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**AGROFORESTRY IN
EDUCATION AND TRAINING PROGRAMMES
-AN OVERVIEW-**

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February 1989**

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AGROFORESTRY IN
EDUCATION AND TRAINING PROGRAMMES

-AN OVERVIEW-

by

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Presented at the International Workshop
on Professional Education and Training in
Agroforestry, University of Florida,
Gainesville, Florida, USA. December 5-8, 1988.

INTRODUCTION

The history of agroforestry as a science is short, 15 years at the most. However, agroforestry is only a new term for age-old practices of integrated land use in almost all parts of the world. Even though still referred to as a "new area" of scientific activity, the number of national and international research institutions, development and donor agencies, NGOs and others that have taken up agroforestry or agroforestry-related activities has increased rapidly over the last few years.

A group of distinguished research scientists and agroforestry leaders worldwide met in Nairobi in July 1987, on the occasion of the Tenth Anniversary of the International Council for Research in Agroforestry (ICRAF). Their evaluation of the recent history confirmed that agroforestry has come of age and it is here to stay.

Land-use circumstances under which existing agroforestry technologies are applied and the interactions between system components are not, in most cases, properly understood. Research results in agroforestry are, thus, scarce if compared to those available for cash and food crops.

The scarcity of knowledge on existing and potential agroforestry technologies in most tropical and subtropical countries has been largely attributed to the lack of institutional capability to confront pressing land-use problems requiring an innovative approach. Existing rigid structures in compartmentalized, conventional, disciplinary-oriented institutions in research and development programmes, have been identified as major limitations for the development of integrated land-use activities. Insufficient resource allocation compounds the problem (Lundgren, 1987). It remains a fact that in spite of efforts made by international centers to integrate forestry research more closely with agriculture, livestock, social sciences, and other disciplines, few research institutions have achieved a similar integration at the national level. Most agricultural research programmes continue to focus on rice, wheat and maize breeding, while forestry research continues to concentrate on tree improvement or improved utilization (Schuh, 1987).

The research constraint is further aggravated by a shortage of trained and experienced professionals with knowledge and skills to integrate several disciplines that together must be combined in researching, planning and managing agroforestry (Contant, 1980 Huxley, 1980).

The development and implementation of agroforestry education and training programmes have been impaired by several factors, among which the following have often been mentioned: rigid institutional structures that, as it is the case in research and development, have not allowed for programmes to cut across various disciplines; insufficient information on verified scientific methods; lack of appropriate instructional materials; and, lack of adequately prepared lecturers and trainers (Zulberti, 1987).

To summarize, agroforestry research and development is constrained by the lack of trained professionals and rigid institutional structures. At the same time, the training of professionals in agroforestry is equally constrained by insufficient research methodology and rigid institutional structures. Yet, agroforestry is fast becoming incorporated in education and training programmes as an experimental science that can be taught. The paradox presents, no doubt, an interesting challenge to this workshop.

The critical issue, I believe, is not so much the identification of recipes to teach agroforestry worldwide - as programmes will have to respond to different human-resource development needs and country conditions - but to understand the rationale behind approaches developed by institutions that have taken the initiative to incorporate agroforestry in existing education and training programmes. The task of the workshop participants is, therefore, to share those experiences, positive or otherwise, that may help identify paths and cost-effective ways to better respond to the human-resource development needs of developing and developed countries in the future.

Fortunately, we are not starting from zero. An International Workshop on "Professional education in agroforestry" was organized by ICRAF and the German Foundation for International Development (DSE) in Nairobi exactly 6 years ago to debate and establish priorities, plans and procedures for action, mainly in agroforestry professional education but with obvious implications for training programmes as well. It was the first attempt to bring together experts representing the fields and disciplines related to agroforestry and to education on a worldwide basis. A rich source of information, although still far from complete, was uncovered then about where and how agroforestry education was being done (Zulberti, 1987).

In this paper, an attempt is made first to review progress made in the incorporation of agroforestry in education and training programmes since the Nairobi Workshop in 1982 (the past) up to 1988 (the present). The review is based on information currently available to ICRAF. A distinction is made between "education" and "training". Education refers to broader, longer term studies to achieve a higher academic qualification. Training refers to relatively short term, in-service study to achieve a higher level of technical knowledge and/or skills.

ICRAF's approach to promote agroforestry research through education and training is also presented as an example of an action programme currently under application.

Finally, some general thoughts on directions are mentioned (the future) that may produce some food for thoughts.

FROM THE PAST TO THE PRESENT

The Past

It is deemed appropriate at this time to extract the main conclusions and recommendations of the Nairobi workshop as an aide memoire and as a starting point to the present workshop.

In assessing the overall agroforestry education situation as it was in 1982, the participants at the workshop felt that there was a great deal of enthusiasm to include agroforestry in existing programmes. Full programmes in agroforestry were, however, only offered in nondegree training programmes. At the undergraduate and postgraduate levels, agroforestry was mostly included as an element of existing courses in forestry programmes. Research in agroforestry was scarce.

Among the major weaknesses in teaching agroforestry, the following were mentioned: the definition of agroforestry varies in different parts of the world; inadequate knowledge about agroforestry as a land-use system, e.g., solid data on land tenure problems, farmer needs and traditional systems, etc.; rigid institutional structures that make the cutting across of a multidisciplinary programme, such as agroforestry, difficult; and, lack of appropriate instructional materials.

The term "agroforester" was not officially recognized, by many professional bodies. The concern was expressed that to offer a degree in such a "new" subject could impede rather than help the recipients up the ladder of professional attainment. The development of agroforestry into an experimental science that can be taught, and result in the provision of adequate numbers of competent, professionally trained personnel, must be done in a way that recognizes existing professional links and existing professional standards and requirements.

