rented from:

Ambrose Video  
Suite 1601  
381 Park Avenue South  
New York, New York 10016  
212-696-4545

NOVAs produced from 1985 to the present can be rented or purchased from:

Coronet Films & Video  
108 Wilmot Road  
Deerfield, Illinois 60015  
1-800-621-2131

Standard rental is \$125; purchase is \$250.

I have asked Sandra Forman, our director of distribution to call you regarding your question about duplication.

Thank you for your interest in our programs. If you need transcripts, which can be purchased for \$4/copy, write to the following address:

NOVA  
(specify name and number of program from catalog)  
Box 322  
Boston, MA. 02134

Don't hesitate to call if you have any further questions.

Best wishes,

*Linda Harrar*

Linda Harrar  
Producer, NOVA

# SWITCHING ENVIRONMENT



International  
**TELEVISION TRUST**  
FOR THE ENVIRONMENT

# ORDERING FILMS

The main distributor only is listed. However, most films have secondary distributors for different geographical areas and markets. For example, large organisations such as the BBC have sales offices worldwide. Many distributors employ agents in other continents. The contact person mentioned for most distributors in the index will redirect your requests — when appropriate — to an agent or company in charge of distribution in your area.

## ***RENTING***

Except for films provided by embassies or international organisations, the renting of programmes is usually possible only within each country. However, some distributors do provide a rental service for foreign productions in their area.

## ***PURCHASING***

Prices will vary according to the use intended. NON-THEATRIC USE implies that the film is shown to non-paying audiences, i.e. working groups, conferences, workshops. THEATRIC USE involves all cases where there is a charge for admission. When ordering, always state the intended use. You will be billed accordingly.

Prices will also vary depending on the format (film or video), type of production, the distributor and the buyer's status. When budgeting for a purchase, don't forget to include the currency exchange charge required for the bank transfer. Also include insurance and shipping costs (unless the distributor automatically includes these in the price). If you represent a non-profit organisation, the distributor may offer a discount and may not charge you for shipping costs, especially if the film is sent by mail.

Most distributors require payment in advance. Allow for an average six weeks lapse between your initial approach and the delivery. This time scale will be reduced if the distributor is based in your country.

Before placing an order, always check on customs clearance conditions and procedures in your country.

There is no standard international coding system for video formats. North America and a majority of South American

countries use NTSC. Most African, Asian and European countries use the PAL system. Fewer countries — France is one — use the SECAM system. Before ordering a video cassette, make sure that the coding system offered is compatible with that used in your own country.

PLEASE MENTION THIS GUIDE WHEN ORDERING.

# INDEX OF DISTRIBUTORS

## ACCESS ALBERTA

16930 114th Avenue, Edmonton, Alberta, Canada

Tel: 403-256 11 00

Contact: Pamela Shanks

## AML INTERNATIONAL

6 Goodwin's Court, St Martin's Lane, London WC2N 4LL, UK

Tel: 1-836 0576

Telex: 267664. Cables: AMATEL

Contact: Chris Wilson

## JANE BALFOUR FILMS LTD

163 Gloucester Avenue, London NW1, UK

Tel: 1-586 3443 and 1-722 5050

Telex: 24224

Ref: 2544

Contact: Jane Balfour

## BARFUSS FILMS

Schiller Strasse 52, 78 Freiburg, Federal Republic of Germany

Tel: 761-75 776

Contact: Peter Krieg

## BBC ENTERPRISES

Education and Training Sales Dept, Woodlands, Wood Lane,  
London W12 OTT, UK

Tel: 1-743 5588 and 1-576 0202

Telex: 9346781

Contact: Marion Cameron

Contact for television sales: Roy Gibbs

## BELBO FILMS

Burg van Hellenberg, Hubarláan 8, 1217 Hilversum, The  
Netherlands

Tel: 35-163 58 or 125 23 or 188 78

Telex: 73242 belfi

Contact: Ben Alkerbout

## BERNARD LANG FILMS

Kirchgasse 26, 8001 Zurich, Switzerland

Tel: 1-252 64 44

Contact: Bernard Lang

**BILLY BUDD FILMS**

235 East 57th Street, New York, NY 10022, USA

Tel: 212-755-3968

Contact: Anne Moynihan

**BULLFROG FILMS**

Oley, PA 19547, USA

Tel: 215-779 82 26

Contact: John Adrahall

**CANADIAN INTERNATIONAL DEVELOPMENT AGENCY**

200 Promenade du Portage, Hull, Quebec, Canada K1A 0A4

Tel: 819-994 37 88

Contact: André Champagne

**CENTRAL INDEPENDENT TELEVISION INTERNATIONAL**

35-38 Portman Square, London W1A 2HZ, UK

Tel: 1-486 6688

Telex: 24337

Contact: Evi Nicopoulos

**CHANNEL 4 TELEVISION**

60 Charlotte Street, London W1P 2AX, UK

Tel: 1-631 4444

Telex: 892355

Contact: Bill Stevens

**CHURCHILL FILMS**

662 N Robertson Boulevard, Los Angeles, CA 90069-9990, USA

Tel: 213-854 222

Contact: Mike Mcrann

**CINEMA DISTRIBUIÇÃO INDEPENDENTE**

Rua Treze de Maio 489, 01327 Sao Paulo SP, Brazil

Tel: 11-288 46 94

Contact: Isa Castro

**CINEMA GUILD**

1697 Broadway, New York, NY 10019, USA

Tel: 212-246 5522

Telex: 238790 NYK

Contact: Laura Freidman

**CON-FILM VERLEIH**

Westerdeich 38, 2800 Bremen, Federal Republic of Germany

Tel: 421-54 00 12

Telex: 246971 con d

Contact: Detlef Ziegert

**THE COUSTEAU SOCIETY**

777 Third Avenue, New York, NY 10017, USA

Tel: 212-826 29 40

Telex: 149514 cousteau nyk

Contact: Susan Richards

**C.S. ASSOCIATES**

27 Booth Hill Road, Scituate, Massachusetts, USA

Tel: 617-545 93 54 Telex: 95 wo6 weon

Contact: Charles Schuerhoff

**DANMARKS RADIO**

Sales Section, TV Centre, 2860 DK-Soborg, Denmark

Tel: 1-67 12 33 Ext. 4076

Telex: 27386 drint dk

Contact: Erik Christensen

**DAVVI MEDIA**

Fanasgieddi, N-9845 Tana, Norway

Tel: 85-28833 and 28806

Contact: John T. Solbakk

**DIRECT CINEMA**

P.O. Box 69589, Los Angeles, CA 90069, USA

Tel: 213-656 4700

Contact: Mitchell Block

**ECO COMMUNICATIONS**

16 Stanley Gardens, London W11 2NE, UK

Tel: 1-221 2153

Contact: Thomas Schultze Westrum

**THE EDUCATION DEVELOPMENT CENTER**

39 Chapel Street, Newton, MA 02160, USA

Tel: 617-969 7100

Contact: Millie le Blanc

**FILM CENTRUM**

P.O. Box 2068, 10312 Stockholm, Sweden

Tel: 8-23 27 50

Contact: Helen Aastrup

**FILMFILM**

Angsvaktartorp, S-75590 Uppsala, Sweden

Tel: 18-32 62 53

Contact: Peter Östlund

**GRANADA TELEVISION INTERNATIONAL**

36 Golden Square, London W1R 4AH, UK

Tel: 1-734 80 80

Telex: 27937. Cables: GRANADA London

Non-theatric sales contact: Greg Moxon

Television sales contact: Vivien Wallace

**GREEN MOUNTAIN POST FILMS**

P.O. Box 229, Turner's Falls, Massachusetts 01376, USA  
 Tel: 413-863 47 54  
 Contact: Charles Light

**GREENPEACE FILMS LTD**

Unit 124, Cannon Drive, Cannon Workshop, West India Docks,  
 London E14 9SA, UK  
 Tel: 1-515 0275  
 Telex: 8953660 gp rwh  
 Contact: Tony Marriner

**MARIAMA HIMA**

148 rue du Faubourg Saint Denis, 75010 Paris, France  
 Tel: 1-239 28 02  
 Contact: Mariama Hima

**HOLMES ASSOCIATES**

10-16 Rathbone Street, London W1P 1AH, UK  
 Tel: 1-637 8251

**HUNGAROFILM**

Budapest 5, Bathori U. 10, Hungary  
 Tel: 1-312 777  
 Telex: 225768  
 Contact: Eva Vézer

**ICARUS FILM DISTRIBUTION**

200 Park Avenue South, New York, NY 0003, USA  
 Tel: 212-674 33 75  
 Contact: John Miller

**INTERNATIONAL FILM EXCHANGE**

201 West 52nd Street, New York, NY 10019, USA  
 Tel: 212-582 43 18  
 Contact: Joy Pereths

**INTERNATIONAL TELEVISION ENTERPRISES**

27 Upper Brook street, London W1, UK  
 Tel: 1-491 1441  
 Telex: 25353 anglia  
 Contact: Ms Trix van Heystee

**JUGOSLAVIJA FILMS**

11000 Beograd, Knez Mihailova 19, Yugoslavia  
 Tel: 11-624 842  
 Telex: 11704 yufilm

**JENI KENDELL**

RMB 116 Blue Knob Road, Nimbin 2480, Australia  
 Tel: 66-89 72 36  
 Contact: Jeni Kendell

**LEON NARBEBY FILM PRODUCTIONS**

P.O. Box 67045, Mount Eden, Auckland, New Zealand  
 Tel: 649-605 316  
 Contact: Leon Narbey

**MICHIGAN MEDIA FILM**

The University of Michigan, 400 Fourth Street, Ann Arbor, MI  
 48103-4816, USA  
 Tel: 313-764 5360

**NATIONAL FILM BOARD OF CANADA**

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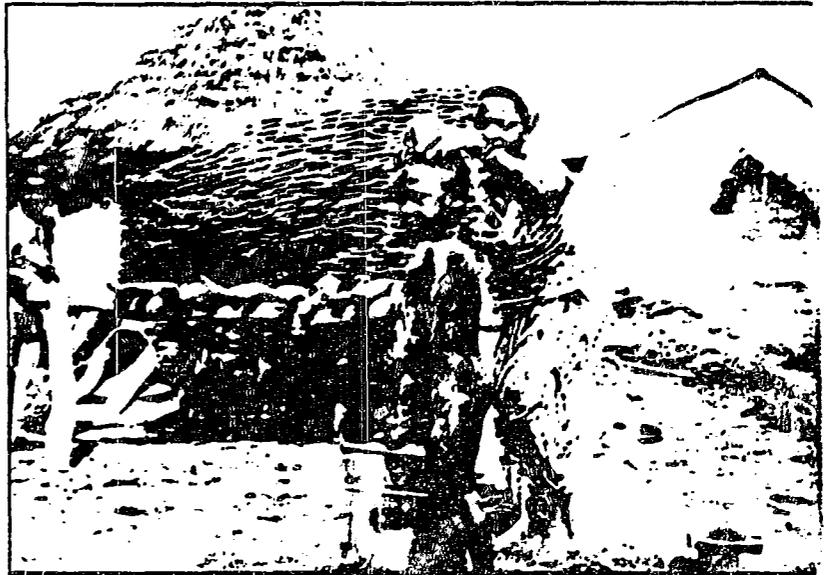
**Telex: 557232. Cables: YORKSTEL Leeds**

**Contact: Geoff Foster**

# AHMED, THE WELL-DIGGER FROM MALI

Switzerland. 1981. 23. min.

Production company : *Bernard Lang Films*  
 Producer/Director : *Bernard Lang*



Survival in Africa's semi-arid regions depends on finding water. Anyone who can do this is afforded a special place in society. One such person is Ahmed, a trained well-digger in Mali, West Africa. The film follows Ahmed on his search for life-giving water, recording his reflections as he does so: If only he had more equipment; if only the people could be taught the basics of hygiene — how much suffering could be avoided.

