Forestry education

New trends and prospects

Seventeenth session of the
FAO Advisory Committee on
Forestry Education
combined with
Regional Expert Consultation
of the Asian Network
on Forestry Education

Bangkok, Thailand
13-15 December 1993

FAO FORESTRY PAPER
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FAO ADVISORY COMMITTEE ON FORESTRY EDUCATION

Seventeenth Session

Thailand, 13-15 December 1993

SUMMARY RECORD

The 17th Session of the FAO Advisory Committee on Forestry Education (ACFE) was organized in combination with the Regional Expert Consultation of the Asian Network on Forestry Education (ANFE). The agenda is shown in Appendix 1. A total of 57 persons participated (10 ACFE members, 13 resource persons, 27 ANFE experts and 7 observers). Thirty participants were from developing nations and 27 from industrialized countries. The list of participants is given in Appendix 2.

The session focused on the need to widen the traditional education and training of foresters so as to incorporate multiple land use, sustainable development and an awareness of how land use interacts with social conditions. Mr. M. Kashio pointed out, while outlining the specific problems in south-east Asia, that the key note has to be as stated at the UNCED, "sustainable development in an environmentally sound, economically viable, socially fair and acceptable way". With particular reference to the region Dr. A. Temu called for forestry educators to respond by reviewing their objectives in a radical way, adapting the curriculum to meet the diverse needs not only of global demands but also of regional and national needs, with a particular shift to multiple land use, despite the resource implications such a shift in curriculum might entail. This call was echoed by Mr. C. Chandrasekharan when he pointed out that most countries of the region had not been able to realise the full potential of non-wood forest products, a situation that had as much to do with inadequacies in forestry education and training as in institutional blockages. Dr. K.Awang referred to the problem that a long period is required for human resource development, "the new forester cannot be produced at the speed many would like".

The extent to which present curricula, and curriculum revisions currently being considered, meet the needs for this "new forester" was a matter of considerable debate. Professors E.P. Bachelard and D.M. Griffin advocated that curricula should aim to produce graduates who are at one and the same time both experts in terms of managing the complex natural resource that is the forest and generalists in terms of the range of disciplines adjacent to and pertaining to forest management. Professor H.G. Miller made a very similar point, but while emphasising that professional and technical competence must be maintained within education programmes at all levels, he also argued that new personal attitudes had to be inculcated as much through the intellectual environment in which the course is taught as through any changes to the curriculum: "teaching should not assume the objectives of forest management, rather it should illustrate how silviculture, policy instruments etc. change with legitimate differences in the demands societies place upon forests". For such training to be effective, as Professors Bachelard and Griffin pointed out, foresters have to develop communication skills and expertise in areas previously regarded as being at best peripheral to mainstream forestry education.

The changes that are required at the undergraduate level are considerable in comparison to the traditional degree. Professors Bachelard, Griffin, Miller and Ferguson all felt that curricula revisions of recent years had already gone a considerable way to responding to the changes required at undergraduate level. However, Professor F. Gilbert argued that more radical approaches were necessary if the desired outcome of educating for multiple use was to be achieved: "management must be ecosystem-based and directed towards long-term stability", even that "forestry education must integrate resources and management and ultimately managers should be moulded into a single professional body". Difference in views seemed to relate more the extent to which the ethos of stewardship had already become incorporated into forestry curricula in the different countries rather than any divergence in beliefs as to the ultimate aim. Professor Gilbert, however, seemed rather less concerned over the need to maintain a "core of professional competence" than were, for example, either Professors Bachelard and Griffin or Professor Miller. Rather worryingly, it would seem from Mr. Kashio and Dr. Temu that multiple use was less a part of forestry curricula in many of the educational institutions of south-east Asia than elsewhere.

A paper by Professor Dr. M. Becker and Professor P. Schmidt, describing the Erasmus Scheme of the European Union, demonstrated the extent to which new ideas and attitudes can be developed through organized student exchange, and to a lesser extent exchange of staff.

There was general agreement that initial training at all levels would have to be systematically augmented by subsequent in-service professional training. Professor Ferguson put the matter succinctly when he stated: "If there is to be an argument for continuation as a profession, it lies in its demonstrated competence to apply the technology rather than in any exclusive possession of the knowledge. It is my personal view that any profession ought to be initiating periodic short courses and ought to require that members undertake some quantum of that further education as a demonstration of their commitment to maintaining competence". This was underlined by Mr. J.M. Higgs who maintained that programmes of continuing professional development, however organized, were "fundamental tools" to be employed by the forestry education community. As if to emphasize that information acquisition alone is not sufficient, Mr. D. Dykstra pointed out that environmentally benign logging is as much to do with the willingness to apply proper supervision as to obtaining new knowledge. The inculcating of a commitment to the environment and the preparedness to exert professional judgement and supervision, however, are proper aims of education. This education must be provided effectively and to a properly validated standard, aspects that become difficult if the educational world is undergoing rapid change, as was pointed out by Professor H. Peredo regarding Chile's inorganic and explosive growth of privately financed forestry education.

The meeting was unanimously considered innovative. Its expansion by holding it in conjunction with the Asian Network on Forestry Education (ANFE) produced a critical mass of interested participants from the region which kept the discussions lively and enthusiastic. The quick sequence of presentation of high-level papers kept the meeting under continuous and dynamic pressure.

Professor H.G. Miller of the University of Aberdeen, U.K was elected as the next Chairman of ACFE. This was the seventh and last session chaired by Professor D.M. Griffin, and his outstanding, sustained contribution to forestry education worldwide was highlighted by the members. It was suggested that the 18th Session should be held in a Latin American country.

As a field activity the Faculty of Forestry and the Regional Community Forestry Training Centre (RECOFTC), Kasetsart University, Bangkok were visited.

Two informal working groups were formed to discuss ideas about curriculum development and continuing education and the idea was developed to involve ACFE members in collaborative activities between sessions.

Conclusions and Recommendations

Conclusions

1. First degrees in forestry should establish a common, solid foundation (core curriculum) with the intention of educating professionally competent natural resource managers of the forested environment, using this last term in its widest sense. This education should not presuppose the objectives of management. These objectives should be established by society through its government, with strong input by forestry professionals. Nonetheless, utilization of trees and forests will be inherent in most forest management though the forms of utilization will vary greatly, e.g. tourism, recreation, non-wood forest products, wood production, water and so on. As no other professional will have expertise in logging, the core curriculum should usually contain appropriate courses in logging and harvesting.

2. The periphery of subjects surrounding the core should aim to make the forest manager generally educated in a range of disciplines and issues underpinning or impacting on forest management. Whilst some are likely to feature in most curricula, many will be 'site specific', influenced strongly by the nature of forestry in each particular country and even by the ethos of the institution.

3. In addition to the subject content of a curriculum, there is the need to impart attitudes and modes of behaviour. There should be emphasis on a proper humility and a readiness to consult whilst at the same time having confidence in one's own professional ability and a readiness to inform the political decision making process.

4. Forest scientists, as distinct from forest managers, may originate from a number of first degree courses in addition to those in forestry. Almost always, these scientists require education going far beyond a first degree. Postgraduate research qualifications, usually obtained in universities, are generally required. Such research degree courses should include sections on the design, monitoring and evaluation of research as well as in the scientific conduct of research.

5. Continuing education is now essential for forestry practitioners and has two fundamental aims:

   (a) to maintain the competence of forest managers throughout their careers;

   (b) to give specialized knowledge to individuals as the need arises during their careers.

   The responsibility for effective continuing education is broadly spread. Universities, state agencies, industrial groups, commercial companies, forest owners and professional associations all have a role to play. The funding of continuing education is often a vexed issue.

6. Although the above conclusions are to be seen initially in regard to professional education, they also apply with little change to technical education. Vocational education, by its very intent, raises other issues not addressed in the session. The Committee did note the pressure for 'competency-based' education at sub-professional levels in a number of countries. However, its usefulness in many aspects of professional education is doubtful because of the problems posed by the important higher level skills and attributes.

7. Looking to the future, (a) the education of private or community forestry owners is seen as a topic demanding increasing, focused attention; (b) the value of regional forestry networks was realized; and (c) the desirability of holding overlapping meetings of the Advisory Committee with members of regional networks was recognized.

Recommendations

The regular programme of the Forestry Education section of FAO and the main themes to be addressed at the 18th Session of the Advisory Committee should be focused upon:

1. curriculum development, including definition, evaluation and revision; and

2. continuing education in a wide sense.

This integration of activities would both be efficient and add meaning to the work of the Advisory Committee through its being able to offer timely detailed advice on the regular programme.

APPENDIX 1

FAO ADVISORY COMMITTEE ON FORESTRY EDUCATION

17th Session

combined with

REGIONAL EXPERT CONSULTATION OF THE ASIAN NETWORK ON FORESTRY EDUCATION (ANFE)

13-15 December 1993

AGENDA

Monday 13 December

1. Opening Ceremony

   Statements of:

   - Mr. J. Mercado, Representing Assistant Director-General, RAPA
   - Prof. D.M. Griffin, Chairman, ACFE
   - Mr. M. Kashio, Secretary of ANFE, RAPA

2. Adoption of the Agenda

Session 1: **FAO activities in the field of forestry education and training and follow up to the recommendations of the 16th session of ACFE.**

3. Secretariat note by Dr. F.M. Schlegel, Secretary of ACFE, FOR, FAO HQ, Rome.

Session 2: **Adaptation of forestry education to users' needs**

4. How to interlink social sciences and extension and communication in professional and technical level forestry education curricula (re. 16th ACFE). Prof. H. Miller, University of Aberdeen, U.K. (Global)

5. Forestry education's response to changing social values and other resources knowledge. Prof. F. Gilbert, Faculty of Natural Resources and Environmental Studies, University of Northern British Columbia, Canada (Global)

6. Response to users' needs in forestry education, with special reference to technical and socio-economic aspects of silviculture and forest management teaching in the Asia-Pacific region. Dr. K. Awang, Winrock F/FRED Project, Pertanian University, Malaysia (Regional)

7. Integration of university courses and exchange of forestry students in Europe under the ERASMUS/Silva-Network scheme (re. 16th ACFE). Prof. M. Becker, University of Freiburg, Germany and P.Schmidt, Wageningen, The Netherlands (Global)

Note: "Regional" and "Global" refer to the scope of the papers.

Tuesday 14 December

Session 3: Continuing education

8. Continuing professional forestry education: a survey of issues (re. 16th ACFE). Prof. E.P. Bachelard and Prof. D.M. Griffin, Australian National University, Canberra, Australia (Global)
9. Refresher and in-service forestry training: responding to the challenges of maintaining quality forestry faculty, government, and industrial personnel (re. 16th ACFE). Mr. J.M. Higgs, USDA Forest Service, International Forestry, Education & Training, Washington DC, U.S.A. (Global)

Session 4: New approaches and disciplines in Forestry Education

10. Postgraduate level education in the Asia-Pacific region. Prof. I.S. Ferguson, University of Melbourne, Australia (Regional)

11. The professional and technical forestry education network in the Asia-Pacific region. Present working inter-institutional linkages and prospects. Mr. M. Kashio, FAO RAPA (Regional)

12. The teaching of ecologically benign logging methods for professional and technical level forestry schools in the Asia-Pacific region. Mr. D. Dykstra, FOP, FAO HQ Rome (Regional)

13. Non-wood forest products in forestry education (re. 16th ACFE) Mr.C. Chandrasekharan, FOP, FAO HQ Rome (Regional)

14. Integrating multiple land-use approaches into forestry education. With emphasis on ways to train teaching staff and focus on field exercises and the development of instruction materials. Dr. A. Temu, ICRAF, Nairobi, Kenya (Global)

15. Professional forestry education with private or public financing. Strengths, weaknesses, quality and standards (re. 16th ACFE) Prof. H. Peredo, University Austral de Chile

Wednesday 15 December

Session 5: Training private owners and workers

16. Private sector contribution to forestry training programmes in France (re. 16th ACFE) J. Bedel, ENGREF, Montpellier, France (Global)

17. Education of private forest owners. Alternatives, perspectives and implications for vocational training (re. 16th ACFE) Mrs. C. Giry, Institut pour le Développement Forestier, Paris, France (Global)

Session 6.1: ACFE Administrative Matters

(For ACFE members only)

18. Election of a new Chairman of ACFE

19. Any other business:

    i) Information by the Chairman
    ii) Recommendations of the ACFE

20. ACFE membership

21. Date and place of 18th session of ACFE

Visit to: i) Faculty of Forestry, Kasetsart University, and ii) the regional Community Forestry Training Center (RECOFTC)

Farewell dinner

APPENDIX 2

FAO ADVISORY COMMITTEE ON FORESTRY EDUCATION
COMITE CONSULTATIF FAO DE L'ENSEIGNEMENT FORESTIER
COMITE ASESOR DE LA FAO SOBRE ENSEÑANZA FORESTAL

Seventeenth Session
Dix-septième session
Decimoséptima reunión

Bangkok, Thailand
13-15 December 1993

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APPENDIX 3

SECRETARIAT NOTE

by

F.M. Schlegel [1]

GENERAL

Over the last two years the Forest Research, Education and Training Branch has continued to work without a Forestry Officer (Extension). Hence the Forestry Officer (Education) has had to carry out all technical support to Forestry Extension in the Field Programme. The recruitment of a Forestry Officer (Extension) was carried out in 1993 and his nomination will come into effect in 1994. This will allow the Branch to respond effectively to ACFE's recommendations regarding Forestry Extension (12th Session of ACFE, Nairobi, Kenya, 1983).

FOLLOW UP TO ACFE RECOMMENDATIONS

A manual on teaching methodology on environmental/forestry education for rural teachers in Andean countries was prepared. It is at present being edited with the assistance of an environmental education expert. It will be published in 1994. (Follow up to the 15th Session of ACFE, Antalya, Turkey, 1989.)

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1 Forestry Officer (Education), Forest Research, Education and Training Branch, Forest Resources Division, Forestry Department, FAO, Rome, Italy.

An updated Directory of Forestry Education and Training Institutions was prepared and printed as a miscellaneous publication. It was distributed worldwide for comments and additional information. The final version will be published next year as a Forestry Paper. (Follow up to the 16th Session of ACFE, Paris, France, 1991.)

A document about professional forestry education with public and private financing in Chile was prepared in Spanish. It will be edited and published next year. (Follow up to the 16th Session of ACFE, Paris, France, 1991.)

Forestry Paper No.100 "Introduction to Ergonomics in Forestry for Developing Countries" was adapted for francophone countries. It will be edited and published next year. (Follow up to the 13th Session of ACFE, Mexico City, Mexico, 1985.)

The agenda of the 17th Session of ACFE was prepared including all the recommendations of the 16th Session.

PUBLICATIONS

The following documents were printed and distributed:

- The English version of Volume I of the Proceedings of the International Conference on Forestry Education, University of Tuscia - FAO - IUFRO, held in Viterbo, Italy, 1990.

- The English, French and Spanish versions of the final Report of the 16th Session of ACFE held in Paris, France, 1991.

- The Spanish version of FAO Forestry Paper No.47, La Enseñanza Tecnica Forestal, Principios y Ejecución.

- The English version of FAO Forestry Paper No.100, Introduction to Ergonomics for Developing Countries.

- The Spanish version of FAO Forestry Paper No.100, Introducción a la Ergonomía para Países en Desarrollo.

OTHER ACTIVITIES OF THE BRANCH

The Branch contributed to the work of the Advisory Committee for External Training of FAO's Interdepartmental Working Group on Training 1991-1993. It participated in the Expert Consultation on Strategy Options for Higher Agricultural Education held at FAO, Rome, December 1991.

The International Forestry Student Symposium, held in Padova, Italy in 1992 was supported with the delivery of a keynote paper entitled "Forestry Education - a World Perspective".

Support was given to the First National Meeting of Forestry Research Institutions held in Campeche, Mexico, 1992, with the presentation of a paper entitled "Overview and Prospects of Forestry Research Organizations". A Panel was chaired on Forestry Researcher training in Research Strategies.

Assistance was provided to the UNCED Preparatory Meeting 1992 with a technical paper entitled "Technology Transfer and Forestry Education and Training and Extension".