Where the approach to education on the development of land use was already being taught in an integrative way, new and separate educational programmes in agroforestry were not deemed necessary. Where a whole programme on agroforestry education was considered desirable, or essential, then the place to start was at the postgraduate level in the form of a 1- or 2-year Master's degree that combines taught courses and field work.

The greatest development of agroforestry was occurring in the tropics and subtropics; therefore, it was recommended that most postgraduate courses be situated in faculties or institutes in developing countries.

Agroforestry technology is highly location specific, both in terms of the species used and in terms of the detailed design and management of actual operations systems. Practical course work, therefore, needs to be carried out in relation to site-specific and problem-oriented situations if it is to be fully relevant.

Short courses of various kinds were recommended on a regional basis for agroforestry awareness and buildup. Many organizations were identified who may organize these. The workshop identified the need to establish an "International course in agroforestry", either at central institutions or at several regional institutions.

The materials needed for teaching agroforestry must cover both principles and practice. Written matter is available from all the important scientific subject areas to underpin the theoretical foundations for understanding and evaluating agroforestry land-use systems and practices. The task of interpretation and selection was, however, harder in some areas (socioeconomics, crop physiology) than in others (soil science). Qualified groups of specialists were deemed necessary to prepare digests of information within each discipline. Needs were identified for an inventory of existing agroforestry systems that describe the systems and provide actual data for comparison and evaluation, e.g., in-depth case studies and visual aid slide packages prepared together with explanatory booklets to illustrate the concepts, complexity and diversity of agroforestry systems around the world.

The "twinning" of appropriate institutions in developing and developed countries was considered as an approach that may positively assist in the development of agroforestry education and training programmes.

The workshop recommended that the work started for the ICRAF/DSE workshop be continued with the help of regionally appointed institutions to collect and disseminate information on agroforestry education on a regular basis. The publication of journals or gazettes on agroforestry were also encouraged.

Funding support has come slowly to agroforestry education. Donor support was deemed essential for the implementation of the foregoing and should, therefore, be actively sought by all those involved.

The Present

The current status of agroforestry in education and training programmes is organized in two parts. Agroforestry in degree (undergraduate and postgraduate) programmes is presented first, and agroforestry in nondegree training programmes follows.

Agroforestry in Degree Programmes

A survey of educational institutions was conducted in October 1987 to inventory existing postgraduate programmes in Africa, Australia, Europe, India, and North America. Over 60 institutions were contacted and information requested on degree programmes, particularly at the M.Sc. level, in forestry, agriculture, animal sciences, and other related disciplines. Also, we wanted to know to what extent agroforestry or related subject matter is being taught and whether agroforestry research is ongoing or planned. Forty-three institutions responded.

The survey complemented information already available to ICRAF on agroforestry professional education. It also showed that the systematic gathering and updating of information on where and how agroforestry is incorporated in existing education programmes worldwide, is a task that requires larger human and financial resources than are available at present in a single institution like ICRAF.

Today, agroforestry or related subject matter has been incorporated in teaching and research programmes at an unprecedented level. Agroforestry is found as an option for specialization in the last year(s) of B.Sc. or diploma programmes in forestry, natural resource management, environmental sciences, and in courses and special seminars. Full undergraduate and postgraduate programmes in agroforestry are being formulated and implementation has started in quite a few, and there are many students choosing agroforestry-oriented research projects for their dissertation. The list can go on.

The scope and content of agroforestry in education programmes is, however, difficult to assess from programme descriptions or standard lists of course offerings. The institutional "niches" or approaches adopted to incorporate agroforestry in existing programmes is almost as varied as the number of institutions themselves. What ways/methods are the recommended ones to assess the extent to which agroforestry is incorporated in existing programmes?

A good setting for higher degree training in agroforestry aspects requires well-equipped and well-staffed combined faculties of at least agriculture, animal science, and forestry. It also requires a strong faculty commitment to a farming systems approach and the concomitant inter-departmental cooperation in teaching and research. Furthermore, agroforestry research projects that meet the requirements of postgraduate students have to be completed in 9 months or up to 2 years. This kind of project is difficult to design except when it is a constituent part of research programmes of greater amplitude and of an interdisciplinary nature. Such programmes have to be conducted by a team of permanent staff of the institution who, at the same time, act as joint supervisors for the student projects. Are these elements present in existing programmes where agroforestry has been incorporated?

Several points emerge for discussion from the analysis of information on agroforestry in degree programmes. First, traditional forestry programmes seem to be broadening the scope of the discipline. Although still concerned, as they probably should be, with the protection and/or exploitation of natural and planted tree communities, programmes are beginning to reflect an understanding that a new kind of tree specialist is needed who is trained to think in terms of integrated land-use systems (rather than in terms of forests). The trend becomes clear if we take a look at gradual institutional changes: from traditional forestry departments or programmes to "forestry and natural resources", "forestry and resource management", "environmental forestry", "horticulture and forestry", "forestry and range management", etc.

Second, agroforestry is finding the proper "niche" in agriculture. Agriculturists have always considered trees as perennial crops. Now they are also beginning to recognize trees as soil improvers and soil protectors; producers of fodder, food and fruit; and as producers of wood for fuel, building, fencing and other domestic and commercial purposes. This long neglect has pervaded all subjects in the curricula as well as textbooks and journals, from "agricultural botany" to "farming systems", "agricultural economics" and "rural sociology".

Third, the role of the agroforester as a professional "integrator" in multidisciplinary research and development projects is becoming clearer and the trend is likely to become even stronger as integrative disciplines, e.g., ecology, range management, farming systems, are incorporated into existing programmes.