## R E M A R K S

AHMED, THE WELL-DIGGER FROM MALI is a rare find. The voice is that of the well-digger himself. Its value to an audience outside Africa is twofold: it illustrates how precious water is, and the handicap of working in a country with a near total absence of any infrastructure.

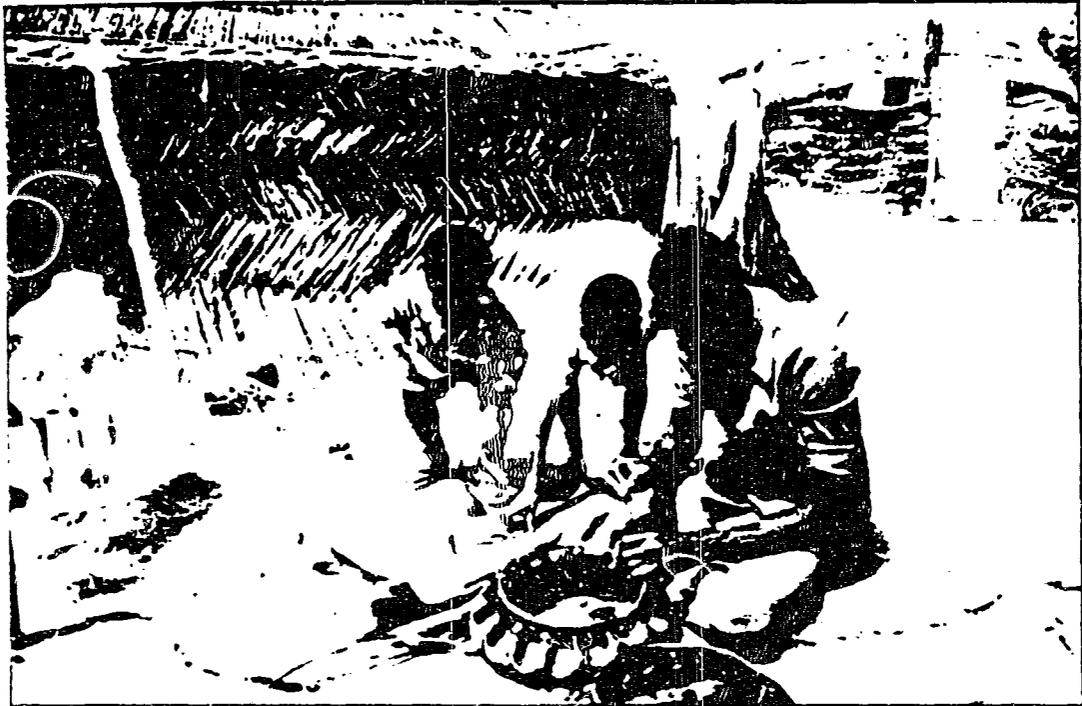
Available on 13 mm and all video formats. French and German.  
 Available at: *Bernard Lang Films, Zurich.*  
 Television sales: *As above.*

# BAABU BANZA

Niger. 1984. 20 min.

Production company : *Mariama Hima and Office de Radio et  
Television du Niger*

Producer/Director : *Mariama Hima*



What can be done with an old tyre? In Niamey, capital of Niger, two resourceful craftsmen, Illo and Razak, have found the answer: every tyre they lay their hands on is turned into a myriad of useful objects to be sold on the local market. Some parts are sold to farmers to be burnt to keep insects away from the crops. Razak turns the remainder into shoes of all shapes and sizes, while Illo concentrates on the inner tube. In an amazing display of skill, gourds for cattle herders, buckets for the village wells, girdles and belts take shape.

## R E M A R K S

BAABU BANZA is a remarkable first film by Mariama Hima. The Niger film-maker knows how to approach her own people with just the right blend of humour and tenderness.

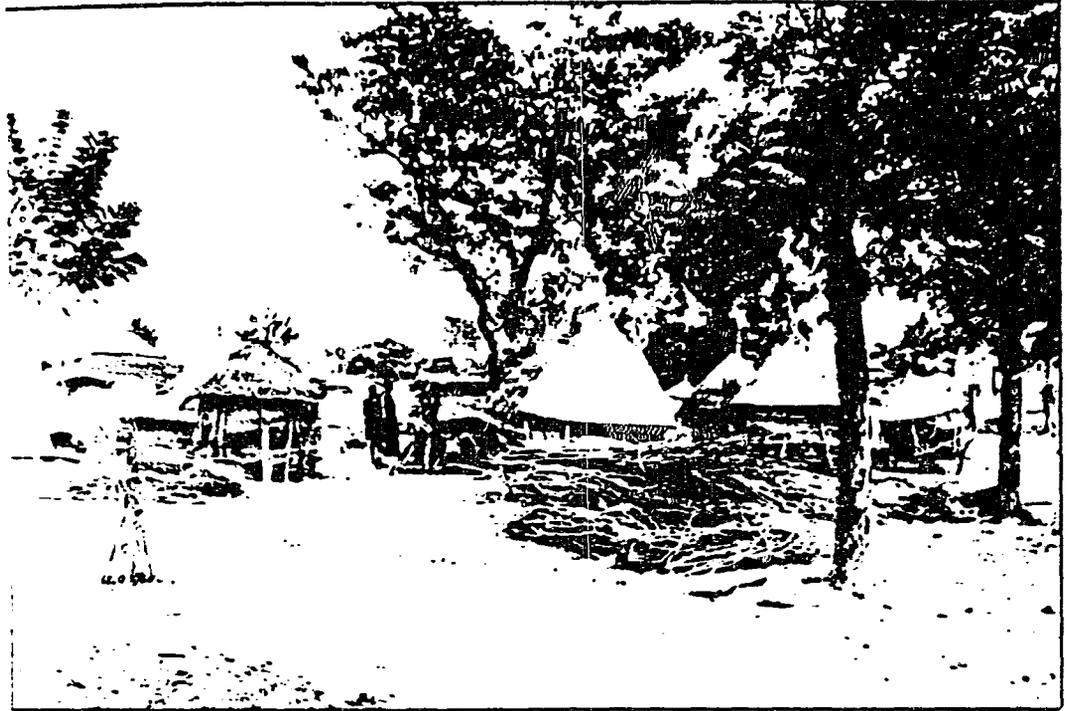
Available on 16 mm, VHS and U-matic. French only.  
Available at: *Mariama Hima, Paris.*  
Television sales: *As above.*

# THE BOWLS

Burkina Faso. 1985. 10 min.

Production company : *Centre National de la Cinematographie du  
Burkina Fasso*

Producer/Director : *Idrissa Ouadraougo*



In a small village in Burkina Faso, two elderly craftsmen go about their daily work. They start the morning by felling a tree, one of the few left in the area. The trunk will give them enough wood to produce four bowls — the rest will serve as firewood. Later in the day, when the old men have finished their craftwork, a younger man takes the bowls to town to sell them at the market. Life goes on, apparently undisturbed. But the village has lost one more tree...

## R E M A R K S

In 10 minutes THE BOWLS encapsulates a vital environmental problem. Trees are the craftsmens' livelihood, but what will they do when the last tree has been felled?

Available on 16 mm, VHS and U-matic. No commentary.

Available at: *Plein Champ, Paris.*

Television sales: *As above.*

# ***A BURNING ISSUE***

UK. 1983. 25 min.

Production company : *International Broadcasting Trust for Channel  
4 Television*

Producer/Director : *Richard Keefe*



Thirty years ago, natural forests covered most of Sri Lanka. Today, three-quarters have been felled for firewood and agriculture. When this film was made, a further fifth was being cleared to make way for a giant hydroelectric project which will be of little benefit to the rural poor. If no action is taken, there will be virtually no forest remaining by the end of the 1990s. *A BURNING ISSUE* documents the crisis facing Sri Lanka where over half the energy used is in the form of firewood. In common with many less developed nations, Sri Lanka lacks the financial capability to mount large-scale reforestation and fuel substitution programmes and alternative energy schemes are making little progress.

## ***R E M A R K S***

*A BURNING ISSUE* documents well the hardships caused by the firewood crisis.

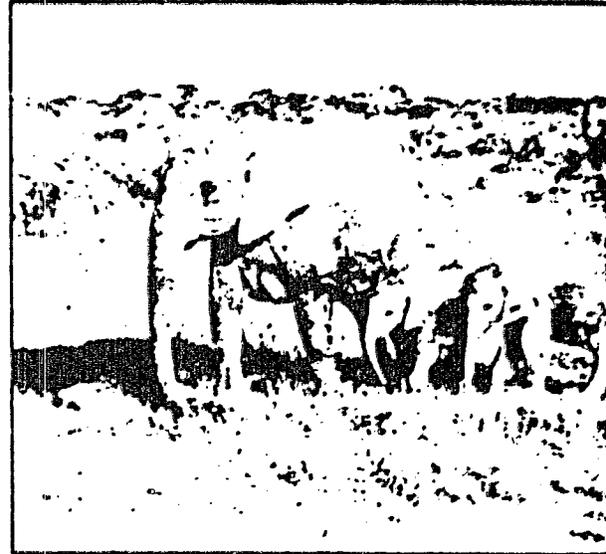
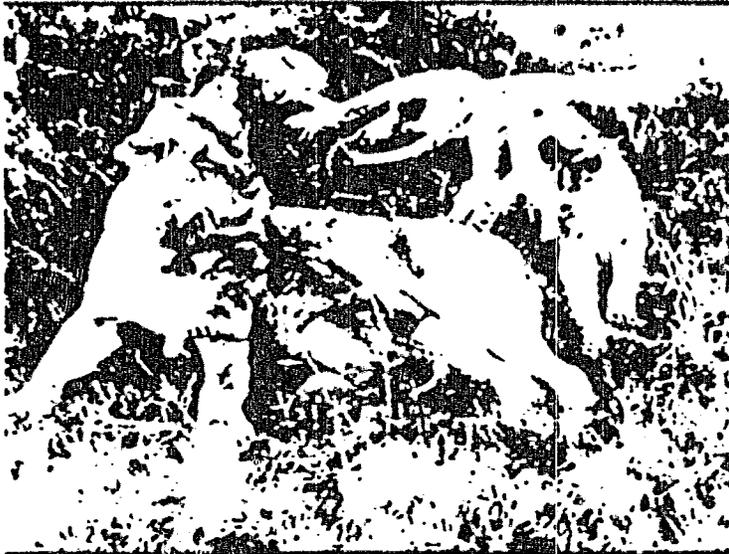
Available on 16 mm and all video formats. English only.  
Available at: *North-South Productions, London.*  
Television sales: *Channel 4 Television, London.*

# THE CAREFUL PREDATOR

UK. 1984. 50 min.

Production company : *BBC*

Producer/Director : *Steven Rose*



In recent years, a radically new approach to conservation in Africa has emerged. Until now, the conventional wisdom has been that the wildlife of Africa is doomed — there are too many people, and people and animals don't go together. That argument is being turned on its head by experiments going on in various parts of Zimbabwe. Villagers are encouraging elephant, lion and leopard back and even allowing eland and impala onto their grazing land — alongside their cattle. In exchange, they are getting food and income from a carefully controlled hunting industry.

## R E M A R K S

THE CAREFUL PREDATOR is a hopeful story, pointing the way to a change in the approach to conservation. Other nations could take a lead from Zimbabwe's example.

Available on 16 mm, VHS and U-matic. English only.