The Strategic Planning of the Centre for International Forestry Research (CIFOR) was supported in 1992 with a thematic paper entitled "Education and Training for Forestry Research".

Technical support was given in the formulation of field projects dealing with Forestry Education and Training and Extension components and the ongoing TFAP.

Several Forestry Education and Training and Extension projects were visited in Latin America and provided with close monitoring. Additionally, technical support and the fielding of Expert and Evaluation Missions was provided.

OTHER MATTERS

Information is given in Annex 1 on FAO's field projects in Forestry Education and Training. (Follow up to the 14th Session of ACFE, Ljubljana, Yugoslavia, 1986.)

FAO's Forestry Department's ongoing Field Programme in Forestry Education and Training is covered by 38 projects. They can be classified under three categories as follows:

A 4 field projects specifically dealing with forestry education and training.

B 7 field projects with forestry education and training as a main component.

C 27 field projects with a forestry education and training element limited to a training programme of national forestry personnel and/or a field training programme for rural people, a study tour or fellowships.

ACFE MEMBERSHIP

The Advisory Committee at present has a total number of 26 members. In 1993 four new member countries were appointed: Costa Rica, Côte d'Ivoire, Egypt and Malaysia. The Czech Republic, Honduras and Vietnam have been invited to propose a candidate for membership. This would give a total of 29 members.

Fourteen members are from developing countries, fourteen from industrialized countries and one from a country in transition. The following table indicates distribution of membership by region.

Region	Developing Countries	Industrial-ized Countries	Transition Countries	Total
Africa	5	-	-	5
Asia	3 (1)	3	-	6 (1)
Europe	-	9	- (1)	9 (1)
Latin America	4 (1)	-	-	4 (1)
North America	-	2	-	2
Total	12 (14)	14	- (1)	26 (29)

Forestry Education Projects
Projets d'Education Forestière
Proyectos de Educación Forestal

1. Projects specifically approved for Forestry Education and Training
1. Projets approuvés spécifiquement pour l'Education et la Formation Forestière
1. Proyectos aprobados especificamente para Educación y Capacitación Forestal

YEAR ANNEE AÑO	COUNTRY PAYS PAIS	TITLE TITRE TITULO	TYPE OF EDUCATION TYPE D'EDUCATION TIPO DE EDUCACION	TOTAL Project Budget (US$ 000) TOTAL Budget du projet TOTAL Presupuesto Proyecto
1993-94	Africa (Regional)	Forest Industries Training Centre for SADC (Phase II)	Consolidation of the gains of the first phase so as to render the FITC capable of producing trained technicians in the field of sawmilling, panel products and sawdoctoring in a viable and sustainable manner.	4,904,810
1986-92	Bangladesh	Development of professional education in the forestry sector	1. Upgrade professional teaching skills in forestry at B.Sc.(Hons) level and initiate the necessary groundwork for a future M.Sc. degree in Forestry. 2. Assist IFCU in planning and development of curriculum and preparation of training materials for a B.Sc.Hons degree. 3. Assist IFCU teaching students for B.Sc.Hons in Forestry.	2,622,861
1988-96	Peru	Educación forestal ecológica escuelas rurales Sierra Peruana (Phase II)	Promover la educación del niño campesino Andino en la recuperación y el uso racional de los recursos naturales en el marco de su realidad cultural.	3,341,720

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1992-96	Senegal	Centre Forestier de Recyclage à Thies (Phase II)	Renforcer la capacité de la Direction des Eaux et Forêts pour la mise en oeuvre des activités de formation permanente adaptée **aux** besoins de la politique nationale. Former annuellement 44 stagiaires.	2,922,254

2. Projects with a main Education and Training Component
2. Projets avec une composante principale d'Education et Formation
2. Proyectos con un componente principal de Educación y Capacitación Forestal

1990-95	Bangladesh	Upazilla afforestation and nursery development	Improved capabilities for Forest Department to undertake community forestry. Involvement and participation of Upazillas and local communities and government agencies to carry out community forestry activities. Support to village homestead forestry.	2,201,498
1991-96	Bolivia	Desarrollo comunal forestal en el altiplano Boliviano	Contribuir elevar nivel de vida de los campesinos del altiplano. Apoyar en forma directa a las comunidades rurales de departamentos Potosi, Oruro y La Paz. Integrar la plantación y manejo de árboles en los sistemas de uso agrícola y pecuario. Aumentar disponibilidad leña, madera, forrajes, frutas. Promover participación activa de mujeres y niños.	6,054,526
1992-94	Burundi	Définition politique et élaboration plan d'actions secteur forestier	Aider Ministère Aménagement, Tourisme et Environnement à définir une politique forestière et préparer un programme d'actions y compris la formation des cadres forestiers.	190,000
1993-94	Chile	Desarrollo forestal participativo en el norte de Chile	Difusión de la foresteria social en la región Andina del norte de Chile. Colaborar con instituciones de la III y IV regiones en cuanto a capacitación, diagnostico y validación. Formulación de un proyecto de desarrollo forestal campesino para las zonas áridas y semi-áridas. Limitar acciones de difusión de material de DFP a la zona del norte del país.	403,494

1993	India	Demonstration and training in primary processing of small logs	Train staff of IPIRTI in utilizing plantation wood by adopting the existing sawmills for the purpose of creating a prototype utilizing existing mills.	212,000
1989-93	Iran	Strengthening postgraduate programme of Faculty of Natural Resources, Karadj	Develop a comprehensive and efficient system of natural resources conservation, utilization and management with reference to soil conservation and resource management, through training of requisite manpower.	350,000
1989-94	Tunisia	Assistance technique au développement forestier	Mettre à disposition Directeur général Forêts consultants dans domaines prioritaires identifiés. Concevoir plans annuels formation et recyclage à l'étranger et assister à leur bonne exécution. Définir besoins en matière formation et recyclage personnel d'encadrement et établir programme et définir moyens.	775,400

3. Projects with Education and Training Elements
3. Projets avec des Eléments d'Education et Formation
3. Proyectos con Elementos de Educación y Capacitación Forestal

1992-94	Interregional GCP/INT/539/ITA	Forestry and food security in Mediterranean and Near East region
1991-93	Interregional GCP/INT/542/ITA	Interregional project for participatory upland conservation
1988-93	Africa (Regional) GCP/RAF/234/FRA	Mise en valeur ressources génétiques ligneuses usages multiples
1989-92	Africa (Regional) RAF/87/075	Watershed management/restoration Highlands of Fouta Djallon
1992-96	Africa (Regional) UNO/RAF/006/GEF	Institutional support for protection of East African biodiversity
1989-93	Asia & Pacific (Regional) GCP/RAS/131/NET	Regional wood energy development in Asia
1993-94	Asia & Pacific (Regional) GCP/RAS/133/JPN	Asia-Pacific Agroforestry Network (APAN) (Phase II)

1991-94	Asia & Pacific (Regional) GCP/RAS/134/ASDB	Forestry Research Support Programme for the Asia-Pacific Region (FORSPAR)
1991-96	Asia & Pacific (Regional) GCP/RAS/137/JPN	Forestry planning and policy assistance in the Asia and Pacific Region
1991-96	Asia & Pacific (Regional) RAS/91/004	Improved productivity of man-made forests through tree breeding
1992-94	Asia & Pacific (Regional) RAS/92/361	South Pacific Forestry Development Programme (Phase I)
1990-93	Near East (Regional) GCP/REM/052/JPN	Development of forest resources for environmental protection
1990-93	Near East (Regional) RAB/89/034	Arid zone forestry sand dune stabilization
1986-93	Angola ANG/85/007	Anti-desertification of Tombwa
1991-93	Belize BZE/87/009	Forest conservation and management

1987-94	Bolivia GCP/BOL/016/NOR III	Restauración forestal y rehabilitación de tierras/Rio Guadalquivir
1987-93	Brazil BRA/87/007	Integrated forestry development in the Northeast of Brazil
1989-93	Cape Verde GCP/CVI/015/BEL	Développement/mise en valeur ressources forestières (Phase III)
1993-94	Cape Verde TCP/CVI/2353(T)	Formation en apiculture
1988-94	Chad CHD/87/016	Développement activités forestières
1991-96	China GCP/CPR/009/BEL	Afforestation, forest resources, planning and development (Phase I)
1993-94	Mozambique MOZ/92/013	Support to management of forestry and wildland resources
1989-94	Pakistan PAK/87/009	Suketar watershed management project - Azad, Jammu and Kashmir
1989-94	Philippines FPA/PHI/89/PO5	Population-Environment IEC Programme

1986-94	Senegal GCP/SEN/029/NET	Rebolsement villageols Tivaouane
1993-97	Sri Lanka UNO/SRL/001/GEF	Development of wildlife and conservation & protected area management
1992-95	Turkey GCP/TUR/045/SWI	Development of appropriate models for community forestry in Turkey

APPENDIX 4

HOW TO INTERLINK SOCIAL SCIENCES AND EXTENSION AND COMMUNICATION IN PROFESSIONAL AND TECHNICAL LEVEL FORESTRY EDUCATION CURRICULA

by

Hugh G. Miller[1]

SUMMARY

The first requirement of training at both professional and technical level is that the practitioners are competent in forestry. In addition, and particularly where involved in extension forestry, foresters at all levels should have some understanding of agriculture and the social sciences. It is emphasised, however, that hybrid courses between forestry and these disciplines may end up with graduates not adequately competent in any field. Rather the aim should be to give the forester and the other specialists adequate knowledge of each others fields to enable effective collaboration. In addition foresters must learn sufficient humility to accept that the setting of objectives of management in the function of someone else, such as the owner or local community. This is best inculcated through the method or the ambience within which subjects are taught. One aspect that should be central to the curriculum, however, is the concept of multiple objective forestry, the teaching of which should demonstrate how changing objectives change silviculture and policy instruments. Finally it is emphasised that state forest services, and sometimes professional societies, must organise programmes of in-service training or Continuous Professional Development to ensure the foresters continue to respond to the needs of society.

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INTRODUCTION

Encroachment by farmers onto forest land, soil erosion on farms and cleared forests, realisation of the dependence of some agricultural systems on forest grazings, problems of growing human misery in rural areas and so on, all part of a larger rural problem that could be described as a need for integrated land use planning of which forestry is only a part. There is now wide-spread acceptance of this, indeed that forestry must be considered in a wider land-use planning context is emphasised in the forest policy statements of both France (FAO,1988) and the European Union (Commission of the European Communities, 1988). Even in the developed countries of Europe, however, "efficient" land-use planning designed to achieve optimum and sustainable use of soil and climate is usually at variance with established traditional uses and can not be implemented for social and political reasons. Thus, in northern Europe the drive to reduce agricultural production has lead to systems of subsidy that aim to encourage tree planting on the best of agricultural soils while often bolstering exploitive agriculture, for example sheep farming, on the foothills where rural societies are fragile, depopulation is occurring and hence traditional landscapes are threatened. The obvious solution, to plant trees in the foothills and allow agriculture to retreat onto the best land, is socially, and hence politically, unacceptable.

Similarly, in developing countries societies are often at transition but this does not mean that traditional life styles can be changed at the whim of planners, no matter how obvious a solution may appear on paper. That there must be planning, given the pressure on resources, is obvious. Equally obvious is that communities are central to the process and that traditional distinctions between agriculture and forestry cannot be sustained. Indeed at the level of particular communities it may be that such distinction never existed, the forest being regarded as a source of animal fodder, fruit, fuel, building material etc. that makes it integral to the agricultural enterprise. This assertion is often made and is undoubtedly frequently true. However, it should not be allowed to hide the facts that many societies (perhaps all societies at some stage of their development) regard the clearance of forests as a mark of civilisation (e.g. Perlin,1989) and that with development comes an increasing split into specialised agriculture and forestry on their own areas (jungle fruit starts to be cultivated in orchards, forest grazing is replaced by feed supplements etc.). Indeed, it may be the very fact that this split, or specialisation, was so advanced in the developed countries that lead to wrong paradigms of land-use being applied to countries still in transition. The mismatch of central planning (administration) and local needs was perhaps not serious when populations were low but as these have expanded problems have become acute.

Arguably, recognition of this was the central message in the World Bank's "Forestry Sector Policy Paper " of 1978. Since then the concept of Social and/or community forestry has been the subject of much discussion, some informed and some not so. What is abundantly clear, however, is that in most, if not all, parts of the world the forester must come out of the forest and work in partnership with the rural community and his agricultural opposite numbers.

PERCEIVED FAILURE IN FORESTRY EDUCATION

Foresters, and hence forestry education, are often accused of failing to adjust to these new understandings. In a fascinating study Dove (1992) looked at the conflicting views of professional foresters and small farmers in Pakistan. It was found that while foresters believed that small farmers were disinterested in planting trees in fact the reverse was true, furthermore whilst foresters advocated large blocks of market-orientated species farmers were looking to plant traditional multi-purpose species predominantly to meet household needs. Dove concluded by stating that there was a failure by foresters to distinguish their non-empirical beliefs about farmers from their empirically based knowledge of trees and suggested that professional foresters would be a legitimate subject of study for social scientists!

This seems to be rather an extreme manifestation of the problem. To suggest that it is generally true would be absurd yet there is little doubt that the attitude depicted was quite common in the past and to a real extent the remnants are with us yet. However, it is also true that increasingly foresters have been active at developing social and community forestry (a random selection of recent papers by foresters on this subject is Arnold, 1992, Baillett, 1992, Carter and Grunow, 1993, and many others can be found). The term "extension forestry " has come to be most widely used in this context, a term that Sim and Hilmi (1988) defined as covering "any situation where people are directly involved in any forestry activity on their own land, or on land controlled by the community or state, in which the people have a direct interest in the outcome, and from which they hope to derive some return in goods, cash, or other benefits, within a reasonable period of time. Where appropriate, this may include programmes undertaken by non-government organisations or industries to promote forestry by individuals or groups of people, to meet either community or industrial needs in the area. The contents may, therefore, be adapted to cover activities referred to as social forestry, community forestry or by other similar terms ..."

Note that this is rather different to the usual use of the term extension to denote transfer of information from a centre of knowledge (e.g. research institute or university) to rather distant potential users of such knowledge, i.e. advisory work. To remain consistent with FAO the definition of Sim and Hilmi will be used here.

PROFESSIONAL QUALITIES IN RELATION TO FORESTRY EXTENSION

In its important review of forestry extension organizations the FAO stated the "tree growing is a problem concerning people, and very rarely a purely technical problem ... forestry staff require an understanding of the community and the conditions under which they live ... a forestry extension strategy requires that change must be brought about by members of the rural community and their own community groups." As the title of this paper suggests it is a problem of social science and communication as much as of technical competence. To be effective extension foresters must be technically competent and must understand how forestry can fit with other land-uses, particularly agriculture. Importantly, however, they must have the imagination necessary to understand and respect ways different than their own and above all have humility. These personal qualities are necessary because extension foresters are going to have to allow the community to set the objectives for the forest and to be intimately involved in the means of achieving these objectives. There is no place for the imposition of views from the top, it is "bottom up" management and as such is strange to civil servants (and administers of aid programmes) in many societies. Sim and Hilmi (1988) even suggested that a readiness by the professional to engage in manual work with the community is of advantage.

More specifically, FAO (1986) laid out some of the characteristics of the extension forester as:

- good technical or professional qualifications with extensive field experience;
- training and experience in the use of teaching methods;
- the ability to use communication media of all levels;
- the ability to listen, observe and understand accurately what other people are trying to communicate;
- readiness to evaluate the success of communication activities, including those he or she may have created;
- a strong belief in the ability of people to adopt an idea which is in their own best interest and to make it work;
- patience.

To these might be added (1) the appreciation that traditional land-use patterns are the result of rational decisions and so cannot be entirely wrong, and (2) a sufficient grasp of sociology, including understanding that a stranger (whether of a different tribe, region, class, country or background) can never be totally integrated into a community, indeed could do harm by trying too hard to do so.

IMPLICATIONS FOR FORESTRY EDUCATION CURRICULA

Education, according to Carter (1973), is the art of making available to generations the organised knowledge of the past, including attitudes and other forms of behaviour of positive value to society. It is convenient to consider the imparting of knowledge and the inculcation of attitudes separately, one being rather more the content of the curriculum and the other being the intellectual environment in which it is taught. It is also necessary to distinguish professional from technical training, although in some countries the distinction is becoming increasingly blurred.