Fourth, six years ago full programmes in agroforestry were only found in nondegree training programmes, whereas today full programmes in agroforestry are being developed at undergraduate and postgraduate levels. A summary of institutions offering degree programmes where agroforestry is included in the academic syllabus or research programme is in the annex (section A). The faculty/department or special programme under which agroforestry is taught is also indicated.

Finally, institutional structures are being created to allow for educational programmes with course work and research projects spanning many disciplines. Several examples are presented in the annex (section B).

Agroforestry in Nondegree Training Programmes

Short-term training leading to the upgrading of professional knowledge and skills in agroforestry has seen in the last few years an upsurge of activities equal, if not larger, to that in education. And, as in education, keeping updated records on courses, workshops, conferences, etc., worldwide, or even on a regional basis, is no small task.

In the absence of staff trained in agroforestry, the first requirement is to provide in-service training, particularly for teaching staff and research workers but also for policy-makers, planners and higher administrators. This must be done through short courses.

ICRAF attempts to inventory short-term in-service courses organized on a regular basis, e.g., annually, by government institutions, regional or international centers where agroforestry is either the main topic or part of a larger theme. A summary of information on courses offered in 1988 that are also expected to be held in 1989 and, probably, onward is in table 1 in the annex (section C).

International Agricultural Research Centers (IARCs) and regional organizations and universities, in both developing and developed countries, play an important role in conducting training programmes in support of national agricultural research systems (NARS) in the developing world. They can also assist national programmes to organize and conduct their own training courses in situ.

An International Agricultural Research Centers' Workshop on Human Resource Development Through Training was held at the International Potato Center (CIP) in September 1988, in Lima, Peru, to address training issues that if addressed collectively can improve the quality and effectiveness of human resource development efforts. A digest on some issues and/or constraints related to agroforestry training follows.

First, commodity-based on-farm research is inadequately addressed for the needs of NARS and requires a holistic approach that goes beyond the mandates of the commodity centers. The diversity of approaches and methods offered to NARS in training have had a negative impact on both the credibility of Centers and of the process. Centers can coordinate on-farm research training activities with the participation of those working in the same geographical regions. To initiate, plan, and coordinate this effort lead Centers need to be identified. Several meetings have taken place in 1988 to coordinate IARCs' networking activities, including training, operating in East and Southern Africa, e.g., ICRAF, CIAT, ILCA, IITA, CIMMYT, and others (Summary Report 1988).

Second, disciplinary-oriented topics that cut across the research of many of the Centers can be addressed collaboratively by those Centers that have ongoing programmes and, therefore, the comparative advantage to do so. Such courses are at present already being offered: agroforestry by ICRAF, agroclimatology by ICRISAT, educational technology by IRRI, and fertilizers by IFDC. An inventory of such courses is needed for distribution to all Centers and interested national institutions (Summary Report 1988).

Third, in some countries national agricultural universities are part of the NARS whereas in others they are not. Some IARCs have evolved strong linkages with these universities, including agreements for thesis research to be conducted at the Centers, contracted research at the universities, and faculty participation in Center training events. A common approach could be explored that is mutually advantageous for establishing or strengthening collaborative relationships with national agricultural universities.

Last, areas of collaboration in training materials need to be identified that can be jointly addressed by Centers, universities and other national institutions. ICRAF is at present conducting an inventory of training materials in agroforestry or related subject matter in East and Southern Africa. A workshop on "training materials in agroforestry" is tentatively planned for 1989.

ICRAF's APPROACH TO HUMAN RESOURCE DEVELOPMENT
IN AGROFORESTRY

Following the recommendations of the External Review that took place in 1985, a change in programme focus and priorities took place recognizing the difficulty, if not impossibility, for the Council to retain the overall aim of having a global impact with very limited resources. While maintaining a responsibility in continuing to develop the agroforestry discipline, the emphasis in the Programme of Work concentrated on dissemination and technology generation through collaborative projects with national and international programmes with a zonal agroecological focus in Africa - the Agroforestry Research Networks for Africa (AFRENA). An integrated "research and training" approach was also formulated then as a more effective way of supporting agroforestry research networking and strengthening national research capabilities (Zulberti 1987).

Short in-service courses, workshops, and residential training were the initial thrusts of the training component at ICRAF. Postgraduate education started in 1988 together with the organization of specialized field trips. A few comments on focus and programme development follow.

Training Courses

Following the recommendations of the Nairobi workshop, ICRAF launched in 1983 a series of international courses on "Agroforestry research for development: concepts, practices and methods". The model of a 3-week course was developed and tested during 1983-85. The course aim is to strengthen the capability of research scientists in developing countries to initiate and implement agroforestry research leading to the generation of technologies that are both suited to local conditions and adoptable by farmers. The programme focus is on the ICRAF-developed Diagnostic and Design (D&D) methodology to undertake the interdisciplinary identification of land-use problems and potentials and establish priorities for research, development and testing of sound agroforestry.

The course programme is organized in modules. The scope and content of modules have been periodically revised to incorporate, change and/or adapt according to progress made in the development of the discipline. For example, the first courses offered in 1983-84 had a strong dose of agroforestry systems "descriptions", because at that time little "quantitative data" were available. The concept of agroforestry was defined with a focus on "systems approach to land-use management" and yet the components were mostly presented as individual units, e.g., tree, crop, animal, man (where information was plentiful) without getting too much into the interaction of these components (where information was scarce). But systems theory is a tool and we did not believe that the mere addition of subject matter on this subject would promote a proper understanding of land management. Furthermore, subject-oriented classificatory structures which may be helpful in the organization of scientific enquiry are

not, necessarily, the best for training people on a systems approach (Fuxley 1982). Nowadays, the course programme is built around the agroforestry systems concepts with plenty of examples and case studies, complete with data (see annex, section D).