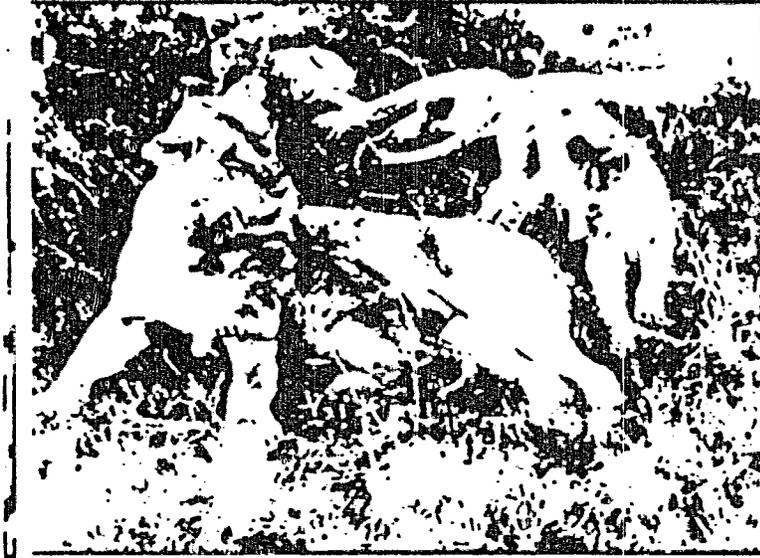
Available at: *BBC Enterprises, Education and Training Sales Dept, London.*

Television sales: *BBC Enterprises, London.*

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Available on 16 mm, VHS and U-matic. English only.  
 Available at: *BBC Enterprises, Education and Training Sales Dept,  
 London.*  
 Television sales: *BBC Enterprises, London.*

# **CHINA: A LAND TRANSFORMED**

Canada. 1983. 28 min.

Production company : *National Film Board of Canada*  
 Producer : *Tom Daly, Arthur Hammond and Barrie Howells*  
 Director : *Tony Janzelo and Boyce Richardson*

In northern China, barren landscapes are being transformed into productive farmland through a revival of ancient water channelling techniques. This film shows how flooding and massive erosion have depleted the soil in the past and describes the steps China is taking to end destructive land use practices.

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## **R E M A R K S**

Well made and low key, CHINA: A LAND TRANSFORMED effectively lets the Chinese peoples' activities speak for themselves. Particularly valuable for the way it shows that in the long run traditional, labour-intensive land management methods can be the best option.

**Available on 16 mm and U-matic. English only.**

**Available at: *The Education Development Center, Massachusetts and the National Film Board of Canada, Montreal.***

**Television sales: *As above.***

# ***THE COST OF COTTON***

USA. 1979. 30 min.

Producer : *David Temple and Luis Argueta*  
Director : *Luis Argueta*

In the fields of Guatemala in Central America, multinational corporations spray poisonous pesticides haphazardly and excessively. US corporations use Guatemala as a dumping ground for goods restricted in the USA. This film shows the consequences: poisoned workers, contaminated crops and water supplies and pesticide-resistant insects. Here, even DDT (now prohibited in many countries) is still widely used.

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## ***R E M A R K S***

THE COST OF COTTON is a shocking film for the way it documents the hazards of chemical contamination. As the film's narration reminds us, "there is more to the cost of cotton than a pair of jeans".

Available on 16 mm and all video formats. English and Spanish.  
Available at: *Cinema Guild, New York.*  
Television sales: *As above.*

# ***THE CROWDED DESERT***

UK and India. 1985. 30 min.

Production company : *Television Trust for the Environment with assistance from the United Nations Environment Programme and the World Wildlife Fund*

Producer : *Robert Lamb*

Director : *Ishwar Pandey*



Three-quarters of the grazing and farm land in the state of Rajasthan in northwest India are in danger of becoming desert. This century, the desert in Rajasthan has expanded by over 9,000 square kilometres, making it one of the world's most densely-populated semi-arid regions. As pressures on the land increase, there are fears that a long dry spell could end in famine. The film highlights one group who might have the answer to the problem — the extraordinary 500 year old Bishnoi Hindu sect. They retain a traditional respect for wildlife and never cut a green tree. The Bishnois are prospering — evidence that conservation is an essential part of economic development.

## ***R E M A R K S***

THE CROWDED DESERT was researched and filmed by an Indian crew. The message is clear — traditional systems of land management have a great deal to offer.

Available on 16 mm, VHS and U-matic. English only.

Available at: *Television Trust for the Environment, London.*

Television sales: *Central Independent Television International, London.*

# THE FRAGILE MOUNTAIN

USA. 1982. 55 min.

Production company : *Sandra Nichols Film Productions*  
 Producer/Director : *Sandra Nichols*



As more and more trees are felled from the Himalayan mountain sides, there is nothing to stop the fertile topsoil from being washed away by heavy rains, making crop growing impossible. Landslides are common and in the North Indian plains, disastrous flooding occurs. In *THE FRAGILE MOUNTAIN*, villagers tell of their growing hardships and express their concern for the future.

## R E M A R K S

*THE FRAGILE MOUNTAIN* shows how population increase and underdevelopment can disrupt the balance between farmers and the land. Beautifully photographed and well paced. The film ends on a note of optimism which, given the scale of the problem shown, has a false ring to it.

Available in 16 mm, VHS and U-matic. English and Nepalese.  
 Available at: *Sandra Nichols Film Productions, Maryland.*  
 Television sales: *CS Associates, Massachusetts*

# A GROWING PROBLEM

UK. 1983. 45 min.

Production company : *Scope Films for Channel 4 Television*  
 Director : *Karin Majid*  
 Producer : *Toni Strassburg*



Kenya relies on cash crops — mainly tea and coffee — for export revenue. But to maintain yields, Kenya has to import pesticides, some of which are banned for use in the exporting countries. Now some insects are developing resistance while dangerous residues from the pesticides have been found in the blood of Kenyan farmers.

## R E M A R K S

A GROWING PROBLEM raises some vital issues surrounding the cultivation of cash crops in the Third World. But without tea and coffee to export, how is a resource-poor country like Kenya to pay for its imports? The need is to create a balance between cash crops and domestic food production, and develop integrated pest control.

Available on 16 mm and all video formats. English only.

Available at: *Channel 4 Television, London.*

Television sales: *As above.*

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Available on 16 mm and all video formats. English only.  
 Available at: *Channel 4 Television, London.*  
 Television sales: *As above.*

# ***HARVEST UNDER TREES***

**FRG. 1981. 41 min.**

**Production company** : *Terra Media*

**Producer/Director** : *Rudiger Lorenz, Hennes Gulde and Stefanie Landgraf*

The tiny Central African state of Rwanda, with close to five million inhabitants, is one of the continent's most densely populated countries. Fertile land is scarce and virtually all the forest has been cleared for agriculture. Stripped of the tree cover, farmland is vulnerable to erosion. Since 1977, a West German aid project has been helping a remote farming community in Rwanda with a programme aimed at boosting yields through a mix of traditional and new methods. HARVEST UNDER TREES shows how a farmer called Kamao has benefited. He is now able to produce a small surplus for sale on the local market.

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***R E M A R K S***

HARVEST UNDER TREES shows how soil conservation and tree planting can be built into an aid project. Yields can be sustained and increased without resort to modern farming machinery and chemical fertilisers. A useful educational film. A follow-up film, POOR SOIL AND RICH HARVEST, assesses the long-term results of the scheme documented in HARVEST UNDER TREES (1986, 30 min.).

Available on 16 mm, VHS and U-matic. German, English, French and Ki-Sahawell.

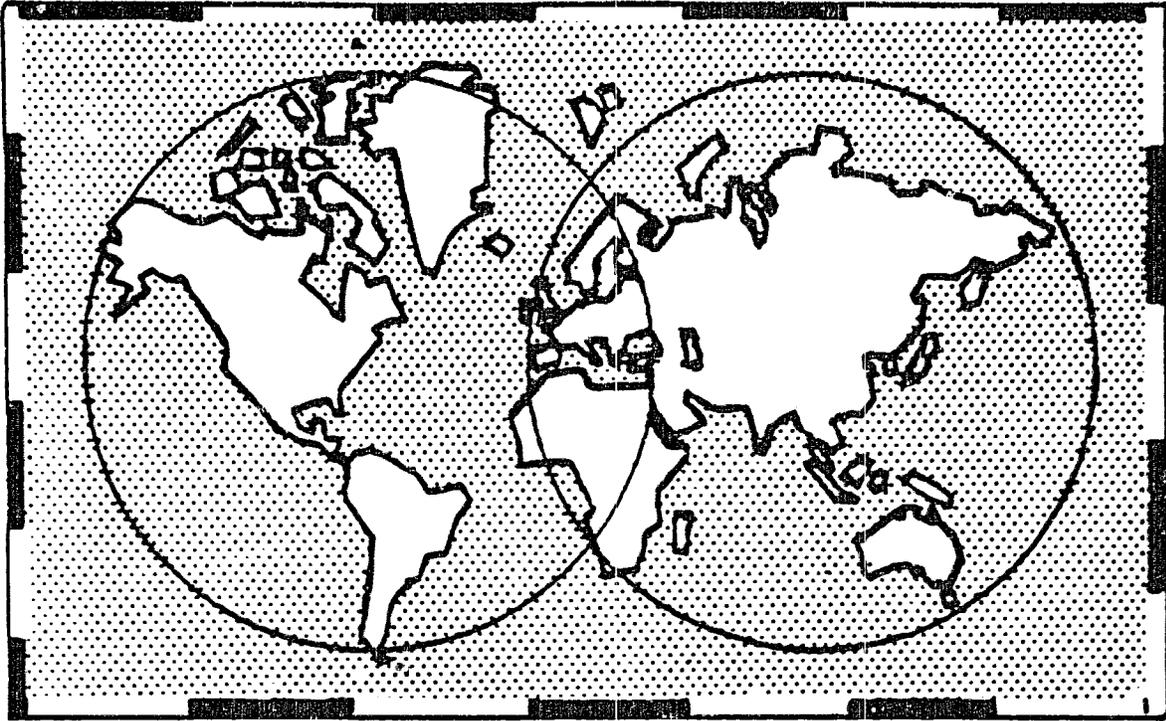
Available at: *Terra Media, Munich.*

Television sales: *As above.*

# ***THE LIVING PLANET***

UK. 1984. 55 min. × 12

Production company : *BBC in association with Time Life Video*  
 Producer : *Andrew Neal*



In **THE LIVING PLANET**, a series of 12 programmes, Sir David Attenborough examines the workings of the earth's ecosystems one by one. In the final instalment, *New Worlds*, Attenborough considers the way mankind is fast changing the face of the earth. In some areas, the remarkable resilience of nature is being tested to the limit with many species and habitats under mounting threat.

## **R E M A R K S**

A sequel to **LIFE ON EARTH**, which detailed the evolutionary history of the planet, **THE LIVING PLANET** creates an invaluable understanding of our environment. Together, the two series create a context for a greater awareness of the threats to our natural inheritance.

Available on 16 mm, VHS and U-matic. English only.  
 Available at: *BBC Enterprises, Education and Training Sales Dept, London.*  
 Television sales: *BBC Enterprises, London.*

# **A NEW GREEN REVOLUTION**

UK. 1984. 50 min.

Production company : *BBC*  
 Producer : *Martin Freeth*

Based on new high-yielding rice and wheat seeds, the Green Revolution has been one of the great success stories of this century... or so we thought. It helped the developing nations of Asia and South America to increase food production faster than the growing population, but in the process rich farmers got richer and the poor poorer. While yields increased dramatically, inequality, hunger and poverty have also increased. An expert argues that it is not the fault of the scientists who engineered the revolution; it is the fault of the politicians who have failed to reform social structures. Scientists in Mexico, Bangladesh and the Philippines are taking matters into their own hands — they have forsaken the laboratories to help develop cropping systems to benefit the poor farmers excluded from the first Green Revolution.

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## **R E M A R K S**

The message of A NEW GREEN REVOLUTION is that to be socially just, new technology must be accompanied by social, economic and political change. Scientists and politicians have a duty to ensure that new developments in the scientific field are used responsibly.

Available on 16 mm, VHS and U-matic. English only.

Available at: *BBC Enterprises, Education and Training Sales Dept, London.*

Television sales: *BBC Enterprises, London.*

# ON THE EDGE OF PARADISE

UK. 1981. 50 min.