In its document the FAO (1986) called for forestry courses "to be changed" to include ecological and environmental subjects, economics, management and the social sciences. With the possible exception of the social sciences most of the changes started to be made to forestry education at the professional level many years ago. The statement is undoubtedly less true for technical training.

Sticking first with professional training. Curricula have been subject to extensive reviews of recent decades particularly the last (e.g. Roche 1990). There has been an increasing need in Europe to increase attention to the economics and organisation of harvesting and marketing whilst in north America the trend has been to increase the amount of silvicuture at the expense of an over concentration on logging. The position in other parts of the world is dependent on whether there is already a large processing industry. Indeed Miller (1990) suggested that in such countries there was a case for splitting education at this level into separate forest management and logging degrees.

Other areas that are demanding more teaching time are economics, particularly a wider interest in land-use economics, and the problems of the economic assessment of the management for non-timber benefits. Also core and optional courses are appearing in subjects such as recreation management, management for conservation objectives and, where it was not already in the course, wildlife.

Because forest managers throughout the world, as advocated in the introduction to this paper, are increasingly making decisions at the integrade between agriculture and forestry, some understanding of basic agricultural systems, terminology and policy is clearly necessary. So necessary that education institutions have sometimes set out to create hybrid degrees in agriculture and forestry, or even specialist degrees in agroforestry. There are undoubtedly needs for such graduates, for example joint degrees may be of value in planning departments or research posts in agroforestry. However, in the more general scene, as has been discussed elsewhere (Miller 1990, Roche 1990), such moves risk placing into the outside world graduates who are neither completely competent in forestry nor in agriculture. Accordingly, many institutions have tried a different tack and have sought to include elementary courses in agriculture or forestry in their forestry and agricultural degree programmes, respectively. This at least ensures that the practitioners of the two major land uses can communicate, something that brings many advantages including a willingness to collaborate. In including such cross-over courses in a degree programme it is important that teachers strenuously avoid any suggestion of an "us and them" situation, neither should a belief be inculcated that one discipline is more important than the other. To do so would be to reintroduce the confrontational attitudes of previous generations (paradoxically, the finger of blame may more often have to be pointed at forestry schools than at agricultural schools, perhaps some form of inferiority complex).

With these moves to increase the amount of economics, conservation and agriculture in forestry degree programmes comes the need to reduce the teaching in other areas. All to often this has been in the basic sciences and ecology, a trend that is undoubtedly due for reassessment (although increasing forestry subjects at the expense of the sciences is popular with students!). As emphasised by FAO (1986) an understanding of the science base for forestry and agriculture is necessary if optimal decisions are to be made and, more particularly, if the practitioner is to remain competent throughout his or her professional life (this will be further explored in the next section). However, for the moment no solution is being offered as to how an ever growing teaching requirement can be fitted into an inelastic time period. What is clear, is that professional and technical competence must be maintained.

The next two areas in which many authorities, including FAO (1986) and Sim and Hilmi (1988), have called for more input are social science and communication skills. Miller (1990) has argued against any move that converts forestry degrees into down-market rural sociology degrees, any more than forestry degrees should become down-market engineering degrees. Indeed, the analogy is apposite for engineering in most forestry degree programmes is taught to a level that enables the forest manager to know the requirements of, and to be able to communicate with, professionally trained engineers. No more can be expected of sociology in the forestry programme, to do so would be to deny the speciality of sociology itself. Thus, many forestry schools have in recent times initiated courses on social forestry and on rural development forestry. Sim and Hilmi (1988) suggested that such courses include factors such as traditional leadership patterns, land tenure, family structure, concepts of reward, agroforestry etc. They also placed great emphasis on extension practices and methods of communication. To these one would want to add teamwork, collaboration and the creation and organisation of networks to bring communities, foresters, agriculturalists and land-use planners together.

Many forestry schools now have optional or compulsory courses entitled rural development, social and environmental forestry, rural development forestry etc. How effectively these are being taught may be questioned but initial reviews are not unencouraging.

It should be recalled at this stage that the work of Dove in Pakistan suggested that the problem was as much that of attitude as of lack of knowledge among professional foresters. It was further emphasised above that the teaching of forestry and agriculture as distinct and antagonistic professions has harmed the ability of both to contribute to more rational land-use planning, rural management and, in particular, community involvement. Rather nebulous concepts such as stewardship and service coupled with an emphasis on humility should permeate through both degree programmes. In many respects it is as much the attitude adopted in the teaching rather than in what is taught. One aspect of a curriculum plan that must be emphasised is that from an early stage, and particularly in forest policy and silvicultural courses, the objects of management should not be assumed, nor, and most importantly, should it be stated or implied that the forestry profession has any particular right to set the objectives. These will be set and prioritised by the owners working within the policy guidelines established by government through the democratic process locally or nationally or perhaps both. Furthermore, the ethos of multi-purpose forestry should be emphasised, for multi-objective forestry not only allows optimisation between objectives at any one time but also permits the change in ordering of these objectives as societies change (as they will). If there is one message in this paper it is this simple one that teaching should not assume the objective of forest management, rather it should illustrate how silviculture, policy instruments etc., change with legitimate differences in the demands societies place upon forests.

The remaining area highlighted in many reports on training for extension forestry is that of proficiency in communication, communication with colleagues, superiors, assistants and above all with the people to be assisted through an extension forestry programme. It has already been emphasised that some training in agriculture and sociology would ease communication with those with whom the forester has to work. The importance of collaboration through networks has also been emphasised. The matter of regular communication within peer groups and with superiors (report writing, oral presentation etc.) undoubtedly will be aided by requiring students in university departments to use these means of communication in preparing essays, presenting oral reports on projects etc. Furthermore project work involving groups of students is also to be encouraged. To what extent there is the further need to include actual teaching of writing skills, rather than the practice of them, is then probably a function of the nature of secondary school education in the country concerned.

Rather different is the teaching of the communication skills needed to reach, and have a dialogue with, villagers and farmers, particularly in some parts of the developing world where literacy rates may be rather low. In an ideal world the extension forester should have in his network of professional colleagues some person with particular skills in this field. In the real world, however, this is rarely the case. This does not excuse the forester seeking advice and comments from wherever such expertise may be found. Meanwhile the training should include at least exposure to the use of media at all levels, from the broadcasting media to picture books. It has also been mentioned earlier, and must be emphasised again, that any communication programme should have designed within it means of assessing the effectiveness of the techniques being used. An input by trained sociologists at this stage is of great benefit.

Thus, the professional forester in an extension programme must be professionally competent, must be able to arrive at management techniques from consideration of first principles, must allow others to set the objectives of management and must have learnt the humility to consult. These remain true for all professional foresters irrespective of their job descriptions.

Much the same applies to the technical forester although in some respect the training they receive tends to militate against the flexibility argued for here. At such levels there is often a poor understanding of the science underpinning forestry which makes change harder. By contrast, technical foresters may be closer in background to the community with whom it is necessary to consult and this can be made an advantage. Such technical and vocationally trained foresters are often the spear head of any extension programme and this should be reflected in their training. They should be trained in the presentation of talks, slide shows etc. As with professional foresters there also remains the need to be technically competent and to have some idea of the interaction of forestry with other land uses. Again the essence of multiple use forestry should have been taught. Flexibility, however, comes in the first instance from the professional level.

IN-SERVICE TRAINING AND CONTINUOUS PROFESSIONAL DEVELOPMENT

This discussion would not be complete without emphasising that much can change over the forty years of a foresters career and steps must be taken to assist them to cope with such changes. Many forest services run "in-service" courses at both technical and professional levels and these can be most important in assisting a forest service to carry out its functions efficiently. The planning of such courses is important and should be given resources. Training could be through a training arm within the service itself or by buying appropriate courses from local forestry schools.

Very similar, and likely to become of increasing importance, is the move for professionally trained foresters in many countries to group into professional societies that are designed to influence the standards and contents of curricula for forestry degrees and, of more importance, to require that if members are to remain professional they must seek to top-up their original training at regular intervals -- a programme of

Continuous Professional Development (CPD). The importance of such training in retaining the confidence of the public and government in the forestry profession cannot be over emphasised. In countries where the profession is not sufficiently well organised to arrange such training itself it is usually true that almost all professional foresters work within a state service. In such cases concerned professionals should agitate to ensure that the state takes the lead in organising regular training courses and requiring that all professionals attend. Forty years is a long time over which to rely on the training given during an initial four years. The very development of extension forestry over the past twenty years stands witness to this fact.

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APPENDIX 5

FORESTRY EDUCATION'S RESPONSE TO CHANGING SOCIAL VALUES AND OTHER RESOURCES KNOWLEDGE

by

Frederick F. Gilbert [1]

Forestry education has been responding slowly to the changing social pressures and increasing ecological knowledge that have caused many to question the approaches and practices of traditional forest management. Requirements that foresters take other values of the forest into consideration when planning silvicultural activities have necessitated curricular revision in order to include concepts of integrated resource management and courses in fisheries, range, recreation, wildlife management and other forest uses and values. The move to ecosystem based decision-making will dictate that forestry students receive broader exposure to the many dimensions of natural resources and land management either at the end of a 4 year undergraduate degree programme or in their junior and senior years as an undergraduate. Intellectural grounding in social, economic and environmental aspects of land management will be as important as any technical skills imparted by the degree programme.

Examples of the influence of professional accrediting organizations and of recent curricular changes in North America and elsewhere are presented. The important trends include increasing interdisciplinarity, greater understanding of social value systems, and

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more sensitivity to the environment and the ecological limitations of the forested land base. In North America, the issue of curricular revision has been reviewed by the Society of American Foresters and three broad elements recommended: 1) general university requirements, 2) a natural resources core common to a number of disciplines and 3) a professional forestry module. The examples given in this paper reflect different responses that seem to fit this model appropriately.

In many respects the debate over the form that forestry education should take in order to respond to changing societal values parallels the debate within the profession itself over the role of the professional forester. North American foresters through their professional societies, the Society of American Foresters (SAF) and the Canadian Institute of Forestry (CIF) with the various provincial bodies such as the Association of British Columbia Professional Foresters (ABCPF) are split among "old school" adherents, who see no need for change, and generally younger members of the profession who recognize responsive and responsible change as not only necessary, but inevitable. Because the national professional bodies in the United States and Canada accredit forestry education their internal debates have great relevance as to how educators will, or can, modify forestry degree programmes. I am most familiar with the North American scene so I will concentrate this paper on that geographic area but will provide examples, where possible, from other regions of the globe.

Forestry, as a profession, has its roots in central Europe. In many ways it was an outgrowth of agriculture and as a result similar principles of land management were applied. Silviculture and the growth of trees for economic profit became the backbone of the profession and thus the education of professionals. Trees were a crop and education was geared to teaching how to tend the crop and to maximizing production. As in agriculture, this meant a rapid move from natural (albeit in many cases terribly degraded) to managed ecosystems with monocultures, even-aged stands, truncated succession, shortened early succession, and more recently chemical applications being consequences of crop management. Also, as with agriculture, these modifications to the natural environment brought the need to control diseases, insects, competition and fire to ensure maturation of the crop for economic return. As forestry was becoming more complex, education expanded to encompass forest entomology, forest diseases, vegetation management and fire management. With the passage of time the focus of foresty education remained on tree growth and yield and more refined silviculture at the site and stand levels. Wood science, product manufacturing, and harvesting techniques all found a place in the forestry curriculum.

Although all these traditional components still remain in one form or another, some components of the SAF and CIF list of educational requirements reflect the type of change that is underway (Tables 1 and 2). The CIF list is the more recent of the two and yet it is the more traditional. Integrated Resource Management is the only subject area requirement that addresses resource areas outside forestry. The SAF requires that topics under Management should include multiple-use principles encompassing not just wood but forage, water, wildlife, fish, recreation, cultural, educational and aesthetic benefits. Both bodies are wrestling with strong arguments from certain educational institutions and members to liberalize the requirements to provide greater diversity of educational opportunities. A parallel argument is that membership of the professional societies should be expanded to include other resource practitioners who manage the forested land base. SAF and to a lesser extent CIF have moved in this direction by opening membership to wildlife biologists, resource sociologists, range managers, and others.

What prompted these changes? Do they predict the direction of future changes accurately? What are the likely revisions to curricular requirements in the short and long terms?

Although the concepts of integrated resource management and multiple-use are not new (documented discussion on the multiplicity of resources to be derived from forest management date back to the 1930's and earlier c.f. Behan 1990), they have done little to expand most forest management curricula from the narrow focus of the sustained yield concept. This agronomically based idea pushes the land base to produce the maximum fibre output on a sustained basis and other resources, if considered at all, are secondary or deferred to adjacent land units. The idea that the land base should produce a multiplicity of resource and social values on the same landscape was never embraced by the forest profession even while the "secondary" professions-fisheries and wildlife biology, recreation management, range conservation and others - endorsed it.

The SAF in conjunction with U.S. schools of forestry sponsored the "Forestry Curriculum Development Project" in the late 1960's. Much discussion of integrated forest resource management resulted in cosmetic changes to forestry curricula, lip-service to the concept and basically business as usual within academia. As Behan (1990) points out the best indication of the failure to adopt a new teaching philosophy was the ultimate rejection of a text book by Duerr et al. (1979), "Forest Resource Management" spawned by the effort that effectively looked at all renewable natural resources and espoused integrated forest management Behan (op. cit.) compared the sustained yield multiple-use and multi-resource forest management approaches (Table 3) and firmly believed in 1990 that the latter was the emergent model for forest management. He defined multiresource forest management as: "The deliberate application or withholding of labor/capita inputs to, or from, a biophysical forest system for the simultaneous production of general socially desirable outputs. It is conditioned by prior knowledge of consequences to the system of both spontaneous and management induced perturbations and constrained by the intentions of maintaining the forest system as a forest system". He also argued for another forestry curriculum development project to acknowledge that forestry management is system management and to recognize the totality of social, biophysical and economic factors that must affect management decisions.

Perhaps in response to Behan's plea and the rising rejection of the old management paradigms and their influence on forestry curricula, SAF and the National Association of Professional Forestry Schools and Colleges convened a symposium in 1991 to explore how forestry education in the next century could address the challenges of the changes occurring in resource management. As Cortner (1992) summarized, "curricula should have a broader resource focus and not be narrowly focused on timber or range and they should produce critical thinkers and problem-solvers" not just "biological technocrats". Forestry education in the future needed to be ecosystem-oriented, global, interdisciplinary and not oriented to technical training. It must integrate the social and biophysical sciences, reflect a commitment to diversity and prepare students for lifelong learning (Cortner 1992). The curriculum should have three broad elements (General University Requirements, a common Natural Resources Core, and a Forestry module). These elements should (SAF 1992):

* stress basic competencies <u>not</u> traditional courses
* provide a flexible foundation for life-long learning
* focus on education rather than on training
* provide a more balanced resource perspective
* place resource management in an international context or at least increase global awareness
* stress that resource managers have a responsibility to society, as well as to their profession and employer
* impart the ability to participate in the socio-political process
* provide hands-on experiential learning to integrate theory with practice
* provide more educational flexibility (i.e. more open courses for non-majors, minors, etc.)
* place a strong emphasis on current issues
* place an increased emphasis on <u>true</u> (e.g. faculty- coordinated and interactive) team teaching.

Others have voiced similar views. Burch (1988) argued that universities need to dissolve disciplinary boundaries that tend to compartmentalize knowledge and to combine skills from a variety of disciplines to train professional "social foresters". Such curricula would require an integrated course in "Methods of Social Science Applied to Forestry Issues" that incorporates demography, anthropology, sociology, political science, psychology, history and economics. This would be followed by six required disciplinary courses in Geographic Information Systems, Marketing, Environmental (Natural Resources) Sociology, Ecological (or Resource) Anthropology, Organizational Systems in Resource Management and Communication Skills for Resource Managers. In Burch's (1988) view this would provide the social foresters with skills in : "(a) social measurement that covers the full range of essential possibility in social life; (b) an ability to group and display the data gained from these measures, and a way of connecting them to biophysical data; (c) an understanding of what and how to market cash products such as honey, mushrooms, baskets etc; (d) an overall interpretive framework for perceiving the functioning and processes of social structures and cultural values; (e) a means to create and to manage the various internal and external species of social organizations affecting humans and forests; and (f) an ability to listen, to interview, to organize, to give voice to, to persuade, to inform, and to direct the participants in social forestry projects".