To date, 10 international or in-country courses have been organized. Eight of them were offered in English, one in French and English, and one in Spanish. The "D&D course", as it came to be called at ICRAF, is offered in-country to collaborative national institutions linked to the AFRENAs during the planning phase of the networks. When agroforestry research implementation begins, then the training focus changes from the "D&D" to "experimental methods" and "techniques for field research". The course is also organized every year in May at ICRAF Headquarters for a world-wide audience. Information on date, venue, sponsor, and course participants from 1983 to 1988 is in the annex (table 2 section E). A total of 259 researchers have participated. They have come from national agriculture and forestry institutions in 51 countries in Africa, Asia, the Pacific and Latin America; about 10% of participants were women. The distribution of participants by geographical regions and countries is in the annex (table 3 section E).

Workshops, Seminars and Conferences

Creating opportunities for interaction among the different parties connected with agroforestry research is an important element in developing research capability. Workshops, seminars and conferences are, broadly speaking, organized to assess problems, develop guidelines or formulate joint plans. They are usually of short duration (2-5 days). In 1988, 10 workshops, technical seminars and conferences took place. Six of them were held in Kenya and the rest in Rwanda (two), Malawi, and Ethiopia.

On-the-Job Training

The scheme aim is to provide professionals from national institutions in developing countries with an opportunity to undertake agroforestry study/work under the supervision of ICRAF's scientific staff. Internships are 6 months long. The programme emphasizes a practical "learning by doing" approach, with little formal training, e.g., lectures. Twenty-five nationals from Africa participated in this programme since 1982.

Research Fellowships/Visiting Scientists

The programme started in 1983 to allow professional staff and senior scientists from national institutions in developing countries to undertake agroforestry research alongside ICRAF scientific staff. It is a nondegree programme that may last up to 24 months. Eight scientists have participated in the programme from countries such as Ghana, India, Kenya, Peru, Philippines, Tanzania and Uganda.

Postgraduate Education

ICRAF collaborates with AFRENA institutions in the identification of human resource development needs and coordinates a fellowship programme for postgraduate education at the M.Sc. level. The aim is to upgrade the professional qualification of multidisciplinary national research cadres so that a constant supply of well trained researchers is guaranteed to plan and implement agroforestry research. In 1987, a 5-year postgraduate education fellowship programme was approved by the Canadian Agency for International Development (CIDA) for AFRENA Southern Africa (S.A.). The survey of existing postgraduate programmes mentioned in this paper in the section on "The Present", was conducted by ICRAF to identify precisely appropriate postgraduate education programmes for researchers from Malawi, Tanzania and Zambia.

The fellowship programme is organized in such a way that a three-person multidisciplinary team representing food/fodder crop agronomy, forestry/horticulture, and farming systems is trained for each country. Although course work will initially be done abroad, these research will be undertaken "in-zone".

The first AFRENA S.A. researchers have been admitted to start postgraduate studies in 1988 at the University of Florida and Michigan State University in the US, and McGill University in Canada. Plans are underway to start a similar programme for AFRENA E.A.. A project proposal was prepared in 1988 and submitted for donor support to allow 12 researchers from Burundi, Kenya, Rwanda and Uganda to undertake M.Sc. studies over a 5-year period starting, hopefully, in 1989.

There are a number of institutions in Africa, as previously mentioned, who have already started or are planning to start agroforestry education programmes. A proposal to start a postgraduate M.Sc. programme in the region - the Agroforestry Postgraduate Programme for Africa (AFPA) - was prepared by ICRAF and submitted in 1988 for donor support. It is proposed that the programme be established in partnership with an African university and implemented with the participation of one or more educational institutions overseas, ICRAF and other IARCs or regional centers.

The effect of education and training programmes in human resource development in agroforestry will ultimately be seen in what NARS accomplish in the generation of appropriate agroforestry technology. In the meantime, ICRAF will continue to strengthen the capability of national institutions through education and training activities in those areas of expertise where the Council has comparative advantages and available resources. The conclusions and recommendations of the present workshop will, no doubt, give a steady direction for the future of agroforestry education and training programmes worldwide.

Participants to the workshop are kindly requested to identify that information on agroforestry courses and programmes that should be included in this report.

THE FUTURE

It is difficult, of course, to speculate about the future of agroforestry education and training. Moreover, this is precisely why we are here today. There are, however, some issues that can probably be mentioned with reasonable certainty that they will need to be tackled in the near future, e.g.:

.the number of national and international research and development institutions that take up agroforestry or agroforestry-related activities will increase rapidly over the coming few years; as a result, requests for agroforestry education and training will also increase. Are existing education and training institutions prepared to meet the demand and at the same time maintain a high-quality standard of instruction and research? Are available resources, e.g., human, physical, financial, appropriate?

.related to the foregoing, there are several examples of professional careers that evolved in the past as a result of felt needs, but these needs were not assessed beforehand in terms of number of professionals required for that particular field, which resulted in a higher number of graduates than professional employment available. How many agroforesters are needed today - or in the next 5 to 10 years? How can the supply/demand balance be best achieved?

.there will be a rapid increase in terms of technology results coming out of research and development projects that will generate large amounts of information. Who will collect and collate information and prepare digests of use as training materials? What resources are required/available?

.most education and training institutions will succeed in developing institutional structures that allow for multidisciplinary programmes like agroforestry; national research institutions and donor agencies alike may, however, take longer to realize that the potential of agroforestry can only be achieved through an integrated institutional approach. Are there ways/strategies to shorten this gap in time?