Production company : *BBC in association with WNET New York*  
 Producer : *Tony Edwards*



This film looks behind the tourist brochure image of the Caribbean. A rapidly increasing population and a dependence on export monocultures are forcing farmers onto land unsuitable for cultivation. The forest is being decimated and water courses destroyed, leading to flooding, erosion and water shortages. On the coast, mangrove swamps and coral reefs, vital for the local fishing industry, are being destroyed. But under the auspices of the United Nations Environment Programme, the Caribbean nations have agreed a regional programme for balanced development.

## R E M A R K S

ON THE EDGE OF PARADISE shows the special vulnerability of island ecosystems. The message is clear — there can be no lasting economic progress unless natural resources are conserved.

Available on 16 mm, VHS and U-matic. English only.

Available at: *BBC Enterprises, Education and Training Sales Dept, London.*

Television sales: *BBC Enterprises, London.*

# **PATHS OF DEVELOPMENT**

Canada. 1985. 30 min. x 6

Production company : *Ironstar Communications for TV Ontario.*

Producer/Director : *Barbara Barde*



A series of six programmes which examine the development options facing developing countries. Three countries — Peru, Malaysia and Niger — are used as case studies. The series focuses on these countries' attempts to shake off their colonial inheritance and develop alternative patterns of economic growth. The films highlight the difficult choices facing each country as it comes to terms with the costs, benefits and trade-offs that must be considered.

## **R E M A R K S**

PATHS OF DEVELOPMENT is invaluable for the way it takes us behind the labels "Third World", "South" and "Least Developed". Political independence will have no meaning until these countries achieve a true measure of economic independence.

Available on VHS and U-matic. English only.  
Available at: *Access Alberta, Edmonton.*  
Television sales: *As above.*

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Available on VHS and U-matic. English only.  
Available at: *Access Alberta, Edmonton.*  
Television sales: *As above.*

# **RECLAIMING THE EARTH**

UK. 1984. 60 min.

Production company : *International Broadcasting Trust and Richard Keefe Productions — for Channel 4 Television, London*

Producer/Director : *Richard Keefe*



Abandoned machinery and dried-up water channels are all that remain of a now derelict irrigation scheme in Northern Kenya. The tribesmen are perplexed — foreign experts came in and told them the project would transform their lives. Now the money and the experts are gone. Africa has been the graveyard of many such well-intentioned aid projects. The irrigation scheme failed because it was alien both to the people and to the environment. RECLAIMING THE EARTH features other examples of poorly planned development. But it also looks at promising alternative approaches. The film raises questions of significance to the whole continent, and points to the need for a change in development to suit the requirements of the people and their environment.

## **R E M A R K S**

RECLAIMING THE EARTH succeeds in showing why environment is a crucial factor in economic and social development. The only "experts" are Africans who are given a rare platform to give their views on the type of "aid" Africa needs.

Available on 16 mm, VHS and U-matic. English only.  
Available at: *Jane Balfour Films, London.*  
Television sales: *As above.*

# **SAVE THE WETLANDS**

UK. 1985. 27 min.

Production company : *Worldwide Television News in association with  
the World Wildlife Fund*

Producer : *Tony Hull*

High on the list of endangered ecosystems are the world's wetlands, areas like marshes, estuaries, swamps and mangroves. The importance of wetlands in protecting coastlines, conserving drainage systems and as fish breeding grounds is little realised. Malaysia's mangrove swamps are vital breeding and nursery grounds for her prawn fisheries. The Netherlands' Wadden Sea is a spawning location for herring. SAVE THE WETLANDS, with sequences from Brazil, Malaysia, Austria, The Netherlands, Kenya and Botswana marked the launch of the World Wildlife Fund's wetlands campaign.

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## **R E M A R K S**

SAVE THE WETLANDS is an excellent introduction to a vital conservation issue. Film footage from many locations is skilfully woven into a coherent and readily comprehensible programme.

**Available on all video formats, broadcast material included. English only.**

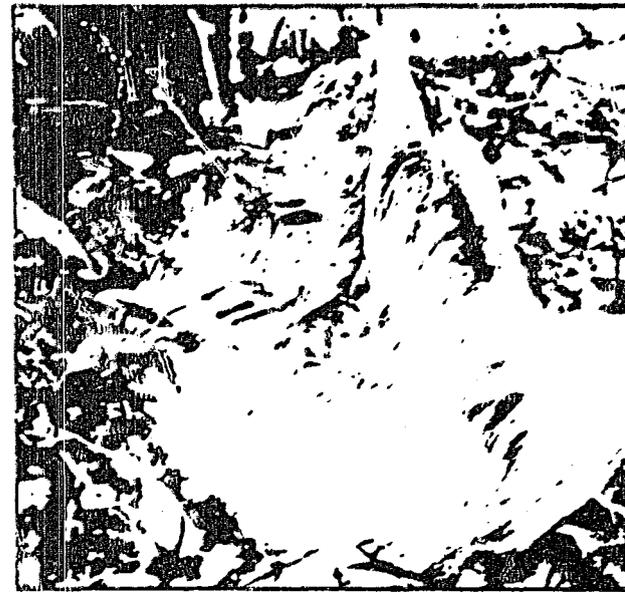
**Available at: *The World Wildlife Fund International, Switzerland and Worldwide Television News (WTN), London.***

**Television sales: *Worldwide Television News, London.***

# **SELVA VERDE**

UK. 1984. 54 min.

Production company : *Partridge Films*  
 Producer : *Michael Rosenberg and Phil Agland*  
 Director : *Phil Agland*



Filmed in the jungles of Central America, SELVA VERDE guides the viewer through the intricate mechanism of the rainforest, dismantling it species by species. It explores the links that tie predators and their prey to the habitat. The need to eat, to avoid being eaten and to reproduce give the forest its life force. The fragility of the rainforest is seen at the end of the film when the trees are consumed by fire.

## **R E M A R K S**

Partridge Films is gaining a reputation as one of the industry's leading natural history film companies. As with all their productions, SELVA VERDE carries a strong conservation message.

Available on 16 mm, VHS and U-matic. English only.  
 Available at: *AML International, London.*  
 Television sales: *As above.*

# VANISHING EARTH

UK. 1986. 55 min.

Production company : *BBC in cooperation with WGBH Boston and the  
Television Trust for the Environment*

Producer/Director : *Michael Andrews*



Filmed in the spectacular and remote interiors of Nepal, Ethiopia, China, West Africa and the Western USA, **VANISHING EARTH** examines the four faces of environmental degradation: deforestation, soil erosion, desertification and salinisation. They show that the key to proper land use lies with the economics down on the farm. The peasant farmer has to respond to world market prices in just the same way as the huge agribusiness in California. Neglect of the peasant farmer has caused catastrophic environmental degradation and even revolution. In the meantime, the developed countries make matters worse by ill-judged subsidies and the dumping of excess food.

## R E M A R K S

In **VANISHING EARTH** the viewer is given an insight into the slow and undramatic causes of famine. Yet this is not a hopeless story — villages, charities, aid agencies and governments are beginning to respond to the global problem of soil erosion.

Available on 16 mm, VHS and U-matic. English only.

Available at: *BBC Enterprises, Education and Training Sales Dept,  
London.*

Television sales: *BBC Enterprises, London.*

# A WEEK OF SWEET WATER

UK. 1983. 37 min.

Production company : *BBC in co-production with UNICEF*

Producer : *Peter Armstrong*

Director : *David Wallace*



In *A WEEK OF SWEET WATER*, the viewer experiences something of what it is like to live with drought. Filmed in West Africa's Sahel region, where millions are struggling to survive from one harvest to the next, this is the story of Minata and her husband Boureima, who live in a small village in Burkina Faso. The film opens in the period between harvests; the granaries are running low and Boureima tells of the humiliation of having to buy grain. The villagers are building a dam to conserve the scanty rainfall, knowing that without it they may perish. Minata must prepare her 10-year-old daughter for circumcision. Although she disapproves of the ritual, she fears the consequences of defying the village elders.

## R E M A R K S

*A WEEK OF SWEET WATER* is a moving film which captures the spirit of a people living in the shadow of destitution. Filmed interviews with Minata and Boureima, sub-titled from the original language, tell most of the story. Elsewhere, West African actors do a voice-over script.

Available on VHS and U-matic. English only.

Available at: *BBC Enterprises, Education and Training Sales Dept, London.*

Television sales: *BBC Enterprises, London.*

TO: AID Staff Concerned with Forestry and Related Matters  
FROM: AID/USDA Forestry Support Program (FSP)  
SUBJECT: Information Exchange

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provide propagation and breeding materials for species that are otherwise threatened with extinction.

A Future for Rattan

Mark Timm reports in the October 1987 issue of "The IDRC Reports" that rattan, a climbing cane plant, popular for the manufacture of furniture, may be threatened with extinction. A member of the palm family, there are 14 genera and 600 species growing throughout tropical Asia and West Africa.

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NOTEWORTHY  
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Rattan Gene Bank

The progress achieved during three years of effort in developing a gene bank for Philippine rattans in the genera Calamus, Daemonorops, and Elettocomia is described in the September 1986 Rattan Information Center Bulletin, Rattan Information Center, Forest Research Institute, Kepong, Selangor, Malaysia. A total of 444 plants representing 30 taxa from 24 provenances, were propagated and planted in 1984 and 1985. Survival was 96% and early growth was slow. However, the gene bank promises to

Rattan is widely used in the manufacture of furniture, and it is excessive demand for this use that is resulting in the harvesting of immature plants before they can produce seed. The result is a rapid reduction in natural growing stock. Next to timber, rattan is Malaysia's most important forest product. Total cane exports, as either raw or processed cane, amounted to \$5.7 million in 1982. Because most rattan grows wild, and is being harvested so extensively, information is lacking as to the amount of rattan that remains, and how long it will last.

The Forest Research Institute of Malaysia (FRIM) in Kepong is the site of the Rattan Information Center (RIC)

## Hogplum\_Gazette

The Hogplum\_Gazette is a newsletter for Caribbean Foresters. Plans are to issue it quarterly, under the auspices of the Caribbean Chapter of the International Society of Tropical Foresters. The newsletter editor is interested in receiving articles and other information on forestry development projects; results of species, plantation and agroforestry trials; sources of publications; seeds and equipment; training opportunities; new parks and reserves; new natural resources legislation; forestry meetings, and the like.

The Hogplum\_Gazette is mailed at no cost to all members in good standing of the Caribbean Chapter of the International Society of Tropical Foresters. Other ISTF members can choose to belong if they have professional responsibilities or interests in the region.

For additional information, write:

The Hogplum Gazette  
USDA Forest Service  
Call Box 25000  
Rio Piedras  
Puerto Rico, 00928-2500.

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SHORT COURSES  
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### Tropical\_and\_Sub-tropical\_Forestry

North Carolina State University at Raleigh, North Carolina, will offer a three week short course from 7 - 25 March 1988. Subjects will include the optimum management of plantation species in the tropics and subtropics, and the ecology and management of natural stands of tropical hardwoods. Major topics to be covered include tree improvement, nursery techniques, plantation establishment, forest management, and wood utilization.

In addition to NC State Faculty, experts from England, Brazil, and other American institutions will be participating in the course

presentations. The registration fee, \$1000, must be received by February 1, 1988. Travel, lodging, meals, and other expenses not directly related to the short-course are not covered by the registration fee.

For more information or to register, contact:

Division for Lifelong Education  
North Carolina State University  
Box 7401, Raleigh, NC 27695-7401  
Attention: Frank Emory/Thelma  
Hunter.

### The\_Design\_of\_Community\_Forestry

The first international course on "The Design of Community Forestry" will take place in the Netherlands from 21 March to 10 June 1988. The course will be held in English. The International Agricultural Center at Wageningen and the International Institute for Aerospace Survey and Earth Sciences collaborated in the development of this short course. The course will provide course participants with the information, broadened outlook, and technical tools needed to conceptualize, plan, implement, and evaluate projects and programs in community forestry.

The course is meant for policy staff from developing countries who are engaged at the national or regional level in policy formulation, planning management and evaluation of forestry programs within the framework of rural development. The course will be open to officials from both government and non-governmental organizations, with preference being given to teams of two participants per country; one involved in forestry and one involved in agriculture/live stock production or rural planning.