I had the opportunity in 1988 as Chair of a newly created Department of Natural Resource Sciences at Washington State University (WSU) to direct a two-year planning process that fundamentally changed the way that university taught forestry to its students (Gilbert et al. 1993). Following the basic tenets expressed decades earlier (eg. Galick 1951) that forestry education needs to be more broadly based with basic understandings of the ecological, social and economic environments within which forest management decisions are made and policies developed, the new curriculum was developed by casting away the old structure and revisiting what competencies and learning levels should be expected of a graduate of an undergraduate forestry programme. From the faculty deliberations emerged a recognition that the basic competencies were the same for foresters as for wildlife, recreation or range managers. This was expressed in the structure of an umbrella degree programme that allowed specialization while maintaining commonality among the resource disciplines. Forestry graduates differed from wildlife, range or recreation graduates primarily in the final two years of a four year degree and even then shared a number of key courses in areas such as planning, sociology, resource economics and policy. An integrated field camp provided further opportunity for interdisciplinarity. This was accomplished within the accreditation requirements of SAF.

Similarly, at the University of Northern British Columbia (UNBC) we have developed a forestry major within a Natural Resources Management BSc degree programme. Other majors include fisheries, wildlife and outdoor recreation. As at WSU, students take what amounts to a common first two years. In fact all students at the university take the same 5 core courses within the first year of study. These courses give both science and non-science majors an integrated foundation of knowledge from the social sciences, physical sciences and life sciences as well as the arts and humanities. Experimental in nature, the courses avoid the "Great Books" or "Great Ideas" approaches presenting subjects as interdependent, interesting sources of information that reflect what we are, how we have evolved, our relationships to the physical and biological environments and the socio-cultural contexts of humanity. The introductory chemistry, physics and biology courses are reduced to one semester if a student has had the subject prior to entering UNBC. These courses, along with a core course in university writing and communications, a course in micro-economics, two 1-credit introductory natural resources courses and a computer applications course, fill out the first year of study at UNBC.

The forestry curriculum at UNBC (Fig. 1) differs from WSU's (Fig. 2) in several ways. There are no specialized options at UNBC at this time, although a Business/Management option is being explored. The Chemistry and Physical Sciences foundation area is much stronger at UNBC. The Natural Resources core has been "deepened" by two courses with courses like Integrated Resource Management in the second year; First Nations' Resource Management in the third; and Planning, Watershed Management, Environmental Impact Assessment, and Issues and Ethics in the senior year. These courses, along with a Field Camp, provide opportunities to share a multiplicity of resource values from among the disciplines represented in the student body and the faculty. In essence it is not just forestry students who are being exposed to the concepts in a course, but rather the classroom becomes an interactive arena where diverse uses and value systems

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[1] "First Nations" is a term used in Canada for aboriginal peoples.

operative on the land base are represented and discussed. Faculty drawn from Environmental Studies, Biology, Outdoor Recreation/Tourism and Forestry for these key courses demonstrate interdisciplinary problem-solving within the classroom. The forestry core is reduced to 8 courses (see list).

The trend to more interdisciplinarity, greater understanding of social value systems, and more sensitivity to the environment and the ecological limitations of the forested land base is not restricted to North American curricula. In the United Kingdom, for example, the University of Edinburgh's Institute of Ecology and Resource Management within the Division of Biological Sciences is responsible for the Honours in Forestry program (BSc Ecological Science) (Table 4). The Forestry, or Honours year, builds on the BSc. in Ecological Science which is awarded after three years of study. Biology and environmental science, conservation and resource management provide the understanding of the scientific basis of resource management. The Honours year consists of the Honours topic, eg Forestry, and specialist teaching in the subject area (one half day per week); a Common Core of seminars, tutorials and exercises on environmental issues and topics for all students (one half to one full day per week); two Honours Options (from a list of about 12) to reinforce an area of interest that in Forestry might be Woodland Management, Remote Sensing or Tropics Soils; and finally an Honours Project lasting 8 - 10 weeks. The project is an original piece of work either selected from a list of 40 or 50 topics representing the interests of the Institute or proposed by the student as his/her own topic. The overall programme reflects the international scope of the Forestry program at the University of Edinburgh, with many students participating from developing countries. The more general ecological and sustainable management themes are well suited to establishing a framework for ecosystem based forest management.

In Africa, the University of Science and Technology in Ghana offers a B.Sc. degree in Natural Resources Management that is ecosystem based and designed to provide a multiple-use management approach to the development, management and use of renewable natural resources. Students may specialize in forestry but the intention is that they would plan holistically because of their training.

The institutions described are representative of the global change underway in forestry education. Other examples could be presented such as the Institute of Forestry in Nepal which offers a 3 year bachelor's course of study following a 2-year technician's course that trains practitioners of community forestry (Rechlin 1993). Graduates serve as advisors to villagers who are the de facto land managers and thus make the key land-use decisions.

What will forestry education look like when the debates are over and the current round of change has been implemented? Clearly, the social, economic, and environmental topics that reflect political and cultural changes in society will be more strongly represented.

A society that values diverse, healthy, and aesthetically pleasing forests will place even greater demands on professionals to practice ethical, sustainable, and environmentally-sensitive management of lands and natural resources. The broadened, interdisciplinary nature of the undergraduate degree in natural resources will better prepare aspiring land managers to meet the complex needs of society today. Forestry still requires skilled technicians trained in the manipulative practices; however, the important decisions on which practices to implement and what circumstances will be made by well-rounded land management professionals.

The social dimensions of forestry education are being strengthened in many ways. These include: the integration of natural and social dimensions in ecological economics to help foresters better justify, or implement, sustainable practices (Bradley and Lewis 1992); the more effective presentation of the linkage between politics and policy-making in forest resource policy by concentrating on the systems that create policy rather than the legislation which preaches it (Ellefson 1993); and by making foresters more knowledgeable about social constraints (Heiner 1992).

However, these elements will not, in and of themselves, create foresters committed to ecologically sound and socially acceptable management. Such commitment requires understanding that management must be ecosystem based and directed to long-term sustainability of all resource values. Thus, a primary role of education is to give students that sound basis in knowledge of ecosystem function and of the interrelatedness of renewable natural resources. The value systems of society, or of the other professions representing those interests can be capitalized on to achieve social, economic or even environmental realities that push us more effectively to positions of such sustainability. The long-term sustainability of communities, economic stability in the forest industry, productivity and availability of all values that derive from forested ecosystems -- all these aspects of forest management require a better understanding of ecosystem structure, function and dynamics. There is more to sustaining human civilization in the long term than simply exploiting resources effectively today. All human values and experiences as revealed in the arts or humanities, are expressions of how different generations and cultures have related to their natural resources and the land base. These understandings must be part of future "forestry" education.

Aldo Leopold (1949) said that we need to "think like a mountain". Education should be a tool that allows forestry students to do just that, to consider impacts and implications of their actions well beyond their own lifetimes. Technology should not be emphasized until students have a foundation for evaluating the benefits and consequences of using that technology. There are, of course, many models that may achieve this. One model considered by the Washington State University faculty was that the undergraduate degree should span 5 years and include major liberal arts and social science components. Wallinger (1993) argued that the education of forestry professionals should include graduate training with a comprehensive, broadly based Doctor of Forestry. In this view, a Bachelor's degree is only adequate as the technician degree for forest resource management.

Forestry education must integrate resources and management and ultimately forest resource managers should be moulded into a single professional body. UNBC's approach is just one model to achieve these objectivese. Whatever the model, forestry will no longer be the stand-alone profession of past decades. The forester will, as Wallinger (1993) advocated, be one member of a cadre of natural resources (land) managers who share the common task of extracting and protecting the diverse values of the land and the renewable resources it supports by means of ecologically sustainable practices. The new land ethic canon of the SAF states that "Stewardship of the land is the cornerstone of the forestry profession". Thus wise and effective land management, not forest management per se, is the credo by which the profession will operate in the future. Responsibility for effective and sustainable land use does not rest solely with the natural resources professionals; engineers, municipal planners, business managers and others plus the people who educate these other professionals must join in the move to sustainable development and land use. This task is a more formidable one than educating foresters to treat the land with respect, nuture it, and produce outputs that not only have values for human societies but also sustain the land base in perpetuity. The forester's education must sensitize him/her to the complex and dynamic nature of social values enabling him/her to recognize when changes in value systems are occurring and to influence those changes. The curriculum will expose students to all the resource professions and be based upon a foundation of ecological knowledge. The result will be forest land managers who understand and accept their social responsibilities and are able to work cooperatively with people from many disciplines, cultures and walks of life to achieve ecologically sustainable management for diverse resource objectives. I believe we have made a good start and that by the end of the decade most forestry schools will have adapted their training programs accordingly.

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Table 1.

Standard Forestry curriculum requirements as outlined by the Accreditation Handbook of the Society of American Foresters.

GENERAL EDUCATION

a). Communications
b). Science and mathematics
c). Social Sciences and humanities (including economics)
d). Electives

PROFESSIONAL EDUCATION

a). **Forest Biology.** Topics should include taxonomy, distribution, and ecological characteristics of trees and other important plants; physiology of trees, including metabolism and growth; basic and applied genetics; ecological concepts and principles, including fire ecology and use of fire; soil formation, classification, composition, and properties; silviculture, including methods of establishing and controlling the composition, growth, and quality of forest stands; entomology and pathology, including the study of representative forest organisms and the application of integrated pest management; and wildlife and fish biology, including habitat manipulation and population dynamics.

b). **Measurement of Forest Resources.** Topics should include land measurement, photogrammetry and remote sensing; sampling theory and methods; measurement of trees, forests and forest products; wildlife habitat assessment; measurement of water yields and quality; assessment of air quality and of the esthetic, cultural, mineral, range, recreation, and wilderness values of forests.

c). **Management of Forest Resources.** Topics should include multiple-use principles, incorporating management for wood, forage, water, wildlife, fish, recreation, cultural, educational, and esthetic benefits; forest engineering, including harvesting and wood utilization; and systematic approaches to problem-solving and decision-making.

d). **Forest Resource Policy and Administration.** This area of study integrates all aspects of forestry education. It provides the student with an understanding of the social, political, legal,economic, institutional, and historical influences on forestry. Topics should include forest policy, administration, land and resource planning, budgeting, and financial and personnel management.

Table 2.

Core subject areas required for forestry programme accreditation by the Canadian Forestry Accreditation Board.

BASIC PHYSICAL and BIOLOGICAL SCIENCES and MATHEMATICS

FOREST SCIENCE and SYNTHESIS

Dendrology
Silvics
Siviculture
Forest Soils
Forest Hydrology
Forest Ecology
Fire Management/Meteorology
Tree Morphology/Physiology
Forest Entomology
Forest Pathology
Forest Mensuration
Photogrammetry/Photo Interpretation/Remote Sensing
Electronic Data Processing
Statistics/Biometrics
Forest Economics
Forest Land Management
Integrated Resource Management
Timber Harvesting
Forest Products and Manufacturing
Communications and Technical Report Writing
Forest Policy

COMPLEMENTARY STUDIES

Human Relationships
Humanities
Professional Ethics
Business and Management Skills

Table 3

Comparison of Sustained-yield multiple-use and multiresource forest management. (from Behan, 1990)

	Sustained-yield multiple-use	Multiresource
Assumptions	The forest is a collection of several useful, merely coincidental substances and services; social perceptions of utility are constant; a chronic social tendency toward "overuse" is historic; land is the scarce factor of production.	The forest is a single biophysical system that responds as a system to the manipulation of any of its parts; social perceptions of utility are volatile and unstable; the scarce factor of production is capital.
Objective	Perpetuate the physical supply of several particular and independent substances and services.	Least-cost, simultaneous production of several interdependent and useful substances and services.
Constraint	Periodic harvest of each resource must be less than or equal to its periodic increment.	Maintenance of the forest system as a forest system.
Application	A police-action enterprise in rationing; an arbitrary policy limitation on use rates.	Prior simulation, subsequent monitoring of the systemic response to management activities; evaluation in biophysical and social terms.
Intuitive response	Increasing production through long-term capital investment; the ultimate constraint is the biophysical maximum of a given site.	Short-term marginal adjustments; maintenance of options; rational use of investment capital.
Consequence	A flow of some unchanging substances is sustained in the long run, but short term sacrifice of others may be necessary (e.g., wildlife escape cover in a clearcut).	The product mix of substances may change, but a flow of value is sustained.
Appropriate social context	The aristocratic, mercantile political economies of central Europe in the 1700s.	The democratic, capitalistic political economy of the United States in the late 1900s.

Table 4

The University of Edinburgh's Honours Forestry program, showing the normal course structure for the three years of the BSc Ecological Science with Honour's year options.

Year 1 Origin and Diversity of Life
Physics in the Life Sciences
Human Population Biology
Biological and Economic Systems
Chemistry I (or Geography I or Geology)
Introduction to Ecological Science
Field Course

Year 2 Principles of Ecology
Biometrics
At least one of Resource Economics, Animal Biology, Plants and Fungi
At least one of Climate and Water, Soils and Land Use
Plus other courses (to a total of 6) selected from:
Agriculture 2; Biological Chemistry; Cellular Metabolism; Evolution in Action; Genes, Viruses and Immunity; Human and Mammalian Physiology; Psycology; and others.
Field courses in Ecological Processes and Resource Measurement

Year 3 Ecological Systems
Resource Ecology
Natural Resource Management
Plus one of:
Evolutionary and Ecological Genetics; Rural Business Management; Environmental Technology; Behavioural Ecology; Evolution and Ecology of Plants; Crop Science
Two or three field courses selected from:
Upland Forestry; Lowland Forestry; Wildlife Ecology; and Agriculture

Honours Year	Ecological Systems Resource Ecology Natural Resources Management One of: Rural Business Management; Crop Science or Animal Production Common Core Options

Educational Foundations

Communications
- *Introductory Writing
- *Technical and Professional Report Writing
- *Human Relations

Social Sciences
- *Economics in Agriculture *or* Fundamentals of Microeconomics
- *Social Science general university requirement

Arts and Humanities
- *Arts and Humanities general university requirement

Intercultural Studies
- *Intercultural Studies general university requirement

Biological Sciences
- *Introductory Biology
- *General Ecology

Chemistry and Physical Sciences
- *Introduction to Chemistry *or* Principles of Chemistry
- *Physical Geology

Math, Statistics, and Computer Sciences
- *Mathematics for Life Scientists *or* Calculus *or* Introduction to Mathematical Analysis
- *Biometry *or* Management Information Science

Natural Resources Core
- *Introduction to Natural Resource Management I
- *Introduction to Natural Resource Management II
- *Introduction to Natural Resource Management III
- *Introduction to Natural Resource Management IV
- *Introduction to Soil Science
- *Natural Resource Measurements and Inventories
- *Forest and Range Plant Resources I
- *Forest and Range Plant Resources II
- *Natural Resource Economics
- *Natural Resources and Society
- *Airphoto Interpretation and Remote Sensing
- *Natural Resource Planning
- *Natural Resource Policy and Administration
- *Watershed Management
- *Integrated Field Studies
- *Big Game Range Management *or* Introductory Wildlife Management

Forestry Core
- *Forest Biology
- *Silviculture
- *Forest Measurements
- *Timber Harvesting
- *Principles of Range Management
- *Forest Finance and Valuation
- *Forest Sampling
- *Forest Growth and Yield
- *Wood, Wood Products and Marketing
- *Harvest Scheduling
- *Introduction to Wildland Fire

Forestry Options

Business
- *Principles of Accounting

Two of the following:
- *Fundamentals of Microeconomics
- *Law and the Legal Environment of Business
- *Management Information Science (Q Methods)

Three or more of the following:
- *Principles of Management and Organization
- *Operations Management
- *Business Information Systems
- *Finance
- *Risk and Insurance
- *Marketing
- *International Business

Wildlife
- *Introductory Wildlife Management
- *Animal Population Dynamics
- *Wildlife Ecology
- *Range Habitat Analysis
- *Big Game Range Management

Management
- *Forest Pathology
- *Forest Entomology
- *Wildland Recreation

Directed Studies

Figure 1. Modules in the revised Washington State University forest management curriculum.