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ANNEX

A. AGROFORESTRY IN DEGREE PROGRAMMES

(i) at undergraduate B.Sc. or Diploma level

- .Forestry - Australian National University (Australia), University of Guelph (Canada), University of Toronto (Canada), Moi University (Kenya), Egerton University (Kenya), Gadjah Mada University (Indonesia), University of the Philippines in Los Banos (Philippines), University of British Columbia (Canada);
- .Forestry and Resource Management - University of California in Berkeley (USA), University of Ibadan (Nigeria);
- .Forestry and Natural Resources - Edinburgh University (UK);
- .Social Forestry - Institute Pertanian Bogor (Indonesia), Universiti Pertanian Malaysia (Malaysia);
- .Forest and Wood Sciences - Colorado State University (USA);
- .Agriculture and Forestry - Escuela de Ciencias Ambientales (Costa Rica), Universidad Nacional Heredia (Costa Rica), Instituto Tecnológico Cartago (Costa Rica), Facultad de Agronomía (El Salvador), Universidad de San Carlos (Guatemala), Universidad Saldívar (Guatemala), Facultad de Agronomía y de Ciencias Forestales (Honduras), Universidad Autónoma (Mexico), Colegio Superior de Agricultura Tropical (Mexico), University of Aberdeen (UK);
- .Management Development Programme for Africa - Silsoe College (UK);
- .Veterinary Medicine and Animal Science - Universiti Pertanian Malaysia (Malaysia);
- .Biology - Wau Ecology Institute (Papua New Guinea), Universidad Centro Americana (Nicaragua);
- .Botany and Horticulture - University of Hawaii (USA);
- .Agroforestry - Memorial State University (Philippines), University College of North Wales in Bangor (UK);
- .Natural Sciences - Facultad de Ciencias Ambientales (Guatemala).

(ii) in postgraduate M.Sc or Diploma programmes

- .Forestry - Australian National University (Australia), University of Melbourne (Australia), Faculdade de Ciências Agrárias do Para (Brazil), Universidade Federal Rural de Pernambuco (Brazil), Universidad de Santiago (Chile), Universidad de Caldas (Colombia),

University of New Brunswick (Canada), Moi University (Kenya), University of Canterbury (New Zealand), University of Technology (Papua New Guinea), Kasetsart University (Thailand), Universidad Agraria La Molina (Peru), Michigan State University (USA), University of Kentucky (USA), University of Massachusetts (USA), Oregon State University (USA), University of Illinois (USA), Texas A&I University (USA);

- .Forest Management - Ibadan University (Nigeria);
- .Forestry and Environmental Studies - Yale University (USA);
- .Forestry and Natural Resources - Colorado State University (USA);
- .Forestry and Resource Management - University of California in Berkeley (USA);
- .Forest Resources and Conservation - University of Florida (USA);
- .Tropical Forestry - Wageningen Agricultural University (the Netherlands);
- .Forestry and Range Management - Washington State University (USA);
- .Forestry for Rural Development - International Institute for Aerospace Survey and Earth Sciences (ITC) and the International Agricultural Centre (IAC) (the Netherlands);
- .Community Forestry in Rural Development - same as above;
- .Social Forestry - University Pertanian Malaysia (Malaysia), University of Reading (UK), Oxford University (UK);
- .Environmental Forestry - University College of North Wales in Bangor (UK);
- .Environmental Studies - University of the Philippines at Los Banos (Philippines), University of East Anglia (UK);
- .Horticulture and Forestry - University of Horticulture and Forestry in Solan (India);
- .Agriculture and Forestry - University of Aberdeen (UK);
- .Agricultural Development - Technical University of Berlin (Germany);
- .Agriculture - University of Maine (USA);
- .Agricultural Sciences and Natural Resources - Universidad de Costa Rica/Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE) (Costa Rica);
- .Renewable Natural Resources - University of Science and Technology in Kumasi (Ghana);
- .Management Development Programme for Africa - Silsoe College (UK).

B. SOME EXAMPLES OF INSTITUTIONAL STRUCTURES CREATED TO ALLOW FOR EDUCATIONAL PROGRAMMES SPANNING SEVERAL DISCIPLINES

(1) The University of Alberta has a unique Faculty of Agriculture and Forestry in Canada where two land-based disciplines are both taught as Faculty programmes and share some of the common basic subjects. Although the Faculty offers no formal course in agroforestry as such, it is able to provide synthesis courses in this subject through directed studies and research work.

(2) The University College of North Wales (UK) formed the School of Agricultural and Forest Sciences with a land-management bias. In addition, the Centre for Arid Zone Studies was created within the framework of the School to deal with problems of land use in difficult environments in the semi-arid and arid tropics. A 3-year B.Sc. degree programme in agroforestry is offered. At the postgraduate level, there is no specialized formal agroforestry teaching, but there are research opportunities.

(3) The University of Melbourne is at present the only one in Australia in which both agriculture and forestry are represented. Research in agroforestry has been proceeding for some time. Having developed a strong research base, the Faculty has now moved to develop graduate training in agroforestry. A course work programme cutting across disciplines has been developed with particular strengths in agroforestry. Students who achieve a satisfactory result in the postgraduate diploma course work can transfer to complete a Master's degree by research (in 2-years' time).

(4) Also in Australia, the Department of Forestry at the Australian National University will merge with the Department of Geography in 1989 to become the School of Resources and Environmental Management where postgraduate (and undergraduate) courses in agroforestry will continue to be taught. Agroforestry research is actively pursued by the Forestry Department and the Centre for Forestry in Rural Development in Australia, Africa, Asia, and the Pacific.

(5) The Center for Semi-Arid Forest Resources at the Caesar Kleberg Wildlife Research Institute of Texas A&I University in the US conducts research leading to the improvement of valuable plants for arid and semi-arid regions. Information obtained from these studies is being applied in the development of international agroforestry programmes. Even though no formal agroforestry courses are available, M.Sc degrees are offered by the Department of Agriculture with thesis research in agroforestry.