For additional information, write: Mr. Peter Laban, Director of Studies, The International Agricultural Center, Postbus 88, 6700 AB Wageningen, Nederland. Tel: 08370-90111.

## Forest Tree Seed Management

Mississippi State University will host a seven-week course on forest tree seed management, from 23 May to 8 July 1988. The course is designed for mid- and upper-level forestry and natural resources professionals. Topics to be covered include planning and implementing of forest tree seed programs, production, collection, extraction, and other seed harvest and storage techniques, nursery management practices, and forestry extension techniques. Reservations will be accepted on a first come first serve basis.

For additional information, write:

Office of International Programs  
Mississippi State University  
PO Box 6342  
Mississippi State  
Mississippi 39762 USA  
Tel: (601) 325-3204  
Telex: 53882-OIP.

## Oregon State University Short Courses

A plywood manufacturing short course will be given by the College of Forestry, Oregon State University, 14 - 18 March 1988.

A 'Variable Probability Sampling: Variable Plot and 3-P' short course will take place in June 1988.

For additional information on these and other short courses, workshops, and conferences, contact the Conference Assistant, College of Forestry, Oregon State University, Corvallis, OR 97331, USA. Tel: (503) 754-2004.

## HBM

The Center for Holistic Resource Management is a non-profit foundation that presents short-courses throughout the year on "holistic resource management" and "building the effective organization". These programs are targeted towards range management specialist and ranchers, and seeks to train interested

professionals in the center's innovative philosophy and techniques of land and range management.

For additional information, and a schedule of 1988 courses, write:

The Center for Holistic  
Resource Management  
PO Box 7128  
Albuquerque, New Mexico 87194  
Tel: (505) 242-9272.

## Agroforestry Course for Pacific and Caribbean Island Foresters

A three-week English-language course on agroforestry will be held 30 May - 16 June 1986. The course is designed to provide hands-on experience and information to island foresters responsible for agroforestry extension or training, and for direct supervision of agroforestry extensionists. Participation will be restricted to people with such responsibilities.

Attendance will be limited to 25 people. Selection criteria are: 1) First priority will be given to students from the American Pacific Islands, and from Caribbean Islands served by USAID. In addition, the students 2) home organization must verify that the person will use the knowledge gained in their jobs, and that they are already actively engaged in forestry or agroforestry extension work; 3) should have a proven ability to complete college-level work, and to lead and train others; 4) should have 2-3 years of experience in forestry, agroforestry, or agriculture, with the expectation of working in extension or supervising others working in extension for the next five years; 5) should be self-motivated, fluent in spoken and written English, be in good physical condition, and be willing to participate fully in the course; 6) should be willing to put up with physical discomfort, poisonous snakes (22 species in Costa Rica), chiggers and other biting insects, uncomfortable accommodations, long hours, and frequent written assignments, with a mandatory final examination.

Nominations of students recommended for attendance, by name, must be received by the Pacific Islands Forester (PIF) or the Regional Forestry Advisor/Caribbean (RFA/C) no later than January 15, 1988. All nominees must have a valid passport in their possession by February 1, 1988. Nominees must provide the PIF or RFA/C, by February 10, 1988, with; full name, date of birth, names of father and mother, place of birth, profession, mailing address, passport number, dates of issue and expiration, and nationality. This information must be received by the PIF or RFA/C no later than February 10, 1988. Nominees who do not possess a valid USA passport must provide their passports to the PIF or RFA/C by March 10, 1988.

For additional information, or to submit nominations, contact:

A. For Caribbean area students:

Loren Ford, Regional Forestry  
Advisor/Caribbean  
USDA Forest Service  
Call Box 25000  
Rio Piedras, PR 00928-2500  
Tel: (809) 763-3939.

B. For American Pacific Islands students:

Leonard Newell  
Pacific Islands Forester, USDA  
Forest Service  
1151 Punchbowl Street, Room 323  
Honolulu, Hawaii 96813  
Tel: (808) 541-2628.

USDA Technical Courses for 1988

Communications and Media Strategies for Agriculture and Rural Development; 20 June - 29 July, 1988.

Development and Operation of Agricultural Extension Programs; Section I: 6 June - 5 August; Section II: 29 August - 28 October, 1988.

Resource Development of Watershed Lands; 6 June - 15 July, 1988.

Land Use Planning for Community Forestry and Natural Resource Development; 13 June - 22 July, 1988.

Project Analysis for Agriculture and Rural Development; 6 June - 15 July, 1988.

Organizational and Management Development; 30 May - 1 July, 1988.

Project Planning for Agriculture and Rural Development; 2 May - 3 June, 1988.

Project Implementation for Agriculture and Rural Development; 18 July - 26 August, 1988.

Policy Formulation and Analysis for Agriculture and Rural Development; 30 May - 1 July, 1988.

Management of Government Organizations; 16 May - 24 June.

Designing and Managing Integrated Agricultural and Rural Development Programs; 19 September - 28 October, 1988.

Establishing Data Bases and Analytical Systems for Economic Decisionmaking in Agriculture; 23 May - 12 August, 1988.

Keys to Rural Development at the Local Level; Section I: 8 May - 21 May; Section II: 7 August - 20 August; Section III: 14 August - 27 August, 1988.

Microcomputer Applications in Agricultural Development; 27 June - 5 August, 1988.

Tree Establishment in Arid Areas for Fuelwood and Conservation; 18 July - 12 August, 1988.

For further information regarding these courses, please contact Valdis Mezainis, Ph.D., Director, International Training Division, Office of International Cooperation and Development (OICD), United States Department of Agriculture, Washington, D.C. 20250-4300, U.S.A. Tel: (202) 653-8320.

Before a course can be reserved, ITD needs to have a letter or telex from your sponsor confirming the availability of funds for course fees. This letter is needed at least 2 months prior to the start of the course.

### Virginia Tech

Solving Forestry Problems with Personal Computers -- A Starter Course (with spreadsheet and database applications); February 29-March 1, 1988.

Advanced dBase III+ Programming for Forest Managers (with example database structures and programs); March 2-3, 1988

### Washington State University and University of Washington

GENE - Forest Genetics and Tree Improvement Shortcourse; February 15-19; Pullman.

CEFES - Forest Ecology and Silviculture Education Course; April 4-29; Pullman.

Forest Growth and Yield Shortcourse; April 4-7; Pullman.

Forest Soils Management for Resource Specialists Shortcourse; April 19-22; Pullman.

Shortcourse on Ecology of Forest and Grassland Communities; April 25-27; Pullman.

International Conference on Timber Engineering; October 24-28; Seattle.

International Symposium on Planning and Implementing Agroforestry Systems; October 24-28; Pullman.

[To find out more about the courses listed above, call (509) 335-2946.]

Marketing Forest Products Shortcourse; February 23-25; Pullman. Contact number: (509) 335-8570.

Western Forest Economists Conference; May 8-9; Wemme, OR. Contact number: (206) 543-0867.

### MEETINGS

DATE: 25 January - 12 February 1988  
TOPIC: IV Curso Internacional de Combate de Incendios Forestales  
LOCATION: Mexico City, Mexico  
CONTACT: Subsecretaria de Desarrollo Y Fomento Agropecuario Y Forestal, Direccion General de Normatividad Forestal, Av. Progreso No. 5 Col. Del Carmen Coyoacan C.P. 04110, Mexico, D.F., Mexico. Tel: 553-56-20, 658-23-17 Y 658-32-15. Telex: 1775888; 1772241.

### MEETINGS

DATE: 26 - 29 January 1988  
TOPIC: Alternatives to Deforestation: Steps Toward Sustainable Utilization of Amazonian Forests. Held in conjunction with the 39th Brazilian Botanical Congress, 24 - 31 January 1988  
LOCATION: Belem, Brazil  
CONTACT: Anthony Anderson, Museu Goeldi, Caixa Postal 399, 66.000 - Belem - PA - Brazil

### MEETINGS

DATE: 30-31 January, 1988  
TOPIC: Working session of Commission on National Parks and Protected Areas of IUCN  
LOCATION: Costa Rica  
CONTACT: Union Internationale pour la conservation de la nature et de ses ressources Avenue du Mont-Blanc CH-1196 Gland Switzerland

### MEETINGS

DATE: February 1988  
TOPIC: 4th International Roundtable Conference on Dipterocarps  
LOCATION: Sakaerat Biosphere Reserve, Thailand  
CONTACT: G. Maury-Lechon, Laboratoire de Phanerogamie, Paris, France.

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DATE: February 1988  
TOPIC: 30th Session of Commission on National Parks and Protected Areas  
LOCATION: San Jose, Costa Rica  
CONTACT: IUCN, P.O. Box 19347, Washington, DC 20036

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DATE: 1 - 11 February 1988  
TOPIC: General Assembly of IUCN  
LOCATION: San Jose, Costa Rica  
CONTACT: Union Internationale pour la conservation de la nature et de ses ressources, Avenue du Mont-Blanc, CH-1196 Gland, Switzerland

\*\*\*\*\*

DATE: 7 - 11 March 1988  
TOPIC: The International Conference on Research in Plant Sciences and its Relevance to the Future.  
LOCATION: Delhi, India  
CONTACT: The Chairman, Organizing committee, RPSRF, Department of Botany, University of Delhi, Delhi 110007, India

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DATE: 22 - 24 March 1988  
TOPIC: Soil Resources: Their Inventory, Analysis and Interpretation for Use in the 1990s.  
LOCATION: Minneapolis, MN, USA  
CONTACT: Dr. J. L. Anderson, Department of Soil Science, University of Minnesota, 439 Borlaug Hall, St. Paul, MN 55108. Tel: (619) 625-8209.

\*\*\*\*\*

DATE: 18 April - 8 July, 1988  
TOPIC: Agricultural and Rural Project Management: A Post-Experience Course  
LOCATION: Project Planning Centre for Developing Countries, University of Bradford, UK  
CONTACT: John Cusworth, Course Director, Project Planning

Centre, University of Bradford, Bradford, West Yorkshire BD7 1DP, UK

\*\*\*\*\*

DATE: 19 - 22 April 1988  
TOPIC: Conference on Forest Growth: Process Modeling of Responses to Environmental Stress  
LOCATION: Gulf Shores, Alabama  
CONTACT: Dr. J. I. Blake, Conference Chairman, School of Forestry, 108 White Smith Hall, Auburn University, Alabama 36849-5418, USA. Tel: (205) 826-4050.

\*\*\*\*\*

DATE: 24 - 26 April 1988  
TOPIC: Second International Symposium on Sustainable Development of Natural Resources in the Third World - Management of Tropical and Subtropical Steeplands  
LOCATION: Columbus, Ohio  
CONTACT: Mignonne Whitlow, School of Natural Resources, Ohio State University, 2021 Coffey Road, Columbus, OH 43210-1085

\*\*\*\*\*

DATE: 6-18 May 1988  
TOPIC: Changing Tropical Forests: Historical Perspectives on Today's Challenges in Asia, Australasia and Oceania. IUFRO Tropical Forest History Working Group Meeting.  
LOCATION: Canberra, Australia  
CONTACT: Centre for Resource and Environmental Studies, Department of Forestry, the Australian National University, G.P.O. Box 4, Canberra ACT, 260, Australia

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DATE: 15 - 20 May 1988  
TOPIC: Forest Products Research - Improved Utilization for Economic and Social Development; IUFRO All Division 5 Conference.

LOCATION: Sao Paulo, Brazil  
CONTACT: Mr. J. Luther Utt, Unique  
Regards, PO Box 21385,  
Roanoke, VA 24018, USA.  
Tel: (703) 744-2900 or  
(800) 888-0028. Telex:  
495-6181 UNIQUE, or Dr.  
Amantino de Freitas, I.P.T.  
Cidade Universitaria, Postal  
7141, 05508 Sao Paulo,  
Brazil. Tel:  
55-11-268-2211. Telex:  
1138119 INPI BR. Also, H.  
Rosen, USDA Forest Service,  
PO Box 96090, RPE,  
Washington, DC 20090-6090,  
USA. Tel: (703) 235-1203.