Educational Foundations

Communications
- Effective University Writing and Communication

Arts and Humanities
- Core Arts and Humanities

Biological Sciences
- Core Life Sciences
- Introductory Biology
- Ecology

Math, Statistics and Computer Sciences
- Calculus
- Computer Science
- Biostatistics

Social Sciences
- Core Social Science
- Micro economics

Chemistry and Physical Sciences
- Core Physical Sciences
- Physical Chemistry
- Organic Chemistry
- Physics or Atmospheric Studies
- Geomorphology

Natural Resources Core
- Natural Resources Management I
- Natural Resources Management II
- Natural Resources Management III
- Natural Resources Management IV
- Forest Soils
- Resource Inventories and Measurements
- Forest Biology
- Plant Systems
- Natural Resources Economics
- Society, Policy and Administration
- Geographical Information Systems
- Integrated Resource Management
- First Nations' Approaches to Resource Management
- Field Camp
- Natural Resources Planning
- Watershed Management
- Environmental Impact Assessment
- Issues and Ethics in Natural Resources

Forestry Core
- Silviculture
- Forest Health
- Forest Practices, Guidelines and Regulations
- Fire Ecology and Management
- Forest Harvesting Systems
- Forest Growth and Yield
- Forest Products
- International Trade

Figure 2. Modules in the University of Northern British Columbia's forestry curriculum.

APPENDIX 6

RESPONSE TO USERS' NEEDS IN FORESTRY EDUCATION, WITH SPECIAL REFERENCE TO TECHNICAL AND SOCIO-ECONOMIC ASPECTS OF SILVICULTURE AND MANAGEMENT TEACHING IN THE ASIA-PACIFIC REGION

by

Kamis Awang [1]

ABSTRACT

Forestry in the Asia-Pacific region, in common with that in the rest of the world, is undergoing transformation. There are increasing concerns over rapid deforestation, environmental degradation, possible threats to biodiversity and the marginalization of forest dwellers. The challenges faced by the forestry profession in resolving these complex and interrelated issues requires new approaches to forestry and hence a new breed of foresters. In future forestry education must satisfy a broadened range of clientele including not only the traditional, such as national governments (forest services) and timber companies, but also farmers, villagers, conservationists, landless people and recreationists. With regards to silviculture and management teaching it is now opportune to review curricula with a view to making innovative changes in response to increased knowledge base and new technologies. The areas/disciplines to be considered include genetics and biotechnology, forest resources measurement, biodiversity and sustainable management, appropriate silviculture and harvesting, economics and resources evaluation, and social sciences. Curricula revision however, must be done in the national context.

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INTRODUCTION

Education development is an evolutionary process. For forestry education this process is consonant with changes in both the needs of the forestry profession and the concerns expressed by society at large. The Asia-Pacific region, comprising some 40 countries and home to more than half of humankind, has been undergoing rapid socio-economic transformations. This has placed tremendous pressures on natural resources (especially forest resources), and on the environment of developing tropical countries in the region. The seriousness of these problems-- rapid deforestation, environmental degradation, increasing threat to biodiversity, marginalisation of forest dwellers/users-- have been acknowledged by the various countries concerned, and efforts are being made to resolve them.

Resolving these problems however, requires forest policy to address many goals, some of which conflict, and many of which are changing rapidly (World Bank, undated). The economic importance of forests and their products still needs to be promoted, now with increased emphasis on non-wood products. The environmental value of forests, legally recognised by all countries in the region, has to be protected. Social goals, including the protection of the interests and traditional rights of forest dwellers, also need to be considered. Furthermore, there is need to take into account the international concern for the importance of tropical forests as rich habitats for diverse species, and as a sink for carbon. Most complex of all the goals that forestry policy has to meet is that of sustainability, which has various dimensions; ecological, economic, and the social and moral aspects of human existence.

The forestry profession, and hence forestry education, needs to respond and adjust to these challenges. It follows that curricula development and their continual revisions must reflect these dynamic and changing realities. The technical and socio-economic implications, particularly in relation to the teaching of silviculture and management, are discussed here.

FORESTRY CLIENTELES REDEFINED

Traditionally, the forestry profession has been responsive to what had been defined as its clients--national governments (forest services) and/or commercial timber companies. Today, however, the profession is increasingly becoming aware that its clientele has been redefined. Clients now also include: farmers wanting to include trees in their agricultural systems; villagers wanting woodlots for fuel and other goods; recreationists wanting places to relax and play; tribal people who traditionally have had access to and control over local forest resources until population pressures began to cause competition for those resources; landless people wanting food, fuel, fibre and other goods that are available to them only on public lands; conservationists wanting to protect the diverse resources and environments.

Indeed, in Rao's (1990) review of the forestry development scenario in the Asia-Pacific region his main areas of focus appear to address this widened clientele for they encompass the following:

- managing remaining natural forest areas in a sustainable way,
- involving local communities in the protection and management of remaining natural forest resources,
- identifying critical watersheds and undertaking programmes of conservation,
- finding appropriate solutions to minimise forest degradation by shifting cultivators,
- establishing networks of protected areas to conserve biodiversity,
- strengthening conservation, collection, and storage of germplasm together with tree improvement to ensure productivity gains in reforestation programmes,

- utilization of non-wood forest products and plantation grown wood,
- promoting community forestry and agroforestry
- promoting amenity forestry.

It is obvious that the mandate of the forestry profession has now been broadened to include new priorities entailing linkages with other groups, institutions, and resource needs. Therefore, educational preparation of forestry professionals should reflect this trend.

TOWARDS THE PRODUCTION OF THE 'NEW FORESTER'

Faced with these new demands, forestry education programmes, government agencies, forestry associations, and individual practitioners should periodically identify and review the knowledge, skills, attitudes, and functions of foresters and related specialists (social scientists). As the various forms of forest practice (e.g. industrial forestry, recreation, environmental management, biodiversity conservation, community forestry, farm forestry) change, it is essential to understand how to deal with the current and emerging demands on professionals instead of prescribing traditional remedies that may no longer work (Parker, 1989).

Forestry education programmes have a range of options as they reorganize and innovate. Those involved in the process, however, must be realistic about the constraints imposed upon them and take advantage of every opportunity open to them. In many cases the programme should pick from the good "germplasm" of the existing curricula and build upon it. Thus, a combination of old and new may best serve institutional needs. In other cases, programme might consider "creative destruction", defined as the act of abandoning the past, outmoded curricula in order to create different curricula founded on a vision of the future that prepares forestry students in new and better ways to meet the challenges of the profession (Parker, 1989).

Silviculture and management (defined in the widest context) constitute the major core of forestry programmes and will remain so following curricula reviews made in response to new forestry needs. However, the review process provides the opportunity to incorporate new knowledge and technologies. These may include the following.

Genetics and Biotechnology

Traditionally, research and development in genetics has been dominated by the use of annual plants of economic importance (for agriculture or horticulture) and little has been done on woody plants or forest trees (Richardson, 1988). Now there is a massive interest and support for such research, in which the new tools of biotechnology are being introduced at an increasing rate. Biotechnology includes any technique that uses living organisms to make or modify products, improve plants or animals, or develop microorganisms (Lantican, 1990).

In forestry, biotechnology applications encompass germplasm preservation, tree seedling production, fertilization, protection of plantations, wood processing, development of new forest products, wood by-products uses, and safe management of hazardous wastes (Dixon, 1986). For example, clonal forestry using vegetatively propagated materials, which have been genetically improved, is increasing in popularity. However, this practice illustrates a contradiction in the users' needs. On the one hand, wood users and technologists seek a uniform raw material and foresters are trying to provide it by restricting genotypic variation. At the same time, we articulate concern over the loss of genetic diversity which depletion of our natural forest implies.

Forest soils are often nutrient poor. In Southeast Asia alone there are 87 million hectares of saline, highly infertile, and drought-prone soil unsuitable for traditionally bred trees. Through genetic engineering it may be possible to engineer trees such that they would accept certain symbiotic microbes that can fix nitrogen from the air (Lantican, 1990). This could replace the use of nitrogen fertilizers which are costly and liable to cause undesirable effect on the environment. The use of mycorrhizae in plantation management is another area of promise. Mycorrhizae enhance nutrient uptake, especially of phosphorus and nitrogen. They also have been shown to increase disease resistance, reduce root shock in outplanted seedlings, and increase tolerance to drought, salt, toxicants, and pH extremes (Dixon and Marx, 1987). Severalfold increase in the growth rates of tree seedlings in the nursery and field situations - and frequently field survival itself - is observed after proper mycorrhizal fungus manipulation.

Yet another example of the application of biotechnology is in the area of pest management, as alternatives to chemical control. Insect pathogenic microorganisms offer one solution for control. Many of the microparasites have merits, including viruses, bacteria, fungi, protozoa, and rickettsiae (Dixon,1986). For example, the tussock moth of tropical pines is a serious global pest. A 1976 outbreak in Papua New Guinea destroyed 40% of the oldest stand of the Lapegu forest in the highlands. In 1982, viruses pathogenic to tussock moth were released in New Guinea through aerial helicopter applications. The moth populations were decimated by viral populations.

Forest Resources Measurement

In the last two decades, we have witnessed the explosion of information gathering, storage and management aided by various new tools such as remote sensing, geographic information system (GIS) and microcomputers. Their application in forest management is vast. Indeed, the development of satellite remote sensing, for example, is dubbed by many as the greatest events in the history of natural resources management (Hoffer, 1988). With its development it has become possible to obtain accurate, timely and reliable data about the extent, location and condition of forest land and rangelands, and other forest resources rapidly and economically over very large geographic areas.

Satellite remote sensing technology is a useful tool for forest mapping and inventory work and for monitoring changes that take place over time such as reforestation, deforestation, and urbanization (World Resource Institute, 1988). Over the last 20 years there has been a considerable improvement in the resolution of satellite images. With LANDSAT 1, which was launched in 1972, the best resolution that could be obtained was 80 meters or roughly the size of a football field. Today, the resolution has been improved to 20 meters which makes it possible to obtain more detailed information from the images. Satellite images are quite cheap compared to aerial photographs (Lantican, 1990).

GIS is a computerised mapping system for capturing, storing, retrieving, and analyzing spatial and descriptive data. In GIS, spatially-referenced data can be derived from hardcopy maps, aerial photographs, video capture techniques, and satellite sensors. The system can integrate and analyze such data and produce a map of the results (Graham *et al.*, 1988). Natural resources managers will find the GIS an excellent tool for data storage and display because it can produce an output in a variety of formats such as maps, tables and statistical graphics. Further, since it can also be used as a powerful modelling tool, managers can also use it for monitoring resource changes, for analyzing causes and effects and for testing the outcome of alternative causes of action.

The microcomputer is no doubt one of the greatest technological innovations of the last two decades. Its development has provided foresters with an inexpensive tool for various aspects of forest management enabling as it does data storage, retrieval and analysis as well as modelling, word processing and presentation of information in various formats such as tables, charts and graphs. Within the last five years, tremendous improvements in the capability of microcomputers for data processing have been achieved. Their data storage capacity and processing speeds have been considerably enhanced with the development of high speed microprocessors, memory enhancing devices, and high capacity floppy and fixed disk drives. Their capacity for displaying and producing output has also considerably improved with the development of monitors with superb resolution and which can show a greater variety of colours. At the same time printers that can make letter-quality printouts have been produced.

Biodiversity and Sustainable Management

Biodiversity (biological diversity) refers to the entire range of variation among plants, animals and micro-organisms, across all levels of the biological hierarchy, from genes to ecosystems. It is commonly thought of, and quantified, in terms of numbers of species, particularly of vertebrates and higher plants (Kemp and Chai, 1993). In these terms tropical forests are exceptionally rich, containing half of all vertebrates and vascular plant species so far identified and, allowing for the much larger numbers of species, particularly invertebrates, yet to be discovered, possibly 90% of the world's total species (McNeely *et al.*, 1991). In addition, the limited studies so far made of variation within tree species in natural forests have revealed high levels of intraspecific diversity which are likely to be a major determinant of how successfully a species will respond to disturbance, either from natural causes, or human interference (Solbrig, 1991). This genetic variation may be particularly significant in relation to possible changes in global or regional climate, or to the longer-term effects, and therefore sustainability of the forest.

Biodiversity conservation may be the catchphrase of today's development efforts because of the increasing concern for rapid tropical deforestation. But, in order to be effective, the following outstanding issues need to be resolved (Boyle, 1992).

- How do the level and distribution of biodiversity affect ecosystem functioning?
- How do we measure biodiversity ?

- How do we value biodiversity ?
- How can we identify key areas for conservation?
- How can progress on forest biodiversity issues be promoted internationally?

Linked to biodiversity conservation is also sustainable productive forest management. This not only requires adequate control over a permanent forest estate but must be supported by information on the composition of the main forest types. The requirement is for information on the silvicultural characteristics of the principal species together with that of other species which may compete with them at various stages of their development. Therefore, improved knowledge on ecology and autoecology as well as genetic structure and breeding biology of the principal species can contribute greatly to management for the conservation of biodiversity.

Appropriate Silviculture and Harvesting

Silvicultural and harvesting practice together constitute the "shop front" of forest management (Florence, 1993). No matter what measures are taken, the social acceptability of production forestry must depend, ultimately, on the perception people have of the harvested forest, and their confidence in the ecological sustainability of the forest.

With regard to silviculture, there are two basic elements to be considered when aspiring to high standards of ecologically sustainable management (Florence, 1993). Firstly, silvicultural practice must conform with the dictum that '... a good silvicultural system is not chosen but formulated as a solution to a specific set of circumstances' (Smith 1962). It follows that where these circumstances are diverse silvicultural solutions might also be diverse. This could require greater flexibility in silvicultural practice, and the use of a wider and more innovative range of silvicultural methods than is characteristic of much present practice. The extent to which this may be done will be consistent with the ecological and structural diversity within the forests, and the range of objectives set for the forests. The latter may include the promotion of non-timber products where appropriate.

Secondly, silvicultural practice must be demonstrated to be ecologically sustainable, that is, maintaining for the long term, the plants, animals, community patterns and ecological processes which characterise each of the forest's component ecosystems. This will require an understanding of community patterns and their environmental relationships, an awareness of the way limiting site resources can affect the vigour, dynamics and health of stands, and an appreciation of the extent to which the composition, stocking and structure of stands might be altered without jeopardizing the sustainability of the ecosystem.

As part of an evolutionary progress towards more sensitive and ecologically sustainable forestry, there must be continuing adjustments to ways in which forests are harvested. Changes that should be designed to reduce the environmental impacts of harvesting and accord greater priority to forest values other than wood production alone. This will be consonant with the goals of sustainable management of forest resources.

New sources of knowledge which have traditionally been ignored in silvicultural and harvesting practice ought to be tapped. For example, the indigenous knowledge of local people might serve as a tremendous source of information about the biological diversity, potential uses, growth patterns of various species, and reasons for poor production in some parts of the nearby natural forest. However, the skills (e.g. communication) needed to obtain this kind of knowledge are different from those required for traditional forest inventories. Therefore, the education of practitioners may need to be expanded to take advantage of new opportunities. Here social technologies, such as social sampling, survey design, interview techniques, methods of systematic observation, and the analysis of social statistics may be most useful (Parker, 1989). These social technologies are also equally important for the success of community/farm/social forestry.

Economics and Resource Valuation

Economics, particularly with regard to forest resources management, has been undergoing dramatic changes. This has to be reflected in forestry education. Traditionally forest economics has tended to focus on the financial viability of plantation forestry, and in the case of natural forests it is more restricted to determining the viability of logging for timber production. The "intangibles" have only been given lip services. Timber from the natural forest has always been underpriced as compared to stumpage values, hence leading to extensive exploitation (Awang Noor and Vincent, 1993).