(6) The International School of Forestry and Natural Resources at Colorado State University in the US offers nondegree and degree programmes at M.Sc and Ph.D. levels in forestry where course work includes forestry, horticulture and agronomy as well as specialized courses in agroforestry.

(7) The Yale Tropical Resources Institute (TRI), created in 1984, provides a focus for tropical resource studies and training at Yale University in the US. TRI has a broad-based curriculum in tropical natural resources research and management. Courses in tropical forestry typically include tropical economic botany, tropical ecology, rural development sociology, and tropical natural history. Students have access to classes in the departments of Anthropology, Economics, Political Science, Sociology, the School of Organization and Management, and others. ICRAF is a member of TRI's Advisory Group.

(8) At the University of Florida, the School of Forest Resources and Conservation is a unit of the College of Agriculture. The primary objective of the School's three Departments - Forestry, Wildlife and Range Sciences, and Fisheries and Aquaculture - is to provide professional education in the areas of forestry, wildlife ecology, and resource conservation. An agroforestry course started for the first time in January 1988. In addition to this course, UF offers courses in Farming Systems Research/Extension, Food in Africa, Tropical Forestry, and other issues related to agricultural development and natural resource management where agroforestry elements are included.

(9) At the University of Ibadan in Nigeria, the Faculty of Agriculture and Forestry offers agroforestry at the undergraduate level in the Department of Forest Resources Management as a three-unit course during the 4th year, which is also a practical year. In addition, introduction to land-use planning is taught in the 3rd year and multiple land use is offered in the 5th year. The Department of Forest Resources Management has been involved in agroforestry research for some time.

(10) The Institute of Renewable Natural Resources at the University of Science and Technology in Kumasi was established in 1982 to promote the proper management and utilization of forests, savannas, wildlife, freshwater fisheries and watersheds through teaching, research, and extension. Four departments representing the foregoing areas have been involved in offering courses leading to B.Sc., Diploma and M.Sc. degrees in "renewable natural resources" and "wood technology and industrial management". Courses are designed to train graduates in a multiple-use management approach based on the ecosystem concept "to plan for the whole rather than any one particular resource and be able to discuss intelligently with and seek advice from other specialists" (personal communication with Asare, 1984). Agrosilvopastoral research integrating tree crop, food crop and small ruminants has been conducted. A postgraduate diploma course in agroforestry started in 1988.

C. AGROFORESTRY IN NONDEGREE TRAINING PROGRAMMES

Table 1. Training Courses in AF or Related Subjects Offered Regularly by National and International Organizations

VENUE	ORGANIZER	DURATION	EXPECTED-AUDIENCE	TITLE/TOPICS
Tel Aviv Israel	Centre for International Agricultural Development Cooperation (CINADCO), Ministry of Agriculture P.O.B. 7054 Tel-Aviv 61070 Israel Tel:03-211490/492 Tlx:361496 MINAG IL	3 months	Government and non-government officials and extension workers who have worked in agriculture, pasture and agroforestry in deserts, arid and semi-arid zones for at least 3 years.	Agroforestry, Desert Agriculture and Extension Programme: Intensive irrigated agriculture under desert conditions, soil and water management, agroforestry under rainfed conditions, etc.
Nairobi Kenya	International Council for Research in Agroforestry (ICRAF) P.O. Box 30677 Nairobi Kenya Tel:521450 Tlx:22048	3 weeks (Every May)	Research scientists in agriculture, forestry, livestock science, social sciences.	Agroforestry Research for Development Programme: Concepts and practices of agroforestry; farming systems and agroforestry; diagnosis of LUS, evaluation of agroforestry systems, experimental designs
University of the Philippines at Los Banos, College, Laguna PHILIPPINES	Winrock International IF/FRED Training Unit P.O. Box 1038 Kasetsart Post Office Bangkhen Bangkok 10903	2.5 weeks 2.5 weeks	Foresters Foresters and social forestry officers	Social Science Concepts and Methodologies for Foresters Programme: Social sciences research methodo- logies for Foresters Forestry for Social Scientists Programme: Forestry, forestry systems and people oriented forestry
Wageningen The Netherlands	International Agricultural Centre (IAC) P.O. Box 88 6700AB Wageningen The Netherlands Lawickse Allee 11 Telegrams:INTAS Tel:08370-90111 Tlx:45888-INTAS NL	3 months	Policy staff in developing countries from government and non-government organizations. Preference to teams of two participants per country, one forester and one agronomist/ livestock or rural planning	The Design of Community Forestry Programme: Forestry in rural development, ecology, silviculture, forest survey technology, agroforestry, watershed management, energy, land evaluation, etc.
Bedford United Kingdom	Silsøe College Professional Development Center Silsøe College Silsøe Bedford MK454DT Tel:Silsøe (0525)60428 Tlx:265871(MONREFG) REF EVM305	1 month	Technical staff working in soil conservation in third world countries	Soil Conservation Programme: Soil conservation design, soil conservation for sustainable farming or land husbandry systems