Biology, University of  
Miami, PO Box 249118, Coral  
Gables, FL 33124, USA.

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DATE: 20 - 23 June 1988  
TOPIC: International Symposium on  
Advanced Technology in  
Natural Resource Management  
LOCATION: Fort Collins, Colorado  
CONTACT: Office of Conference  
Services, Rockwell Hall,  
Colorado State University,  
Fort Collins, Colorado  
80523, USA.

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DATE: June 1988  
TOPIC: The Effects of Drying  
Forests on Watershed  
Management and Torrent  
Control.  
LOCATION: Aix-en-Provence, France  
CONTACT: G. Kronfeller-Kraus,  
Forstliche  
Bundesversuchsanstalt,  
A-1131 Wien, Austria.

DATE: 26 June - 10 July 1988  
TOPIC: Regional Workshop on  
Tropical Forest Ecology and  
Management in Asia-South  
Pacific.

LOCATION: Lae, Papua New Guinea  
CONTACT: Dr. S. M. Saulei, Chairman,  
Workshop Organizing  
Committee, PO Box  
320, University, Papua New  
Guinea. Tel: 253900;  
Telex: NE 22366.  
(Participants must be  
directly involved in land  
resources management in  
their own countries.)

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DATE: 6 - 9 June 1988  
TOPIC: Ecosystem Management Rare  
Species and Significant  
Habitats  
LOCATION: Syracuse, New York, USA  
CONTACT: ESF Continuing Education,  
SUNY College of  
Environmental Science and  
Forestry, Syracuse, NY  
13210-2784, USA

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DATE: July 1988  
TOPIC: Protection of Habitat from  
Floods, Debris, Flows and  
Avalanches.  
LOCATION: Graz, Austria  
CONTACT: Interpraevent 1988, Postfach  
43, A-8010 Graz, Austria.

\*\*\*\*\*

DATE: 5 - 12 June 1988  
TOPIC: Resource Availability and  
the Structure and  
Functioning of Tropical  
Ecosystems, an International  
Symposium  
LOCATION: Miami, Florida (5-8 June)  
and San Jose, Costa Rica  
(9-12 June)  
CONTACT: Jay M. Savage, Chairman, OTS  
Silver Anniversary  
Symposium, Department of

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DATE: 10 - 15 July 1988  
TOPIC: International Working  
Meeting on Soil  
Micromorphology in the  
United States  
LOCATION: San Antonio, Texas  
CONTACT: Dr. L. P. Wilding, IWMSM-88  
Chairman, Soil & Crop  
Sciences Department, Texas  
A&M University, College  
Station, TX 78430-2474, USA.

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DATE: 12 - 19 July 1988  
TOPIC: 4th Round Table Conference  
on Dipterocarps  
LOCATION: Bangkok and Nakhon  
Ratchasima Province, Thailand  
CONTACT: Mr. Parvit Chittachumnonk,  
Silvicultural Research  
Sub-division, Silvicultural  
Division, Royal Forest  
Department, Bangkok 10900,  
Thailand.

\*\*\*\*\*

DATE: 17-22 July 1988  
TOPIC: 8th International  
Biotechnology Symposium  
LOCATION: Paris, France  
CONTACT: International Convention  
Representatives, 35 West 65  
Street, New York, NY  
10023-637. Tel: (800)  
237-1993; (212) 496-8900

\*\*\*\*\*

DATE: 19 - 24 July 1988  
TOPIC: First International Congress  
of Ethnobiology  
LOCATION: Belem, Brazil  
CONTACT: Prof. Dr. Darrell Addison  
Posey, Nucleo de  
Etnobiologia, Museu Paraense  
Emilio Goeldi - CNPq, Caixa  
Postal 399, 66.040 Belem,  
Para, Brazil. Tel: (091)  
288-2341, ext. 65.

\*\*\*\*\*

DATE: 31 July - 3 August 1988  
TOPIC: International Symposium on  
Erosion and Volcanic Debris  
Flow Technology  
LOCATION: Yogyakarta, Indonesia  
CONTACT: Mr. Hartono Pramudo,  
Secretary, Organizing  
Committee ISEV, Tromol Pos  
23/KBT Kebayoran Baru,  
Jakarta Selatan, Indonesia.

\*\*\*\*\*

DATE: September 1988  
TOPIC: The Forest: Structure,  
Ecology, Silviculture &  
Agroforestry

LOCATION: Montpellier, France  
CONTACT: Colloque sur la Foret, c/o  
Institute de Botanique, 163  
rue Auguste Broussonet,  
34000 Montpellier, France

\*\*\*\*\*

DATE: September 1988  
TOPIC: Second Uppsala Modelling  
Workshop  
LOCATION: Uppsala, Sweden  
CONTACT: Department of Ecology and  
Environmental Research, The  
Swedish University of  
Agricultural Sciences, Box  
7072, S-750 07 Uppsala,  
Sweden. Tel: 018-17 10 00

\*\*\*\*\*

DATE: 2 - 8 October 1988  
TOPIC: Air Pollution Effects on  
Forest Ecosystems  
LOCATION: Interlaken, Switzerland  
CONTACT: Organizing Committee, IUFRO  
Meeting - Air Pollution and  
Forest Decline, c/o Swiss  
Federal Institute of  
Forestry Research, CH-8903  
Birmensdorf, Switzerland.

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DATE: 18 - 22 October 1988  
TOPIC: 4th International Forestry,  
Timber Processing and  
Woodworking Exhibition  
LOCATION: Jakarta, Indonesia  
CONTACT: Nicholas West, Overseas  
Exhibition Services Ltd., 11  
Manchester Square, London  
W1M 5AB, UK. Tel: 01-486  
1951/487-5831/935-4672.  
Telex: 24591 MONTEX G

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DATE: November 1988  
TOPIC: Forestry Congress  
/International Symposium on  
Agroforestry  
LOCATION: Havana, Cuba  
CONTACT: Comite Organizador, 1  
Congreso Forestal de Cuba,  
Palacio de las Convenciones,  
Apartado 16046, La Habana,  
Cuba. Telex: 511609  
PALCOCUBA

\*\*\*\*\*

DATE: November 1988  
TOPIC: International Rangeland Congress - Development of Grass Rangelands in the Tropics  
LOCATION: New Delhi, India  
CONTACT: Dr. Panhjab Singh, Director Indian Grassland and Fodder Research Institute, Jhansi 284 003, India

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DATE: 28 November - 3 December 1989  
TOPIC: Genetic improvement strategies and the rational management of breeding populations; a joint meeting of several IUFRO working parties, to be hosted by the Royal Forest Department, Bangkok, Thailand  
LOCATION: Pattaya, Thailand  
CONTACT: Dr. D.G. Nikles, Department of Forestry, PO Box 631, Indooroopilly, 4068, Australia.

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DATE: 12 - 16 December 1988  
TOPIC: Mountain Logging and Pacific Northwest Skyline Symposium  
LOCATION: Oregon State University  
CONTACT: The Conference Assistant, College of Forestry, Oregon State University, Corvallis, OR 97331, USA. Tel: (503) 754-2004.

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TECHNICAL PUBLICATIONS

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Institutional Publications

GTZ, 1986. Manual do tecnico florestal (in Portuguese). Colegio Florestal de Irati, Parana, Brazil. 4 Vols, 2000 pp.

A.I.D.

1. Selected tree seed sources in Australia, India, Holland, and the United States.

- 2. The potential of starch graft polymers "super slurpers" for forestry and agriculture.
- 4. The comparative advantages and disadvantages of root trainers, dibble tubes, plastic bags and bare-rooting.
- 6. Windbreak and shelterbelt technology for increasing agricultural production.
- 7. Growth yield increase of trees through fertilization.
- 10. Casuarinas: trees of promise.
- 14. Jojoba: a promising new crop for arid lands.
- 15. Solar curing barns, fast growing trees and agroforestry offer a solution to the deforestation caused by tobacco production in Thailand, Tanzania, Sri Lanka, Nepal, Philippines and other developing countries.
- 16. Excerpts from: evaluation and recommendations for research on fast growing tree species for wood energy production and gasification for irrigation products in the Philippines.
- 17. *Leucaena leucocephala*: a tree that "defies the woodcutter".
- 18. State-of-the-art: *Acacia albida*.
- 19. Guide book for rural, cottage and small and medium scale industries and paddy rice cultivation.
- 20. Soils, crops & fertilizer use (Peace Corps).
- 21. Handbook of tropical and subtropical horticulture (USAID).
- 22. World literature on *Leucaena*.
- 23. *Paulownia*, "The Princess Tree", an excellent candidate for agroforestry.
- 24. Utilization of neem (*Azadirachta indica juss*) and its by-products.

The following curriculum and reading list for a new EDI seminar is intended for trainers. Please note that EDI cannot supply all the reading materials because of copyright restrictions and because some of them may not yet be ready for wide distribution. Those available from EDI are marked with an asterisk and can be obtained from Ms. Edith Pena, Economic Development Institute, 1818 H Street, NW, Washington, DC, 20433, U.S.A. For further information about any aspect of the course curriculum write directly to the contact given below. Please do not write to the Review.

### Seminar on Land and Water Ecosystems Management

Contact: Jacques Kozub, Agriculture and Rural Development Division, EDI (see address above)

#### Introduction

This seminar is part of a series addressing key facets of agricultural policy and management. It reflects the concerns in the World Bank and its member countries about the need to manage agricultural ecosystems beyond the space and time boundaries of agricultural rural development projects.

Even though many agricultural projects are financed by member governments, with World Bank and other financing, most agricultural activities take place beyond the reach of (or despite) national policies and institutions and with little regard for the 'carrying capacity' of natural resources. Nature's carefully designed ecosystems are upset as a result, and frequently with undesirable ramifications for agriculture, other sectors, and society as a whole.

In many developing countries, the management of land and water ecosystems is complicated by the short-term needs for agriculture to provide food and employment for rapidly growing populations. The World Bank is aware that the management of natural resources has always presented difficult choices between the preferences of present generations and the needs of future ones, on the one hand, and between public gain and private welfare, on the other hand. Even if these were simple choices to be equitably reconciled to the satisfaction of all interests, still unintended effects can and frequently do follow, either for lack of sufficient information, such as scientific evidence, insufficient means to sustain the costs, intersectoral consequences and competing claims, and understandable uncertainty concerning future social and economic requirements for development. For these reasons, beginning in 1986, EDI designed and organized a series of seminars on land and water ecosystems management, and plans to conduct at least one in each of the major regions. The first was held in Washington in November 1986, and the second in Nairobi in October 1987 for eastern and southern African countries. A third will be held in the Philippines in March 1988, and a fourth in

Costa Rica in September 1988 for Latin American countries.

The main objective of the two-week seminars is to raise the participants' awareness and analytic insights to the long-run environmental and economic implications of present policies and management approaches to land and water ecosystems (including wildlife in Africa), particularly for agricultural development. A corollary purpose is to provide participants with up-to-date sources of information, documentation, and cooperation available on natural resources management. The participants' attention is drawn to the following:

- o leading issues in managing land and water ecosystems under demographic pressure and environmental, institutional, and economic constraints;
- o the need and technologies for climatic, land, and water information and related resources surveys;
- o comparisons of experiences in their own countries with those of other countries;
- o approaches to economic concepts and means to manage land and water ecosystems in a sustainable way.