This has changed. Today, there are calls for greater economic emphasis to be given to products and services other than timber, and for the need to give consideration to the effect of increasing scale of resource use. For example, that utilization of non-timber goods is economically viable compared to other forms of land use was shown in a study by Peters *et al.*(1989) in a Peruvian tropical forest. In the calculation of the net present value of fruit, latex and timber under two different conditions of selective cutting in one hectare of forest, fruit and latex were found to account for up to 98% of the total net present value of the forest.

There are some constraints in doing this kind of analysis, especially when we have to deal with non-timber goods and services that do not have monetised markets. Several economic tools, however, have been developed recently to overcome this. Shadow pricing is one of them. It has been used in cost/benefit analysis, not only to value goods and services for which there are no monetised markets but also to price non-timber goods and timber with monetised markets on their true value (Salleh and Manokaran 1993).

For long term forestry, an approach to valuation of all goods and services is being developed through the concept of "emergy" (embodied energy) (Nilsson and Sundberg, 1990). Through this concept, which is in the realms of ecological economics, all forest goods and services could be valued in terms of energy, not money as in traditional economics, and then compared with other commodities through energy flows, since short-term monetary values may be unreliable in predicting long-term values. Ecological economics attempts to overcome some of the basic difficulties perceived in traditional economics, such as the possibility of substitution of resources that could become scarce, as well as the function of the market place. It may be too early to judge the role of ecological economics in forestry but the emergy concept holds much promise.

Social Sciences

Forestry profession has now woken up to the new realities. It needs public approval in the conduct of its practices for it to survive. There are at least two aspects that warrant attention in this area. Firstly, foresters must learn more how to communicate with the public at large in "selling" the way they conduct their profession. Very often it is not that what they do is wrong, but more a matter of how the public perceive their actions. They may be the custodian of the nation's resources, but they are not devoid of public accountability. Therefore, public relation is something foresters must learn to master.

Secondly, many areas of new forestry (e.g. community forestry, farm forestry, social forestry and agroforestry) require direct people's participation. They usually form parts of development projects which usually attempt to address a number of complex issues that may include deforestation, environmental degradation, and rural poverty. Their success depends not only on the understanding of the biophysical conditions under which they will be implemented, but also the social, economic and cultural context within which they have to operate. Traditionally trained foresters with limited social sciences education are generally handicapped for this task. The infusion of disciplines such as anthropology, political science, and sociology must be increased to prepare the new forestry professionals for the reality of the world in which they will work.

CONCLUSIONS

In relation to the revision of forestry curricula in response to users' needs Burch (1989) has succinctly expressed the situation when he stated the following:

" Professional forestry education programmes have a dual responsibility---to retain the continuity in their core subject matter while adapting to changing needs by altering the mix and nature of course offerings. This dual responsibility is greatly affected by changes in our knowledge base that makes some practices outdated and confirms others. Also there are changes in the natural systems that we manage. Finally, there are natural changes in the human perceptions of the values, benefits and needs sought from natural systems."

The revision must be done in the national context while being sensitive to international concerns. In meeting the demand, we should take account of the long time required for human resources development. The new forester cannot be produced at the speed that many would like.

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APPENDIX 7

INTEGRATION OF UNIVERSITY COURSES IN EXCHANGE OF FORESTRY STUDENTS IN EUROPE UNDER THE ERASMUS/SILVA-NETWORK SCHEME

by

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and
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SUMMARY

The European Community Action Scheme for the Mobility of University Students (ERASMUS) was established in 1987. Its main aim is to motivate western European students to spend three to twelve months of their study time at a higher education institution in an EC country which is not the student's home country.

Students interested in the programme apply for a grant which compensates them for the additional costs of study abroad. They enroll at the host institution without paying tuition fees there. Grades obtained at the host institution must be fully recognized and integrated in the degree or diploma at home.

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SILVA-Network is an Inter-University Cooperation Programme under the ERASMUS scheme. Despite a low budget and a loose institutional structure it has succeeded in linking more than twenty forestry education institutions at university level located in fourteen European countries and in organizing the exchange of more than 60 forestry students during the 1993/94 academic year. Differences in curricula, course structures and exam regulations make it difficult for a foreign student at a host university to tailor a study programme to his/her required shape.

INTRODUCTION

The ERASMUS Scheme

1. General Introduction

The EuRopean Community Action Scheme for the Mobility of University Students (ERASMUS) was established in 1987.

ERASMUS is not simply an acronym but recalls to mind Erasmus Desiderius of Rotterdam, a famous Dutch scholar, writer, and humanist who lived from 1466 to 1536. Erasmus worked in the Netherlands, France, England, Italy, Germany, and Switzerland. It was usual in the middle ages for students not to enroll and study at a single university but rather to move over the Euro-pean continent from one university or abbey to another, endeavouring to come into personal contact with prominent scientists and teachers of their time, such as Erasmus. Travelling was exhausting, expensive, and often dangerous in the middle ages; therefore, students needed sponsors, and they used to move in groups, often covering large distances on foot. Communication between scholars, on the other hand, was easy in medieval European academic society for everybody spoke Latin in addition to their mother tongue.

Thus, the ERASMUS scheme's acronym indicates the main aim of the programme, namely to support student mobility in Europe. It tries to stimulate the exchange of students and to accelerate the integration of the people of the Europe. Originally only aimed at the 12 member countries of the European Community (EC), the ERASMUS scheme has since been expanded to assist students from EFTA countries (European Free Trade Association, i.e. Austria, Finland, Iceland, Norway, Sweden and Switzerland) to attend for some part of their degree a university or equivalent establishment in an EC-country.

The EC has established further programmes which support mobility and exchange of students and scientists, e.g. from eastern Europe or from developing countries. These instruments will not be dealt with in this paper.

Under the ERASMUS scheme, the EC provides the necessary finance to Member States. The basis for the distribution of the ERASMUS budget, amounting to a total of about 45 Million ECU (European Currency Unit, roughly equivalent to the US$), among member states is primarily the proportion of 18 to 25 year-olds coupled with the proportion of all students enrolled at higher education institutions in each EC country.

ERASMUS grants may be used to stimulate four types of activities:

- Student mobility
- Joint development of curricula
- Teacher mobility
- Organization of intensive programmes.

This paper concentrates on **student mobility. Joint curricula** is an attempt to encourage parallel development of curricula so so making it easier for students to integrate their studies abroad with those at their home institution. **Teacher mobility** motivates lecturers to go to a foreign university and teach there for a lengthy period. **Intensive programmes** are special courses taught over one to four weeks by lecturers from different universities and open to students from different countries.

The somewhat complicated organisational and administrative structure of the ERASMUS scheme will not be explained in any detail. It is necessary, however, to introduce the Inter-University Cooperation Programmes (ICPs). An ICP may be defined as a cooperating group of at least two departmental units from different countries in a special discipline - such as forestry. Formally, rectors or presidents declare in a Letter of Intent that their university is willing to participate in a certain ICP. But what makes ICPs work are the activities developed by faculties, departments, study courses or however and whatever the disciplines may be organized and named (in the following, the term department will be used). Usually, an ICP is coordinated by a university teacher based in one of the participating departments. This programme coordinator cooperates with the ICP-representatives of the other departments involved. He/she prepares the yearly applications for funds to be addressed to the ERASMUS Bureau in Brussels as well as periodic reports; the coordinator also initiates meetings of the ICP-representatives.

2. ERASMUS Students

In the initial phase 1988/89, nearly 12,000 students were awarded an ERASMUS grant. The number has risen to 70,000 in the period 1992/93. It is expected that more than 100,000 students will make use of the scheme in 1993/94; this figure may be compared with a total of 8 to 9 million students at higher educational institutions in the EC. Students receive mobility grants either through an existing ICP or individually, the latter being known as "free movers". In practice, only a small number of awards is open for students who apply directly to the national ERASMUS agencies. As a rule, mobility grants are awarded to students enrolled at departments participating in Inter-University Cooperation Programmes. Interested students have to apply to the ERASMUS representative of their department.

It is the task of the ICP representatives to inform students of their department about the mobility scheme, to give advice to students interested in studies abroad, to help them select a suitable host university and to initiate the contact with the representative of the partner department. The representatives also coach students from partner departments during their stay at the host university. Quite often, however, a special supervisor is also involved. Students at the receiving department can also be important role in helping guests to settle in and to adapt to their new surroundings.

These are the main regulations of the ERASMUS scheme:

1. The scheme is open to all types of higher education institutions and to all subject areas. It is open also for PhD students, even though by far the majority of participants are undergraduates.

2. Grants are awarded to nationals of EC and of EFTA Member States. However, students from EFTA countries get funding only for studying in an EC country.

3. A student can only profit once from ERASMUS funding.

4. A student will be awarded with a grant only after he/she has been enrolled in the home country for at least one year.

5. The duration of stay at the host university must normally be between three and twelve months.

6. The student stays enrolled at the home university, paying the usual tuition fees; he/she also enrolls at the host university, gaining the advantages of student status there, but without paying tuition fees.

7. The stay must be confined to the period from 1st July to 30th of September of the following year. Forestry students and scientists regard this a somewhat restrictive and unnecessary for it makes for difficulties, e.g. collection of field data for a thesis over one growing season.

Student mobility grants do not cover total costs of study abroad, but only compensate for any additional costs, especially higher costs of living, travel expenses, and all costs of any foreign language preparation. The sums provided to students vary from country to country because they are fixed in part by the national ERASMUS agencies and in part by the individual universities. Usually the funds available are not sufficient to cover all needs. In this event a national agency may decide to limit the number of students supported. However, the tendency seems to be to limit payments for each grantee in order to include a high number of participants.

In Germany, for example, the maximum amount payable per month and student is theoretically fixed at about 340 ECU per month but in reality the grants awarded are only about 150 ECU. According to the ERASMUS Annual Report for 1992 the average ERASMUS student grant paid by all the national agencies was 192 ECU per month in 1990/91.

SILVA-Network

2.1 Development of the Network

Of more than 2300 Inter-University Cooperation Programmes currently under the roof of ERASMUS three are formed by forestry education institutions. SILVA-Network was the first to be founded and is by far the largest. Of the two others, one is a cooperation of four professional forestry schools in Germany and Greece, whereas the third encompasses six universities organizing intensive courses on short rotation forestry. The examples show that the ERASMUS scheme allows different types of cooperation and that it does not only cover universities.

After the start of ERASMUS in 1987 most forestry departments of universities in EC Member States examined the programme and judged it to be very ambitious. Even before the inception of ERASMUS it was common practice to host students from other countries, to encourage students who wished to seek study opportunities abroad, to invite colleagues from other departments or to support them in organizing field study tours etc. There was also some early experience with Joint Study Programmes of the EC that ran from 1976 to 1987. So in principal the aims of ERASMUS, to further student mobility and the exchange of lecturers, and especially the offer of funds for these purposes, were well received. However, the specific aims of the scheme seemed hard to meet, while the formal requirements looked like generating a lot of administrative inconvenience. Specific requirements include:

- Formal declarations by universities are required in order to enter an ICP.

- Activities must be planned in detail one year before the begin of the funding period.

- Departmental planning must be tuned in time with that of partner departments.

- Detailed applications for grants must be presented to the EC administration.

- Financial statements as well as reports on activities must be submitted every year.

- Student mobility must be organized in a way that grades obtained at a host department are fully recognized and can be integrated in the degree or diploma at the home department.
- This requires (beside of open minded examiners) the harmonization of curricula and exam regulations or a transfer system for credits obtained abroad.

Despite such scepticism and reservations several EC forestry departments showed an early interest in ERASMUS programme and began to contact others in order to ascertain prerequisites for cooperation. Eventually the Forestry Department of the University of Wageningen in the Netherlands stated that it was willing to carry the administrative burden of coordinating any forestry ICP that might be established, this came to be known as the SILVA-Network.

In 1989, 9 forestry departments from 7 EC countries formed SILVA-Network and presented the first funding application for the study year 1990/91. This was at a time when most ICPs only had two member institutions. In 1991, the number of forestry departments rose to 15. Today, SILVA-Network links 21 forestry departments from 14 countries, of which 9 are EC Member States and 5 belong to the EFTA. Countries where SILVA-Network departments are located are shown in the map on page 8. The Network is now managing the fourth year (1993/94) of student exchange. As yet forestry education institutions from Denmark and Spain are missing, but universities from these countries will probably participate in the study year 1994/95. The total number of departments participating would then be expected to be 25.

2.2 How the Network works

SILVA-Network is directed at international forestry education on university level within the ERASMUS programme. It includes all forestry subjects, from botany and silviculture to forest policy or wood technology. Teaching and research at the departments involved cover aspects of forestry in polar regions as well as in densely populated

Central Europe, in Mediterranean regions and in the tropics. This great variety opens up the possibility for mobile forestry students to add specific elements to the study programmes offered at their home departments. One might consider SILVA-Network as the nucleus of an International Forestry University. But before falling into raptures about the possibility of such an ideal institution at some stage in the distant future, it beholds us to look at how the SILVA-Network functions today.

Organization, coordination, finance

Since its foundation, SILVA-Network has been coordinated by the Department of Forestry at the Agricultural University Wageningen, The Netherlands. The yearly budget available for the administration and coordination of this group of now 21 departments amounts to about 20,000 ECU. This is, under western European conditions, not even enough money to pay the salary of one employee.

Therefore, SILVA-Network neither boasts an impressive office facility nor a permanent staff. The EC finance awarded is helpful and it is necessary, however what makes the network work is not in the first instance money, but the activity of the coordinating team in Wageningen, the commitment of the representatives and of a usually group of lecturers in every participating department, and not at least the growing interest of forestry students to move (which again motivates members of the teaching staff to involve actively in the ERASMUS programme). The main elements holding the network together and developing it are meetings of the representatives, organized once or twice a year in different countries and hosted by one of the departments. A considerable part of the ERASMUS funding mentioned above is used to cover travel expenses in connection with these meetings. This external finance is vital as travel budgets of the departments are small and the representatives do not have access to individual ERASMUS funds.

The SILVA-Network meetings have different functions. Generally, they are necessary to bring the representatives together for direct exchange of information, for discussion of difficulties met, for planning of future activities, also, and not at least, for mutual motivation through personal contacts. The individual departments present themselves, their curricula and specific capacities on these occasions. The representatives contact each other in order to find adequate suitable host departments and tutors for students interested in a study period abroad. The meetings support the coordinator in preparing the applications for funding and in taking decisions on future activities.

The coordinator and the individual representatives distribute written information to the other departments, covering institutional structure, study and research subjects, course programmes, duration of courses, start and duration of lecture terms, languages used, costs of living, exam regulations etc.

The teachers in the departments are asked every year to propose thesis subjects suitable for foreign students. Based on the proposals the coordinator compiles a list which is available to the representatives and to students who intend to do thesis research abroad. Even though it is evident that thesis projects must be shaped in direct contact between an individual student and his/her instructor, these lists stimulate interest and ideas and help students to identify an institution in which they would like to stay.

More instruments of information, coordination, and motivation have been proposed and shall be developed, e.g. a SILVA-Network Newsletter and a standard questionnaire to interview students on their experiences.

Languages

Teaching at the departments forming SILVA-Network is in 10 different languages. Only few forestry departments also offer courses in a foreign language, mainly English in non-English speaking countries.

It is expected that guest-students master the language spoken at their host department. They are stimulated to improve language knowledge following courses either at home or immediately after arriving in the host country. The ERASMUS funding comprises a modest budget to finance language preparation of students. Positive experience has been reported with informal ways of "language training", e.g. when SILVA-Network students began their stay abroad with field work in the forest together with a group of host students.

In practice, the command of foreign languages is one important factor influencing the flow of students within SILVA-Network. Obviously, the decision to study abroad for some months is much easier for students who already master a foreign language spoken at SILVA-Network departments; for many of these students the wish to improve language command is one strong motive to participate in the exchange. Students with poor command of a relevant foreign language are rather hesitant to apply for an ERASMUS grant. Furthermore, it is noticed that there is a preference for forestry departments where teaching is in a language commonly on the curriculum of most high schools in western Europe, especially English and French. Departments with "lesser known languages", such as Greek and Portuguese, may send more students abroad than they host (even though the departments in Lisbon and Thessaloniki proved to be quite attractive for a sufficient number of foreign forestry students).