<p>Edinburgh United Kingdom</p>	<p>TROPAG Consultants Ltd. The School of Agriculture University of Edinburgh West Maires Road Edinburgh Scotland, UK EH9 3JG Tel:031-667 1041 Fax:031-667 260 Tlx:727617</p>	<p>2 months</p>	<p>Research scientists and extension staff</p>	<p>Tropical Agroforestry Programme: agroforestry, agriculture, forestry land extension methods for the introduction or improvement of agroforestry systems</p>
<p>West Midlands United Kingdom</p>	<p>Agricultural Education and Training Unit (AETU) The Polytechnic Wolverhampton Castle View Dudley DY1 3HR West Midlands Tel:0384-459741 Tlx:336301 POLWOL G</p>	<p>3 months</p>	<p>Teachers and trainers of agroforestry, forestry and other natural resources subjects</p>	<p>Agroforestry/Forestry Teaching Programme: teaching methodologies for natural resource subjects</p>
<p>Fort Collins Colorado USA</p>	<p>International School of Forestry & Natural Resources College of Forestry & Natural Resources Fort Collins, Colo 80523 Tel:(303) 491-5443 Tlx:9109309011</p>	<p>Various</p>	<p>Government officials or private employees working or teaching on forestry and natural resources</p>	<p>Various topics, e.g. - natural resources - natural resources ecology - range science - forest and wood sciences - earth resources, etc.</p>
<p>Logan Utah USA</p>	<p>Utah State University Range Science Department Logan, Utah USA 84322-5005 Tel:(801) 750-1696 Tlx:3789426</p>	<p>3 weeks</p>	<p>Students, administrators and land managers</p>	<p>Desertification, Rehabilitation land Management of Rangelands in Pastoral Systems Programme: pastoral production systems, ecology of arid lands, range/livestock extension, etc.</p>
<p>Logan Utah USA</p>	<p>International Irrigation Center and Utah State University Department of Agricultural and Irrigation Engineering Utah State University Logan, Utah 84322-4150 USA</p>	<p>5 weeks</p>	<p>Agricultural Engineers Watershed Management Specialists, Conservationists, and Agronomists</p>	<p>Soil & Water Conservation Management Programme: erosion processes and measurement, economics and soil and water conservation, biological treatments (agroforestry), etc.</p>

D. MODULES FOR THE ICRAF COURSE TO BE HELD 8-26 MAY 1989

I-Introduction to agroforestry

The systems approach, agroforestry systems and practices, multipurpose trees and shrubs for agroforestry systems, agroforestry systems and their recommendation domains, and interaction of components in agroforestry systems;

II - Diagnosis and Design

Introduction to D&D, analysis of ecozonal land-use systems (macro and micro) to identify constraints and agroforestry opportunities, identification and specification of agroforestry improvements or interventions, ex ante analysis of proposed agroforestry systems/technologies for existing farming systems, and derivation of research and extension agenda;

III - Agroforestry Experimentation

Technology development process, and critical steps in design and analysis of on-station research and on-farm experimentation, e.g., identification of researchable problems, definition of experimental objectives/hypotheses, formulation of treatments/treatment combinations, selection of experimental designs;

IV - Agroforestry Evaluation

Main evaluation domains: ecology, biology, economy, sociology; time frame for evaluation; user-perspective evaluation; evaluation of agroforestry components, practices or systems; and impact on other systems.

E. ICRAF TRAINING COURSES 1983-88 AND PARTICIPANTS

Table 2

	I	II	III	IV	V	VI	VII	VIII	IX	X	TOTAL
VENUE	ICRAF KENYA	ICRAF KENYA	UPM MALAYSIA	UNIPA PERU	ICRAF KENYA	HYDERABAD INDIA	CHIPATA ZAMBIA	ICRAF KENYA	ICRAF KENYA	ICRAF KENYA	-
DATES	1 - 18 November 1983	4 - 22 June 1984	1 - 19 October 1984	3 - 22 June 1985	4 - 22 November 1985	16 - 30 September 1986	Dec 5 - 17 November 1986	11 - 29 May 1987	Nov 23- Dec 10 1987	9 - 27 May 1988	-
SPONSORS	ICRAF/ USAID	ICRAF/ USAID	ICRAF/ USAID	ICRAF/ USAID	ICRAF/ USAID	ICRAF/ FORD FOUNDATION	ICRAF/ IDRC	ICRAF/ SIR	ICRAF/ USAID	ICRAF/ DSO	-
<u>PARTICIPANTS</u>											
A. AFRICA	22	21	0	0	28	0	24	12	22	20	149
B. ASIA & PACIFIC	0	0	19	0	1	29	0	10	0	15	74
C. LATIN AMERICA	0	3	0	26	0	0	0	3	0	4	36
TOTAL	22	24	19	26	29	29	24	25	22	39	259