The syllabus is designed for senior officials and policymakers, advisors, or managers in agencies concerned with land and water resources and natural habitats. So far they have been permanent secretaries, directors-general and equivalent, from ministries of agriculture, livestock, natural resources, wildlife, planning, and so on. Senior staff from academic and research institutions and nongovernment environmental organizations have also been invited as observers. Participants are selected to represent a balance between professions and organizations. The seminar's curriculum is drawn from several academic disciplines, supplemented by case studies and papers from experienced practitioners, including the participants' own contributions. However, because of its short duration and the complex linkages inherent in natural resources management, the seminar is limited in scope to information needs, public policies, institutional arrangements, incentives, and

management practices for typical types of agroecological and farming systems. References to particular scientific and technological aspects are used only to the extent that these influence political or economic decisions and institutional arrangements. The emphasis varies from one region to another, for example, the importance given to wildlife and semi-arid pastoralist systems in eastern Africa.

The seminar covers six major topics, on which two or more sessions are spent. Readings are selected from the references listed at the end of this syllabus. They are frequently supplemented by case studies drawn from regional and national experiences in the region where the seminar is being conducted.

## I. LEADING ISSUES IN THE MANAGEMENT OF LAND AND WATER ECOSYSTEMS

The focus is on changes in the conditions and management of land and water ecosystems and implications for the future. This includes an assessment of how the environmental and economic effects of present developments are interpreted, and their future consequences if present policies and management continue.

### Session 1: Leading issues in land and water resources development

Reading: Warford, J. 'Natural Resources Management and Economic Development,' in Background Readings, vol. I, pp. 7-26.

### Session 2: Natural resource systems for sustainable development

Reading: Myers, N. 'Natural Resource Systems for Sustainable Development,' in Collected Papers, pp. 3-18.

## II. LAND AND WATER INFORMATION SYSTEMS AND ASSESSMENT

This topic concerns ways of assessing the information needed for decision making and management, how to obtain and use it economically and efficiently. The information needs are viewed from several perspectives--population, farming systems, climate and weather patterns, and so on--some of which is obtained by traditional mapping and cadastres and by remote sensing technology. Economical ways of climatic and weather analysis, land mapping, resources surveying, and global environment monitoring and data bases are illustrated.

### Session 3: Land resources information: cadastral systems and mapping component

Reading: McLaughlin, J. 'Land Resource Management: The Cadastral Component,' Collected Papers, pp. 19-70.

Background readings: Dunkerley, H. B. 'Land Information Systems for Developing Countries,' Background Readings, p. 27.

McLaughlin, J. 'Land Information Management: A Review of Selected Concepts and Issues,' Background Readings, p. 35.

Dale, P. F. 'Legal Cadastre Study,' Background Readings, p. 59.

### Session 4: Land information systems: land capability

Readings: Purnell, Maurice. 'Preparing to Manage Land Resources in Conditions of Scarcity,' Collected Papers, pp. 81-96.

Norton-Griffiths, M. Oct. 1987. Land Use Surveys for Management and Development Planning. Nairobi. Processed.\*

### Session 5: Resource surveys: the data base types

Readings: Trevett, J. W. 'Resource Surveys: The Data Base,' Collected Papers, pp. 71-79.

Morgan, Glenn. 'Natural Resource Surveys, an Overview of Concepts,' Background Readings, pp. 93-109.

Clarke, R. (ed.). 1986. The Handbook of Ecological Monitoring. Oxford: Clarendon Press. Passim, especially chapter 5.

### Session 6: Agrometeorology

Readings: Rijks, D. 'Agrometeorology: A Tool in Land and Water Management,' Collected Papers, pp. 97-124.

Keane, T., P-O. Harsmar, and E. Jung. 1986. Economic Benefits for Agrometeorological Services. Geneva. Commission for Agricultural Meteorology.

### Sessions 7 and 8: Water resources management under conditions of scarcity and uncertainty

Readings: Rangeley, V. R. 'Water Resources Exploita-

tion,' and Barber, W. 'Groundwater Resources,' Collected Papers, pp. 125-166; and Rangeley, V. R. 1987. Notes. Washington, DC. Processed.\*

Goodland, R. 'Environmental Aspects of Hydroelectric Power and Water Storage Projects,' Background Readings, pp. 127-160.

Barghouti, S., and D. Lallement. 'Water in the Sahelian and Sudanian Zones, from Irrigation to Water Harvesting,' Background Readings, pp. 183-213.

### III. POLICIES, INSTITUTIONS, AND INCENTIVES FOR LAND AND WATER RESOURCES MANAGEMENT

Discussion of the range of policy objectives and alternative measures, their social and political acceptability through incentives, and their administrative feasibility. These will be viewed from different political, economic, and institutional perspectives in light of multiple jurisdictions and interests. It involves active participant contributions.

Sessions 9 and 10: Incentives and the farming system: adaptation of farming systems to population growth and resource conservation

Reading: Schaefer-Kehnert, W. 'Adaptation of Farming Systems to Population Growth and Resource Conservation Needs in Developing Countries,' Collected Papers, pp. 167-208.

Session 11: The policy environment and institutions for multilevel management

Reading: Kamugasha, B. B. Nganwa. 1987. Institutional Arrangements and Multi-Level Participation: The Search for Coherence. Nairobi. Processed.\*

### IV: THE ECONOMICS OF SUSTAINABLE YIELDS FROM LAND AND WATER RESOURCES

The purpose is to define or clarify objectives against which the environmental and welfare impact of alternative policy and management options can be assessed. The major policies and instruments (market and nonmarket incentives such as prices, taxes, users' fees, tenure rights) that can be employed to minimize medium- and long-term effects are reviewed.

Session 12: Valuing national resources and the implications for land and water management

Readings: Pearce, D. 'Valuing national Resources and the Implications for Land and Water Management,' Collected Papers, pp. 219-232.

Helmets, F. Leslie C. H. 'What is the Value of a Lake?' Background Readings, pp. 161-182.

Dixon, J., and M. Hufschmidt. 1986. Economic Valuation Techniques for the Environment: A Case Study Workbook. Baltimore: Johns Hopkins University Press.

Session 13: Agricultural incentives and policy options for sustainable yield

Readings: Easter, K. W., J. A. Dixon, and M. Hufschmidt. 1986. Watershed Resources Management. Boulder: Westview Press, pp. 94-97, 106-107.

Repetto, R. 'Economic Incentives for Sustainable Production,' Collected Papers, pp. 235-250.

Nelson, M. 1987. Terms of Reference for a Country Case Study. Washington, DC. Processed.\*

Cleave, J. H. 'Philippines. Forestry, Fisheries and Agriculture Resource Management (FFARM) Study. Initiating Memorandum,' Background Readings, pp. 327-338.

### V: APPLICABLE MANAGEMENT TECHNIQUES AND INCENTIVES

Selected examples (or case studies) of difficult but feasible management techniques and institutional arrangements are used to illustrate their application to typical farming systems: in mountain ecosystems or watersheds, semi-arid agropastoral areas; wildlife; and agroforestry (where timber and other products are both a land resource and a market product). Ways to introduce market and nonmarket incentives and to generate public (that is, institutional) support to manage change are illustrated by case studies or examples contributed by participants.

Session 14: Watershed or mountain ecosystem management

Reading: Easter, K. W., J. A. Dixon, and M. Hufschmidt. 1986. Watershed Resources Management. Boulder: Westview Press. Part I: also Carpenter, R. A. (pp. 251-270) and Dixon, J. (pp. 271-291) in Collected Readings.

Session 15: Agricultural expansion in the humid tropics

Readings: Nelson, M. 1985. Land Settlement in the Humid Tropics: Lessons From Experience in Latin America. Paper prepared for the Seminar for Settlements in Rural Regions, United Nations Centre for Human Settlements, Nairobi, Kenya, November 1985.

Nelson, M. 'The Development of Tropical Lands,' Collected Papers, pp. 295-301.

Session 16: Agroforestry and soil/water management: the potential of agroforestry for soil conservation and sustainable land use

Reading: Young, A. 'The Potential of Agroforestry for Soil Conservation and Sustainable Land Use,' Collected Papers, pp. 301-318.

Session 17: Competitive land use: livestock

Reading: Cossins, N. 'The Management of Water and Land Resources in the Traditional Pastoral Areas of East Africa,' Collected Papers, pp. 319-343; and Cossins, N. 1987. Competition and Complementarity--Livestock and the Management of Land and Water Ecosystems. Nairobi. Processed.\*

Session 18: Competitive land use: wildlife (East Africa)

Reading: Wasawo, David P. S. 1987. Issues in Wildlife Management. Nairobi. Processed.\* (Plus case study on Amboseli National Park.)

## VI: INTERNATIONAL COOPERATION FOR LAND AND WATER RESOURCES MANAGEMENT

One session consists of a review of experience and the scope of regional and international cooperation. The use of remote sensing technologies, computerized data banks, and so on, such as UNEP's Global Environment Monitoring System (GEMS), Global Resource Information Database (GRID), and INFOTERRA are reviewed.

## VII: NATIONAL ACTION PLANS

During the last two sessions participants are asked to design, formulate, and discuss options in their respective countries based on explicit objectives, socially and politically acceptable policies and applicable economic criteria.

## BASIC REFERENCES

Participants are invited to use the following texts

for reference. Other texts, many of which deal mainly with resources management in developed countries, can also be suggested.

Bromley, D., and R. Bishop. 1986. Natural Resources and Development. Madison: University of Wisconsin.

Clarke, Robin (ed.). 1986. The Handbook of Ecological Monitoring. A GEMS/UNEP publication. Oxford: Clarendon Press.

Dixon, J., and Maynard Hufschmidt. 1986. Economic Valuation Techniques for the Environment. A Case Study Workbook. Baltimore: Johns Hopkins University Press.

Easter, K. W., J. A. Dixon, and M. Hufschmidt. 1986. Water Resources Management: An Integrated Framework with Studies for Asia and the Pacific. Boulder: Westview Press.

Economic Development Institute. 1987. Seminar on Land and Water Management: Collected Papers. Washington, DC: Economic Development Institute of the World Bank.\*

Kozub, Jacques (ed.). 1986. Land and Water Resources Management: Background Readings. Vol. 1. Washington, DC: Economic Development Institute of the World Bank.\*

Hufschmidt, Maynard, David E. James, Anton D. Master, Blair T. Bower, and John A. Dixon. 1983. Environment: Natural Systems and Development. Baltimore: Johns Hopkins University Press.

World Resources Institute. 1987. World Resources, 1987. Washington, DC: World Resources Institute. (An assessment of the resource base that supports the global economy with data tables for 146 countries.)



# East-West Center

Environment and Policy Institute

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September 24, 1987

Mr. Peter Freeman  
619 Upland Place  
Alexandria, Virginia 22301

Dear Peter,

I enjoyed talking to you today on the phone; there seems to be several ways that we could assist AID with its in-house training, especially given the interest in natural resource economics.

As promised I enclose a draft of a paper "Managing Watershed Resources" that began as a presentation to the EDI and will appear as an article in the Annals of Regional Science. I also enclose my lecture outlines from the recent ADB-sponsored short course held in Kuala Lumpur. We usually tailor presentations to suit the audience, although the presentations draw heavily on our published books and monographs. I also enclose a C.V. that will give you an idea of the sorts of things I have been writing about recently.

Don't hesitate to call or write if you need additional information or we can be of assistance.