Communication between individual representatives or lecturers from the SILVA-Network departments is in different languages. During meetings and in documents distributed to all member departments, English is the joint language.

Student mobility and other activities

Students spending a period of up to 12 months at a department in another country broaden their views, experience cultural variety, make friends, improve their command of a foreign language etc. Under ERASMUS, however, there is the specific requirement that activities at the host university shall be integrated in the regular programme necessary to obtain the degree at the home department.

From the start of SILVA-Network, and still today, it has proved to be very difficult for forestry students to identify a set of courses and examinations at a host department fitting into the curriculum followed at home. These are some of the reasons, most of which may be grouped as:

- study years begin at different times;
- lecture periods are organized in trimesters, semesters, or in other sequences;
- most lectures, seminars, practicals are not concentrated on a few days or weeks, but run over one trimester up to 18 months;
- students may be admitted to courses only if they have successfully participated in certain fundamental prerequisite courses timetabled in an earlier study period;
- exam regulations differ and are sometimes very strict, prohibiting students from moving to the next year before they have completed and passed the exams of the preceding one; examinations are not provided immediately after the end of a course;
- curricula differ considerably in regard to kind, weight, number, sequence of study subjects, also in regard to the classification

of subjects as compulsory, eligible, or optional; even at the time when only a few forestry departments formed SILVA-Network, it was impossible to find a common core in their curricula.

These problems have been discussed during most meetings of the SILVA-Network representatives. Different strategies have been proposed, if not to resolve the problems at least to reduce them.

Harmonization of curricula would help, but with more than 20 departments involved this task seems to be almost impossible. There is also the argument that an alignment of teaching programmes would be contrary to aim of providing additional subjects and knowledge through study abroad. Because of the realisation of this it was decided that the SILVA-Network should concentrate the exchange of students on those wishing to work for their thesis abroad. A forestry student who wants to write a thesis at a foreign department chooses the thesis subject following contact with a university teacher at the host department. He/she will go to a place where the thesis subject forms a central part of research and where an expert is available to coach the foreign student. Field or lab work, data processing and reporting is done at the host department, which grades the study according to its own standards. The student returns home with the thesis and a grade. This foreign grade eventually must be transformed into the system used in the home department. In addition, students may attend courses and pass examinations at the host department. Results are administrated in a similar way to the thesis. The decision to concentrate on thesis work has made it possible to start the programme after a relatively short period of preparation.

During each of the first two years of SILVA-Network about 10 students were sent to other departments. Since then the number of forestry students awarded ERASMUS grants has increased considerably, to about 35 in 1992/93 and probably to more than 60 in 1993/94. Whereas a majority of all ERASMUS students go abroad during their third study year, most of the forestry students move to a foreign department in their fourth or fifth study year, as usually thesis work is done at the end of study time.

At the moment, no uniform system exists to evaluate student's experiences in the SILVA-Network. Recently, the representatives have decided to translate and adapt an evaluation questionnaire used in the Netherlands.

As far as the authors can determine, the results in terms of grades given to SILVA-Network students are clearly above average. On the basis of oral and written reports given by students on their return home their reactions have been very positive. Often it is not so much the professional knowledge obtained that has pleased the students as the experience of being cope alone in a different cultural surrounding enjoying the contact with different views, both on science and life; the cooperation with new people, especially students and teachers; and the feeling of a rapid development of their own personalities. Even in the few cases where the education received was not all that might be wished, e.g. because of insufficient coaching by the host department, the stay as a whole, including the personal enrichment, is usually judged positively.

SILVA-Network activities are not limited to the support of student mobility. The exchange of university teachers is being coordinated. However, due to money shortage so far only a few colleagues have received ERASMUS finance for this purpose. Attempts are also being made to develop intensive lecture and seminar units with the participation of teachers from different departments. It is proposed that subjects not integrated in normal curricula, e.g. forest development in environmentally sensitive areas or agroforestry, will be presented at such seminars at an advanced level. As intensive programmes are restricted to a few weeks duration, they facilitate the attendance of students from different countries at the same time and may become a "second leg" of the SILVA-Network in addition to the thesis work.

3. Summarizing Conclusions

The EC ERASMUS scheme offers grants to students who want to stay between three and twelve months at a host university abroad. There are specific requirements regarding organization and quality of students mobility: ERASMUS covers a large number of cooperating groups of higher education institutions in different disciplines, called Inter-University Cooperation Programmes (ICPs). It requires that grades obtained by students during their stay at a host department must be recognized and integrated into the degree or diploma at the home department. The aim is not simply to support students to move but also to establish networks of cooperating institutions based in different countries. One may also identify the integration of western Europe and the better understanding of people from different nations and cultures as a general aim of the ERASMUS programme.

SILVA-Network is a cooperating group of 21 (in near future: 25) forestry departments located in 9 EC countries and 5 EFTA countries. It started as an ERASMUS ICP in 1989. On the basis of four years experience with the SILVA-Network a few general conclusions can be drawn regarding the prerequisites and methods for achieving international cooperation between higher forestry schools:

1. A stable and active regional network of more than twenty forestry departments can be started and maintained with a **low budget** and with a loose **institutional structure.** However, it seems that this is only possible if there is a strong commitment of a small group of staff members in every department involved, if one department is ready to coordinate the group, and if all members give support to the coordinator. It seems that SILVA-Network has nearly reached the limits possible with the available funding and current structure.

2. **Regular meetings of representatives** of all departments involved are essential. The main functions of these meetings are mutual information exchange, development of rules for the network, decisions regarding the admission of new departments, preparation of applications for funds and of reports, and motivation through personal contact. If communication is only by mail these benefits will not be effectively provided. As a consequence, sufficient travel funds are necessary to keep a network operating.

3. During the first years of SILVA-Network, most forestry students hosted by departments abroad concentrated on **thesis work**. This happened mainly because of the considerable differences of curricula, lecture periods, and exam regulations in force at the individual departments, creating difficulties for foreign students to tailor a study programme to their particular requirements. Thesis work in another country mainly attracts top students; this experience motivates supervisors at host departments to accept the additional work of tutoring foreign students, to integrate them in existing teams, to provide laboratory facilities etc. Sometimes, however, lack of finance for field work or equipment hinders thesis work abroad because ERASMUS does not offer research funds for students.

4. In regard to **grading of theses**, cooperation of the supervisor at the host department as examiner with a university teacher at the student's home department as co-examiner has proved to be a reasonable solution.

5. The participation of foreign students in lectures at a host department is easier if block seminars, **intensive courses**, or summer schools of a few weeks duration each are offered. One approach followed by SILVA-Network is to motivate lecturers from different departments to create intensive programmes mutually, preferably on subjects not currently taught in member

departments. However, the preparation of such ambitious additional programmes demands a lot of time and work and ERASMUS funding for this purpose is inadequate. Therefore, it seems more promising to modify course units of short duration that already exist at some departments and to integrate lecturers from other universities.

6. Strict **exam regulations** are formal obstacles for foreign students who want to gain grades during their stay of a few months at a host department. But examiners in SILVA-Network departments apparently have developed a flexible exam practice for ERASMUS students. According to examples quoted by the representatives, tests have been organized out of schedule for guest students or ERASMUS students were allowed to present their thesis in a foreign language.

7. The majority of departments involved practice some kind of **credit system**. It would be helpful to harmonize these systems or at least to make them more compatible. Experiences from a Course Credit Transfer System pilot project of the European Community probably will help in achieving this aim.

8. **Student experience** of the SILVA-Network has provoked very positive responses.

Sources of information

This paper is based mainly on unpublished documents, personal information from SILVA-Network representatives and students, and on personal knowledge of the authors. Beside of these sources, the following publications have been used:

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APPENDIX 8

CONTINUING PROFESSIONAL FORESTRY EDUCATION: A SURVEY OF ISSUES

by

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and
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ABSTRACT

The increasing realisation that the management of virtually any natural resource cannot be effective unless it occurs in the context of the much wider ecosystem, including human beings, within which it is located has led to dramatic changes in the practice of forestry, with a corresponding impact on the forestry profession. So many disciplines are now brought to bear on the management of forests that some have doubted whether the forestry profession in the traditional sense can survive. This paper argues that there is a necessary continuing core of knowledge, an 'expert knowledge', required if forests are to be managed effectively. It is this knowledge and the ability to integrate information of diverse origins that must be maintained in the continuing education of professional foresters. As specialisation of role or change in specialisation occurs within a career

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there is also need for the availability of courses relating to specialised topics. The paper concludes with a discussion of higher order skills and attributes appropriate to forestry education and which might form a basis for validation.

INTRODUCTION

In this paper we have been asked to address the question of validation of degrees and courses in forestry with particular reference to continuing education. However in some parts of the world the definition of forestry as a profession and the role of foresters are increasingly being called into question. This is particularly evident in the USA where these questions have been debated vigorously in symposia (e.g. SAF 1991) and in most issues of the *Journal of Forestry* over the last several years. In Australia, almost all the independently identifiable State forest services have recently become incorporated within broader-based land management agencies due to public and political concerns about the way in which the forests were being managed. These changes have important implications for future forest management, the role of foresters in that management, and hence the future directions of forestry education.

Since validation of any activity can only be considered in the context of what is being validated, by whom, and for what purpose we briefly review the way in which forestry has evolved and where it may be heading in the future before addressing what may be an appropriate education for it. Although conditions underlying the requirements of forest management differ between places, e.g. developed and developing countries, and at different times, we focus here on recent developments in Australia and, to some extent the USA, in the belief that some of the principles we address are also relevant to other countries.

Forestry as a Profession

Forestry as a profession developed relatively recently - in Europe in the early 1800s (Plochmann 1992), in the USA in the late 1800s (Watkins 1992), and in Australia in the early 1900s (Carron 1985). In all these places the stimulus for the development of professional forest services was the need to rehabilitate forests which had been degraded by past uncontrolled exploitation for agricultural purposes and wood products. Controls on the use of the forests by empowered forest services did not come easily and the pioneers of professional forestry were men of energy and vision who fought tenaciously against influential vested interests and a largely disinterested public.

Although the primary objectives of the developing forest services were the rehabilitation of degraded lands, and maintenance of sustained yields of timber for human use, the role of the forests in providing non-wood values such as water, wildlife habitat, recreation was also recognised. The important role of the forests in providing multiple values was formally enshrined in legislation in the USA in 1960 with the passage by Congress of the Multiple Use-Sustained Yield Act. In this Act multiple use was defined as "the management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best suit the needs of the American people". In Australia, a document outlining multiple use practices (Forwood 1974) was praised by a highly respected observer of, and participant in, forestry practices throughout the world as a model for the application of multiple use principles (see Westoby 1987).

In considering the application of multiple use principles it was recognised that not all forest uses and values are compatible with one another and that multiple use may have to be practiced over sufficiently large areas to allow for periodic adjustments in use to conform to changing needs and conditions. The US Act also required that "consideration be given to the relative values of the various resources and not necessarily to the combination of uses that will give the greatest dollar return or the greatest unit-output".

To foresters throughout the world, the concept of multiple use management appeared to offer the best solution to the task of providing the community with the multiple goods and values of the forests in perpetuity. It was not long, however, before multiple use as practiced came under fire from an emerging group of environmentalists in the US and in Australia (see Barney 1974, Routley and Routley 1975). The principal cause of criticism was the charge that undue dominance was being given to timber production at the expense of all other values. These criticisms were exacerbated, and made more apparent to a more environmentally conscious public, by the intensification of forest practices, including clear falling, at a time when greater demands were being placed on the forests for non-wood values, particularly recreation, by an increasingly affluent and mobile population.

In Australia, in the early 1970s, the large scale clear falling of areas of native forests associated with a developing woodchip industry, and an acceleration of the replacement of native forests with fast-growing softwood plantations added, immeasurably, to the concerns being expressed by the environmentalists. Although foresters could point to the future benefits of building a viable softwood resource and industries based upon it, and the conversion, by clear falling, of previously unutilisable native forests debilitated by fire and past logging practices to vigorous naturally regenerated regrowth, these arguments were not accepted by the public.

The validity of the foresters' arguments has largely been justified by the reliance Australians, including environmentalists, now place on timber supplies from plantation forests, and by the fact that innumerable enquiries into the environmental effects of woodchipping in native forests have been unable to identify any long-term, deleterious effects (RAC 1992).

Nevertheless, the scale of the operations and the apparent disregard to other forest values was, to say the least, insensitive and the devastated appearance of large clear-felled areas was used to great advantage by the environmentalists at public meetings and through the media. Although, progressively since the 1970s forest management practices have improved enormously, both in the softwood plantations and in native forests, this has not reduced criticisms by environmentalists, and forestry and foresters in Australia have never regained the trust of the public in forest management.

More recently in the USA, multiple use management has been criticised (Behan 1990) on the grounds that it is multiple use by 'adjacency', i.e. single uses are dominant on any given area at any given time and is, in reality, a mosaic of single uses. Behan claims that "multiple use has always held more promise than our profession could deliver" and he argues for a 'paradigmatic shift' to multiple use by 'multiplicity'. In this paradigm, forests would be recognised as single, interactive systems in which all components are interconnected, and that alteration to anyone component as, for example, cutting a single tree, will influence all other components. This view has much in common with principles on sustainable development (interpreted as *ecologically* sustainable development in Australia), biodiversity, and application of the 'precautionary principle' recently endorsed by most countries at the United Nations Conference on Environment and Development (UNCED) in Rio in 1992.

How well multiple use by multiplicity and the several principles endorsed at Rio can be implemented will depend on the way in which they are interpreted in different places; on the extent and nature of community demands on the forests; its willingness to pay for the manifold products and values; and on the ecological and silvicultural requirements of the forest systems.

The Future of Forest Management

Westoby in his many contributions to the philosophies underlying, and the practices of, forest management throughout the world (see Westoby 1987) has repeatedly emphasised the view that "forestry is not about trees; it is about people. It is about trees only so far as they *serve* the needs of people". We believe that, contrary to the view promulgated by many environmentalists, foresters have devoted themselves to the service of the public. One of these services was wood production in accordance with governmentally determined policies. While in Australia the foresters response to environmental concerns was slow, they have since the 1970s adapted their practices very substantially to help meet environmental concerns and have attempted to maintain a continuing dialogue with the environmental movement. Unfortunately the polarisation between forestry and the more extreme environmental lobby has not been breached; indeed, if anything, the rift is widening.

It is becoming apparent that the differences between foresters and the environmental lobby is not so much a matter of practice but a matter of policy and the environmentalists have cleverly, but mistakenly, attributed the formulation of policy to the forest services. It is not. In democratic societies, at least, national or State policies are determined and enacted by governments on their evaluation of the perceived needs of the community. While foresters through their knowledge and expertise, must be active participants, and even assume a leadership role, in the formulation of forest policies they do not, in themselves, set it. They must, however, be in a position to implement those policies once defined.

One possible advantage of the incorporation of forest services into multidisciplinary departments as has happened in Australia recently is that it should help allay the unjustified concerns that forest policies are both made and implemented by forest services.

Forest Education

It is clear from the preceding discussion that forestry is not only about trees. It is about the whole forestry environment and individuals trained to manage the forest resource may require an increasing number of diverse skills. Quite clearly no one individual can possess all the skills required for modern forest management, and it is essential that modern forest managers work as members of a team. However in a paper delivered in 1971, Westoby (see Westoby 1987) cautions that the establishment of multidisciplinary teams is not in itself any answer to the problems of fragmentation and integration. He quotes Coombs (1971) who stated: "Look at what happens when a collection of specialists of virtually any brand is put together in an operational agency - such as a bilateral aid agency, a specialized international agency or a national ministry. In short order each subgroup of specialists creates its own box on the chart, spawns its own sacred doctrines and begins displaying aggressive tribal tendencies of the most unscientific sort".

In contrast to the multidisciplinary approach, Westoby describes a metadisciplinary approach which he defines as training an expert with a solid grounding in a given area of expertise and with a general knowledge of a problem area. He thus becomes a specialist in terms of his expert knowledge, and a generalist in terms of a set of problems to which he becomes committed. In the metadisciplinary approach, it is the common problems to which the team members are committed that help them bridge the intellectual barriers of expert knowledge.