Table 3 Participants to ICRAF Training Courses

Region	Country	Courses										Total
		I 1983	II 1984	III 1984	IV 1985	V 1985	VI 1986	VII 1985	VIII 1987	IX 1987	X 1988	
A. Africa	Benin	-	1	-	-	-	-	-	-	-	1	2
	Botswana	-	1	-	-	-	-	-	-	-	-	1
	Burundi	1	-	-	-	2	-	-	-	6	-	9
	Cameroun	-	-	-	-	-	-	-	-	-	1	1
	Cape Verde	1	-	-	-	-	-	-	-	-	-	1
	Ethiopia	2	-	-	-	2	-	-	1	1	4	10
	Ghana	1	1	-	-	-	-	1	1	-	1	5
	Kenya	6	5	-	-	7	-	1	1	8	1	29
	Lesotho	-	-	-	-	-	-	-	-	-	1	1
	Liberia	-	1	-	-	-	-	-	-	-	1	2
	Malagasy	1	-	-	-	3	-	-	-	-	-	4
	Malawi	1	1	-	-	1	-	4	-	-	-	7
	Mali	-	-	-	-	1	-	-	-	-	1	2
	Mauritius	1	-	-	-	-	-	-	-	-	-	1
	Morocco	-	-	-	-	-	-	-	-	-	1	1
	Mozambique	-	-	-	-	-	-	-	-	-	1	1
	Niger	1	-	-	-	-	-	-	-	-	-	1
	Nigeria	1	2	-	-	1	-	-	1	-	-	5
	Rwanda	-	-	-	-	2	-	-	-	1	1	4
	Senegal	-	1	-	-	-	-	1	-	-	-	2
	Sierra Leone	-	-	-	-	-	-	-	2	-	-	2
	Somalia	-	-	-	-	-	-	-	1	-	1	2
	Sudan	-	2	-	-	5	-	-	3	-	-	10
	Tanzania	3	1	-	-	-	-	4	-	-	1	9
	Tunisia	-	-	-	-	-	-	-	-	-	1	1
	Uganda	2	3	-	-	3	-	-	1	6	1	16
	Zaire	-	-	-	-	-	-	-	1	-	1	2
Zambia	1	-	-	-	-	-	9	-	-	-	10	
Zimbabwe	-	2	-	-	1	-	4	-	-	1	8	
	Sub-total	22	21	-	-	28	-	24	12	22	20	149
B. Asia & Pacific	Bangladesh	-	-	-	-	-	-	-	-	4	-	4
	China	-	-	-	-	-	-	-	-	-	2	2
	India	-	-	1	-	-	29	-	4	-	1	35
	Indonesia	-	-	4	-	-	-	-	-	-	-	4
	Malaysia	-	-	6	-	-	-	-	1	-	1	8
	Nepal	-	-	-	-	-	-	-	1	-	1	2
	Pakistan	-	-	-	-	-	-	-	-	-	1	1
	Papua New Guinea	-	-	-	-	-	-	-	-	-	1	1
	Philippines	-	-	4	-	1	-	-	1	-	1	7
	Sri Lanka	-	-	-	-	-	-	-	-	-	1	1
	Thailand	-	-	4	-	-	-	-	1	-	2	7
	Vietnam	-	1	-	-	-	-	-	2	-	-	3
		Sub-total	-	-	19	-	-	29	-	10	-	15
C. Latin America and Caribbean	Belize C.A.	-	-	-	-	-	-	-	-	1	-	1
	Bolivia	-	-	-	3	-	-	-	-	-	-	3
	Brazil	-	-	-	4	-	-	-	-	1	-	5
	Colombia	-	-	-	4	-	-	-	-	-	-	4
	Costa Rica	-	1	-	-	-	-	-	1	-	-	2
	Ecuador	-	-	-	3	-	-	-	-	1	-	4
	Guatemala	-	-	-	-	-	-	-	1	-	-	1
	Peru	-	2	-	9	-	-	-	-	1	-	12
	Venezuela	-	-	-	3	-	-	-	-	-	-	3
	Trinidad	-	-	-	-	-	-	-	1	-	-	1
	Sub-total	-	3	-	26	-	-	-	3	-	4	36
	Total No. of participants	22	24	19	26	29	29	24	25	22	39	259

AFRENA S.A.
Survey of Educational Institutions Contacted in Africa, Australia,
Europe, India and North America

A. AFRICA

Dean
Forest Resource and Wildlife Management
Moi University
P.O. Box 3900
Eldoret
KENYA

Egerton University
Private Bag
P.O. Njoro
Nakuru
KENYA

Head
Department of Forest Resources Management
University of Ibadan
Ibadan
NIGERIA

Sokoine University of Agriculture
Faculty of Forestry
Department of Wood Utilisation
P.O. Box 3009
Morogoro
TANZANIA

B. AUSTRALIA

Head
Department of Forestry
Australian National University
Canberra ACT
AUSTRALIA

Prof. I. Ferguson
Faculty of Agriculture & Forestry
University of Melbourne
Parkville
Victoria 3052
AUSTRALIA

- 23'

C. EUROPE

Dean
Forestry Institute "HINKELOORD"
Wageningen Agricultural University
P.O. Box 342
6700 AH Wageningen
THE NETHERLANDS

Principal
University College of North Wales
Bangor
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Vice Chancellor
University of Oxford
University offices
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Vice Chancellor
University of Edinburgh
Edinburgh, EH8 9YL
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Vice Chancellor
University of Aberdeen
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Faculty of Agriculture
University of Reading
White Knights
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Reading RG6 2AN
U.K.

Silsoe College
Silsoe
Bedford, MK45 4DT
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D. INDIA

Registrar
University of Horticulture and Forestry
Solán-173 230
INDIA

E. NORTH AMERICA

Canada

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Fredericton
New Brunswick
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University of Guelph
Faculty of Agriculture
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F. UNITED STATES OF AMERICA

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Head
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U.S.A.

Dean
School of Forestry and Environment Studies
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Head
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(USA cont'd)

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Department of Forestry
Michigan State University
East Lansing
Michigan 48824
U.S.A.

President
International Programs
College of Environmental Science and Forestry
State University of New York
Syracuse
New York 13210
U.S.A.

Head
Department of Forest Science
Oregon State University
Corvallis
Oregon 97331
U.S.A.

Head
Ceasar Kleberg Wildlife Research Institute
Texas A & I University
Kingsville
Texas 78363
U.S.A.

Dean
Department of Forestry and
Range Management
Washington State University
Pullman
Washington 99164
U.S.A.

28

(USA continued)

Dean
College of Natural Resources
University of Wisconsin
Stevens Point
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U.S.A.

Head
Department of Forestry
University of Florida
Gainsville
Florida 32611
U.S.A.

29

G. SOUTH EAST ASIA

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Jl. Raya Pajajaran
P.O. Box 28
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INDONESIA

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Los Banos
PHILIPPINES

Don Mariano Marcos State University
Bacnotan
La Union
PHILIPPINES

Universiti Pertanian Malaysia (UPM)
Serdang
Selangor
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COLOMBIA