With best regards,

Sincerely yours,

John A. Dixon  
Research Associate

rg  
enc

*John - I also enclose a short write-up for a workshop report based on my presentations in KL.*

# I. INTRODUCTION TO ECONOMIC EVALUATION

## 1. The Role of Economic Analysis

- o To help in the decision making process
- o To help decide among alternatives and allocate scarce resources
- o As a way of ordering information

## 2. Rationale for Economic Analysis of Environmental Effects

- o Better use of resources; sustainable development
- o Higher social returns
- o Fewer social costs
- o Anticipatory planning

## 3. Micro versus Macro Level Analysis

- o The arguments for macro, policy level analysis
- o The case for micro, project level analysis
- o A synthesis of both and how to achieve this goal

## 4. The Project Cycle and Interdisciplinary Work

- o Starting early in the project cycle
- o Retaining flexibility
- o Roles of different disciplines

## II. ECONOMIC MEASUREMENT OF ENVIRONMENTAL IMPACTS

### 1. Steps in the Analysis

- o Identify impacts
- o Measure (quantify) impacts
- o Place monetary values on impacts/effects
- o Incorporate the effects in the economic analysis

### 2. The Analytical Perspective

- o Private versus social analysis
- o Externalities
- o Time

### 3. Neo-Classical Welfare Economics

- o Basics of welfare economics
- o Key assumptions

### 4. Practical Applications and Adjustments to the Real World

- o Guidelines for starting the analysis
  - where to start
  - symmetry in benefits and costs
  - with-and-without framework
  - explicitly state assumptions
- o Determining the boundary of analysis
- o Time horizons
- o Choosing a technique for project evaluation
  - Net present value
  - Benefit/cost ratio
  - Economic internal rate of return

### III. GENERALLY APPLICABLE TECHNIQUES

#### 1. Choosing a Technique

- o "Less is More"--start simply
- o Key assumptions

#### 2. Techniques Using Market Prices to Value a Change in Production

- o General theory
- o Changes in productivity approaches
  - theory
  - examples
- o Loss of earnings approach
  - theory
  - examples
- o Opportunity-cost approach
  - theory
  - examples

#### 3. Techniques Using Market Prices to Value Costs

- o General theory
- o Cost-effectiveness analysis
  - theory
  - examples
- o Preventive expenditures
  - theory
  - examples

#### IV. POTENTIALLY APPLICABLE TECHNIQUES

##### 1. Techniques Using Surrogate Market Prices

- o General theory and concept of "economic rents"
- o Property value approach
  - theory
  - examples
- o Other land value approaches
  - theory
  - examples
- o Wage differential approach
  - theory
  - examples
- o Travel cost approach
  - theory
  - examples
- o Marketed goods as environmental surrogates
  - theory
  - examples

##### 2. Cost-analysis Techniques

- o Theory behind these techniques
- o Replacement costs
  - theory
  - examples
- o Relocation costs
  - theory
  - examples

## V. LIMITS OF ECONOMIC ANALYSIS OF ENVIRONMENTAL EFFECTS

### 1. Knowing What to Include

- o How far to "push" the analysis
- o Use of qualitative information

### 2. Selected Problem Areas

- o Discount rate
- o Intergenerational equity
- o Uncertainty and irreversibility
- o Value of human life
- o Incrementalism
- o Aesthetic values
- o Social and political factors

## **Economic Analysis of Environmental and Natural Resource Effects**

The process of development places many demands and stresses on the natural resource base of a country's economy. We use natural resources--land and water, air, energy and minerals--to produce the goods and services that we require. These resources are used both directly for consumption and indirectly, as inputs into production processes. Decisions must constantly be made about how to use resources and how to handle the good and bad effects of resource use.

Economic analysis can play an important role in the decision making process. When natural resources are involved, particularly renewable resources such as land and water and the many products derived from their use, it is necessary to consider both direct and indirect effects. The indirect effects, frequently occurring as environmental impacts, can effect the generation of net benefits and the welfare of the population. Usually several alternative ways exist to develop a given resource or achieve a certain goal. Economic analysis helps decision makers to decide between these alternatives and weigh the benefits and costs of various options. Since our financial and natural resources are limited, it is important to design strategies that maximize net benefits--that is, strategies that seek a cost-effective way to limit unintended or harmful environmental impacts. The ultimate goal, of course, is to make better use of resources and develop them in a sustainable manner.

Environmental assessment is a key element in this process. EA or EIA, environmental impacts assessment, helps to identify the type and magnitude of potential environmental impacts of projects. If an economic

analysis is carried out in a broader, social context, the analysis will include benefits and costs wherever they occur, on the project site itself or those that are removed in space or time.

Examples of unintended effects of development projects are common. An upland forestry project may result in soil erosion and resulting sedimentation in downstream areas, in river beds, or behind reservoirs. Filling in a mangrove area may result in a sharp drop in the catch of fish or shellfish that are dependent on the mangrove for part of their biological cycle.

In order to correctly handle these effects it is necessary to both identify them and then examine alternative ways for developing the resource or implementing the project. This process requires that, where possible, monetary values be assigned to environmental effects. This workshop has introduced a number of techniques that can be used to do this. Note that the approach presented here focusses on projects and their design and implementation. Macro policies may be equally important and should also be considered but are outside of the area covered in this workshop.

It is essential that project design and analysis be done in a multi-disciplinary format whereby planners, engineers, environmentalists, economists and others work together from the start. It is usually easier and cheaper to design in sound environmental management than it is to add it onto a project that has already been completely designed.

The actual economic analysis of alternatives is commonly done in a benefit-cost analysis framework. In this approach, the various benefits and costs of the proposed project, both direct and indirect, on-site and off-site, are placed in a value flow table that covers the life of the

project or other appropriate period of time, and are discounted back to the present. The mechanics of benefit-cost analysis are straightforward and are covered in such standard texts as Gittinger (1982) or the ADB report used in the workshop (Dixon et al. 1986).

It is necessary to make decisions about the appropriate "boundary of analysis" for the project. That is, how far afield one should go in including off-site effects. Upland forestry development and resultant soil erosion, for example, are a case where the downstream effects of soil and sediment should be included. Another important question is that of time. How far into the future should the analysis be carried out--to the end of the useful life of the project, or beyond if there are longer lasting environmental effects? Guidance on these questions that are important for an "extended" benefit-cost analysis can be found in the ADB report and more detailed presentations found in Hufschmidt et al. (1983) and Dixon and Hufschmidt (1986).

The actual decision criteria employed in the benefit-cost analysis is usually either a net present value (NPV) calculation, a benefit/cost (B/C) ratio, or an internal rate of return (IRR) calculation. Figure 1 presents the formulas for these decision criteria and the relationships between them.

Placing monetary values on non-marketed or unpriced environmental effects may be difficult. For example, Figure 2 illustrates the range of goods and services produced by a mangrove ecosystem and the division of those goods and services into those that occur on-site and off-site, and have or do not have market prices. Examples of non-marketed or non-priced goods and services are represented by those found in quadrants 3 and 4 in Figure 2. Nevertheless, much can be done to place values on

## Figure 1. Decision Criteria for a Benefit-Cost Analysis and the Relationships Between Them

Perhaps the single most widely used formula in project analysis is that which calculates the *net present value (NPV)* of a project.

$$NPV = \sum_{t=1}^n \frac{B_t - C_t}{(1+r)^t}$$

The *internal rate of return (IRR)* is defined as the rate of return on the investment that equates the present value of benefits and costs. It is found by an iterative process and is equivalent to the discount rate ( $r$ ) that satisfies the following relationship:

$$\sum_{t=1}^n \frac{B_t - C_t}{(1+r)^t} = 0$$

The *benefit-cost ratio (B/C ratio)* is a simple derivative of the net present value criterion:

$$B/C \text{ ratio} = \frac{\sum_{t=1}^n \frac{B_t}{(1+r)^t}}{\sum_{t=1}^n \frac{C_t}{(1+r)^t}}$$

$r$  = the discount or interest rate expressed as a decimal (also known as  $i$ )

$n$  = the number of years involved in the economic time horizon

$t$  = the relevant year, usually expressed as a running subscript 1, 2, . . . ,  $n$

$B_t$  = benefit in year  $t$

$C_t$  = cost in year  $t$  (these may be capital, operations, maintenance, or replacement costs)

$\Sigma$  = sigma, the summation sign that indicates the sum of some function, in this case over some period of time

### Comparing the Three Measures of Present Value

All three measures presented here rely on the concept of present value of a stream of benefits and costs. In fact, a verbal explanation of the three measures points out this similarity (Gittinger 1972a):

$$\text{Net present value} = \left[ \begin{array}{l} \text{Present value} \\ \text{of benefits} \end{array} - \left[ \begin{array}{l} \text{Present value} \\ \text{of costs} \end{array} \right] \right]$$

That discount rate which results in:

$$\text{Internal rate of return} = \left[ \begin{array}{l} \text{Present value} \\ \text{of benefits} \end{array} = \left[ \begin{array}{l} \text{Present value} \\ \text{of costs} \end{array} \right] \right]$$

$$\text{Benefit-cost ratio} = \frac{\text{Present value of benefits}}{\text{Present value of costs}}$$

Not surprisingly, there are also parallels between the values for these measures. The following comparison points out these relationships:

<u>NPV</u>	<u>B/C ratio</u>	<u>IRR</u>
If $> 0$ then	$> 1$	and $IRR > r$
If $< 0$ then	$< 1$	and $IRR < r$
If $= 0$ then	$1$	and $IRR = r$

Figure 2. Relationship Between Location and Valuation of Goods and Services Produced by a Mangrove Ecosystem

		Location of Goods and Services	
		On-site	Off-site
Valuation of Goods and Services	Marketed	<p><b>1</b></p> <p>Usually included in an economic analysis (e.g., poles, charcoal, woodchips, mangrove crabs)</p>	<p><b>2</b></p> <p>May be included (e.g., fish or shellfish caught in adjacent waters)</p>
	Nonmarketed	<p><b>3</b></p> <p>Seldom included (e.g., medicinal uses of mangrove, domestic fuelwood, food in times of famine, nursery area for juvenile fish, feeding ground for estuarine fish and shrimp, viewing and studying wildlife)</p>	<p><b>4</b></p> <p>Usually ignored (e.g., nutrient flows to estuaries, buffer to storm damage)</p>

environmental effects and the workshop introduced an approach to doing so.

The ADB report divided economic valuation techniques into two broad categories--those that are generally applicable and those that are potentially applicable (Table 1). The most direct approaches are those that rely on market prices to value a change in production. This set of approaches includes such methods as the change in productivity approach, the loss of earnings approach, and the opportunity cost approach. Detailed examples of these and other techniques can be found in various publications: the ADB report, Dixon et al. (1986); Sinden and Worrell (1979); Hufschmidt et al. (1983); and Dixon and Hufschmidt (1986).

A second set of techniques rely on the use of market prices to value costs. These include the very useful cost-effectiveness analysis techniques, and preventive expenditure approaches. These techniques rely on information on actual expenditures to assess the value of changes in environmental quality.

The set of potentially applicable techniques are divided into two groups--those that rely on what are called "surrogate" markets, and those that use potential costs to analyze options. Surrogate markets are cases where one analyzes actual expenditures for one good or service to derive information about another, unpriced environmental resource. Examples of these techniques include property and other land value approaches, wage differential approaches, and the travel cost approach. Cost-analysis techniques rely on information about potential expenditures to determine values. Replacement costs and relocation costs are examples of these.

As outlined in the ADB report, it is important to start simply and use readily observable effects and market prices wherever possible. It

Table 1. Measurement and Valuation Techniques

Generally Applicable

1. Those that use the market value of directly related goods and services:
  - (i) Changes in productivity approaches
  - (ii) Loss of earnings approaches
  - (iii) Opportunity-cost approach
  
2. Those that use the value of direct expenditures
  - (i) Cost-effectiveness analysis
  - (ii) Preventive expenditures

Potentially Applicable

1. Those that use surrogate-market values:
  - (i) Property value approach
  - (ii) Other land value approaches
  - (iii) Wage differential approach
  - (iv) Travel-cost approach
  - (v) Marketed goods as environmental surrogates
  
2. Those that use the magnitude of potential expenditures:
  - (i) Replacement costs
  - (ii) Relocation costs
  - (iii) Shadow-project approach

is important to understand what can be usefully include in a monetary sense and what can only be included in a qualitative sense. A number of problem areas were briefly introduced; these include such questions as the correct discount rate to use, intergenerational equity, value of human life, uncertainty and irreversibility, and aesthetic, social or political factors.

The key point is that the analysts need to consider the project in a holistic manner and use the tool of environmental assessment and economic analysis as an aid to the design of better and more socially profitable projects. The analysis does not give the "correct" answer; rather, it provides information that is a necessary component in an efficient decision making process.

## References

- Dixon, J.A., R.A. Carpenter, L.A. Fallon, P.B. Sherman, and S. Manopimoke  
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