This appears to us to be a most applicable framework in which to consider the training of forest managers.

The 'expert knowledge' required of forest managers is, in our view, expertise in *management* of a complex natural resource, the forest. They need to be 'generalists' in a range of disciplines pertaining to forest management.

The primary role of forest managers is to *integrate* a broad range of relevant information so that they can produce and implement practical management plans within an approved policy to best meet the needs of the community. Depending on circumstances, the forest policy may require the forests to be managed for wood, for water, for recreation, for preservation or a combination of these and it is the forest manager's responsibility to fulfil these government and community requirements as economically, and with as little impact on the environment, as possible. Uses of the forests may vary widely at different places and at different times but it is important to appreciate that, for any use, forests must be managed. Even allocation of areas for a purpose such as wilderness will require sensitive management on aspects such as fire control, invasion by exotic weeds, control of recreation, and intrusion by scientists and other visitors. Hence the range of relevant skills which the forest manager must call upon is extremely broad, and requires a specialised training.

Traditionally foresters have been trained to have an appreciation of the basic physical and biological sciences pertaining to forest ecosystems, a knowledge of the sciences, technologies and economies which underpin both wood production and environmental management, and a professional experience of forest policies and economic and management systems. Forest managers need not be expert in all these different fields but they must have sufficient understanding of them to formulate and supervise the implementation of appropriate management plans; to be able to communicate meaningfully with experts in other disciplines as the need arises; and to be able to determine when that expert advice is required.

The complexity of forest management in traditional areas has increased due to changing demands on the forests and on technological developments in many areas including management systems, e.g. computer simulation, geographical information systems.

There are further requirements for foresters to develop their communication skills, especially with the public, and to have greater expertise in areas that were, at best, peripheral to the mainstream of forestry education as, for example, agroforestry, land rehabilitation, urban forestry, extension forestry, community forestry, business management, environmental law, conflict resolution, and a better appreciation of the role of forestry in a national and international context. How can all these requirements be met?

One suggestion (Wallinger 1991) is to extend the formal training to seven years with the first four years to baccalaureate level being technical training followed by a three year course leading to the professional qualification of Doctor of Forestry. This is unlikely to be adopted by most countries on economic and 'efficiency' grounds, and we also question the value of it in the absence of prior or concurrent professional experience.

In developing a curriculum for a four-year baccalaureate training in forest management, we believe each educational institution needs to ask -

* what are the basic underlying skills and knowledge required. These will differ indifferent places at different times and the core curriculum must be reviewed regularly.

* to what depth must these skills be imparted.

* to what extent can the skills being imparted be 'generic', i.e. skills common to more than one specialty, e.g. plantation forestry, agroforestry, land rehabilitation.

* whether it is desirable or possible to provide optional stream for greater specialisation.

After resolving these questions an attempt should be made to impart the underlying knowledge and skills within the first three years of the course to allow the students the time and intellectual space to integrate these in the formulation of management plans paying due regard to biological, political, social and economic demands. As far as possible, a 'case-study' approach should be adopted so that students become familiar with 'real-life' problems. Students should also be required to present their management plans, at least to their peer group, but more widely if possible to help develop their communication skills. A curriculum based along these lines is, we believe, suitable for the *basic* training of forest managers but in view of the rate of technological change and the developing demands on the forests, further or continuing education of foresters is now essential.

Continuing Education

We have already referred to increasing requirements for expertise in disciplinary areas previously considered peripheral to forestry *per se*. In addition, new concepts such as those relating to biodiversity and ecologically sustainable development, and advances in technology in many disciplinary areas all require forest managers to update, or acquire, new skills. Clearly not all forest managers require further training in all areas of interest but all forest managers require that training in some areas. This can be provided in several ways namely -

* further formal training, by either course work or research, at educational institutions leading to a postgraduate qualification at graduate diploma, master or doctoral level.

* formal or informal in-service training ranging from instruction at basic skill levels for new graduates or more specialised training in areas of need.

* short courses on specific topics to be delivered by specialists from universities, government agencies, industry, or elsewhere alone or in combination.

Courses must be selected carefully on the basis of identified need and, in our view most further education will be of greatest value for people who can, through their own professional experience, appreciate how the subject matter relates to their present or future responsibilities.

Validation of Courses

Validation of courses has much in common with competency-based education and training (CBET) in so far as they are both concerned with educational outcomes. CBET is an area of increasing interest in the Australian government bureaucracy in view of its concern about 'effectiveness' and 'efficiency' of training at all levels, including professional training. An advantage claimed for CBET quite apart from its perceived value in assessing vocationally relevant competencies, is that comprehensive descriptions of professional practice can also improve the public image of a profession and its relationship with clients by providing the foundation for a greater level of accountability.

In view of the developing interest in CBET in Australia, Nelson and Trevitt (1993) have reviewed the relevant literature from Australia, USA and the UK and proposed a framework for consideration by foresters of the relative merits of the concept. We draw on this review for this section of our paper.

Competency may be based on several approaches, namely the task approach, the attributes approach, or an integrated task/attributes approach.

The task approach depends on identification of the duties (tasks) required of a position and the requirements for the competent performance of these tasks. This approach has been criticised on the grounds that it ignores higher skills and tends to reproduce the occupation as it exists rather than adapting for the future.

The attribute approach emphasises the importance of higher order skills and attributes underlying competent performance. Nelson and Trevitt list as examples of higher order skills:

- the ability to accumulate knowledge;
- the ability to extend the mind;
- the ability to organise;
- the ability to think critically and solve problems;
- the ability to innovate and think creatively.

and, examples of attributes include:

- levels of knowledge;
- flexibility and adaptability to varied and changing social and occupational environments;
- personal qualities such as motivation and energy levels;
- attitudes conducive to accumulating knowledge, extending the mind, problem solving, innovating, thinking creatively and critically, effective leadership and interpersonal communication.

Criticisms of this approach to competency include the fact that the higher order skills and attributes may be difficult to define and assess, and that the presence of these skills and attributes does not guarantee competent performance in the workplace. Hence an integrated task/attribute approach may have more to offer and is the one being advocated by those interested in developing CBET for all professions in Australia.

The whole concept of CBET has been criticised, particularly by higher education authorities, on the grounds that it cannot satisfactorily incorporate higher order skills and attributes and because of perceived difficulties in defining the core competencies in a profession as diverse as forestry. Nevertheless this is what we attempt to do in determining the core subjects in our forestry curricula. Professional foresters in Australia who were exposed to the concept reacted more positively and believed, if properly constructed, it could be usefully applied to their roles.

Nelson and Trevitt presented a generalised framework for the forestry profession within which more specific modules could be developed. This encapsulates much of our earlier discussion and gives a formal structure within which education, particularly continuing education, could be considered.

The "wider environment" component of the framework indicates the way in which forest policy is determined by society after consideration of the nature of the resource, and the political, economic, social and ecological objectives. Forest management objectives are determined on the basis of this policy.

Attainment of the management objectives is determined by both individual and team actions. Individuals will bring their existing abilities, based on past training, to their role in fulfilling the objectives but as conditions change or demands increase, they may have to develop additional abilities. This may be through experience or further education, most probably by both. Not all individuals need to have the same abilities and it is the sum of abilities which will determine the competency of the whole sector. In some situations, team actions will be required either through inter - or intra - disciplinary collaboration, and the total of individual and team competencies should be aimed at providing socially acceptable forest management.

While this framework does not, in itself, provide a measure of competency or validation of education at any level, it does help identify the stages in the educational process. Forest agencies, and the individual staff themselves, must be conscious of the need for the development of different abilities over time, and appropriate educational opportunities must be available. Validation of the success of these courses can only be determined by evaluation of how well they have achieved their objectives using competency based assessment or some other evaluation process.

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APPENDIX 9

REFRESHER AND IN-SERVICE FORESTRY TRAINING: RESPONDING TO THE CHALLENGES OF MAINTAINING QUALITY FORESTRY FACULTY, GOVERNMENT, AND INDUSTRIAL PERSONNEL

by

J.M. Higgs [1]

SUMMARY

The science and practice of forestry are evolving. As a result, the technical competency of practising forestry personnel who rely solely upon basics learned in traditional education programs can suffer. Refresher and in-service training offered as an adjunct to long-term forestry education programmes are vital mechanisms for maintaining a technologically current forestry workforce. These short-term programmes must be keyed to the particulars of employees in their on-the-job circumstances. And, because the success of these programmes relies upon substantive exchange and coordination with forestry sector as a whole, forestry educators, their programmes and institutions benefit.

INTRODUCTION

Few places remain on this Earth where resource based development, competitive markets, and evolving technologies are not altering the science and practice of forestry. All segments -- from the halls, laboratories, and forests of government activities to the

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concessions, mills, and factories of industrial activities -- show ample evidence of the many changes. And this evolution continues at an increasing pace. The challenges for and responsibilities of forestry educators to design and implement effective education and training programs have never been so great.

Training and education are playing an integral role in this ongoing evolution. Educationally-driven research is a significant stimulus and contributor to new concepts and procedures. Trained and educated graduates are carriers of the latest technologies and practices as they enter the workforce. Specialized short-term programmes, designed to provide refresher and in-service training, strive to keep currently employed forest resource planners and practitioners up to date on the latest developments.

Long-term programmes are at the forefront. As a centre for research, education and the transfer of technology, university programmes in forest resource management and utilization provide leadership at the professional level. As a centre for technical education and competency-focused training, technical colleges and training centers provide leadership at the technical level.

Short-term programmes are the primary methods for the development and delivery of refresher and in-service training to those already employed. These programmes benefit from the input and leadership of both formal university and technical training centre programmes and personnel. However, informal contributors, such as resource-based industries, the manufacturers of relevant equipment and supplies, associated activities, as well as the general public, can also play a significant role.

This paper aims to promote greater attention to the need throughout the forestry sector for refresher and in-service training as a means of maintaining quality forestry faculty, government and industrial personnel. The potential role in this task of the formal forestry education community will be highlighted. Mechanisms for the development and direction of relationships between long-term and short-term forestry programmes in service of this goal will be described.

THE STANDARDS OF FORMAL EDUCATION AND TRAINING

Ideally, a forestry education or training programme proves its usefulness by contributing to society through its successful graduates. A primary function of this success is the use the graduate makes of the education or training in competing for entry, and then succeeding in a relevant career.

This linkage between education and training programmes and the world of work is a prime contributor to the development and presentation of programme content, duration, etc. Typically, this linkage provides the core of standards by which programmes are both developed and evaluated.

A relatively complex question is often asked as a general rule. Were the knowledge and skills provided by the education/ training programme functionally useful to the programme's graduate as he/she competed for the opportunity to perform and/or performed tasks assigned by an employer?

THE WORLD OF WORK

An employee-employer relationship is functionally successful when the skills an employee brings to the workplace match the employer's needs for those skills.

Whenever a new employee is hired, or an existing employee is promoted, the employer acts on the belief that the employee possesses at least the minimum level of skills, often referred to as entry level skills, necessary to successfully perform the tasks of the new position.

This concept of entry level skills is important in a number of contexts:

* for the general forest labourer it provides a description of the minimal skills required to gain employment at the lowest level.

* for the school-leaver job applicant it provides a description of the skills required for the more technically sophisticated position.

* for each current employee it provides a description of the next level of skills required in order to be promoted.

* for the forestry employer it provides a description of the minimal skills required of an employee at **each successive level of employment**, e.g., field work, junior forester, senior manager, director, etc.

WORKFORCE LEARNING

Generally speaking, a newly hired or promoted employee initially reports to his/her new position with at least the entry level skills, as described above. With time, however, those skills can be expanded and enhanced through a series of job-related activities and experiences. These activities and experiences can be formal or informal, as well as accidental or planned. They can include:

* **Tasks Familiarity** -- increasing comfort and experimentation with surroundings, policies and procedures.

* **Informal Peer Training** -- learning through observation and assistance from fellow workers and associates.

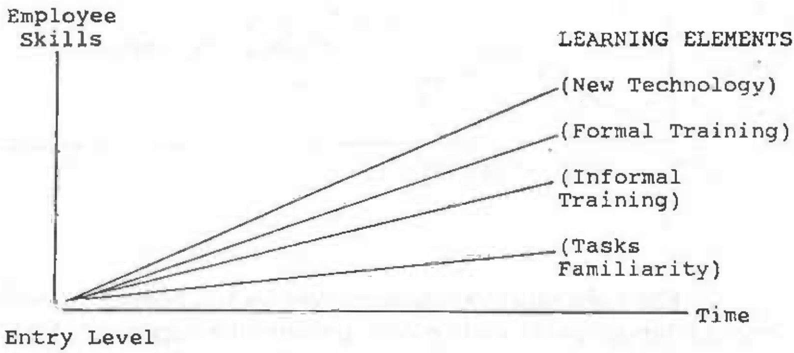
* **Formal Refresher/In-Service Training** -- organized programmes to enhance knowledge and skills.

* **Introduced Technology** -- exposure to innovative technologies, procedures and or policies (which may or may not include associated formal training).

Under ideal circumstances, the result of these experiences is growth in employee knowledge, skills, and performance. This potential for improvement provides a number of fundamental benefits. Primarily, employers are provided with an expanding pool of increasingly competent employees, and employees are given an expanded competitiveness in their search for career advancement. The net result provides a basis for an overall increase in operational efficiency and overall productivity.

The following illustration displays a very simple scenario for the potential on-the-job learning a forestry employee might experience.

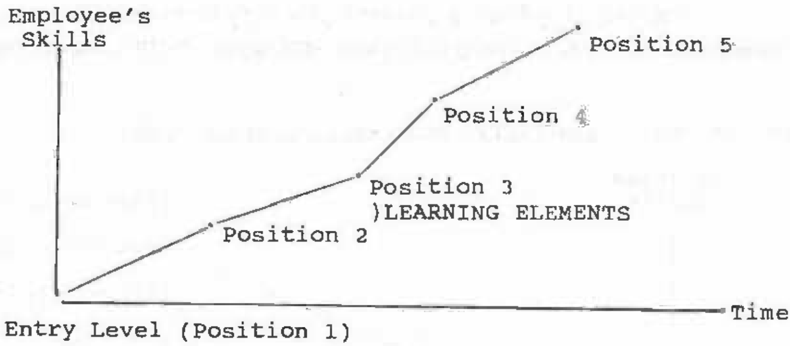
Figure One - SIMPLIFIED WORKFORCE LEARNING CURVE



CAREER LEARNING

Over time, an employee's acquisition of skills and knowledge while on the job accumulates. This accumulation, when combined with ambition and opportunity, can generate a series of promotions. Each promotion to a position of higher responsibility contributes to that employee's career path.

Figure Two - SIMPLIFIED EMPLOYEE CAREER PATH



Each new position in an employee's advancement, from the first one out through the close of career, provides the opportunity for its own new and unique learning curve as illustrated in Figure 1. Advancement from position to position along a career path generates a succession of individual learning curves. Each segment in that career path provides the same general opportunities for an on-the-job learning based upon the same general learning elements illustrated in Figure 1.

REFRESHER AND IN-SERVICE TRAINING

The elementary concept, the entry level skills acquired by long-term programme graduates, was mentioned earlier, (illustrated at the junction of the X and Y axes of the Workforce Learning Curve). It represents the intimate relationship that should exist between curriculum development for long-term forestry educational programmes and the knowledge and skills expected by potential employers of those programmes' graduates.

But more important to the focus of this paper, both curves illustrate the potential role forestry educators can, and indeed should, have in the development of short-term training programmes for the forestry sector.

Post-employment promotion learning is a fact in the forestry work world. It is important from the lowest to the highest levels of responsibility, in industry, government and university segments of the forestry sector. This learning takes place in the unique circumstances specific to each individual forestry employer's organization and management. Short-term refresher and in-service training should be a vital contributor to post-employment/promotion learning. But most importantly, the forestry educators are a logical source for short-term refresher and in-service training.

A need, fundamental to these responses, is the task of making forestry organizations and industries aware of the opportunities to work with, and benefits of working with, forestry educators in order to manage their employers' workplace learning curve.

Employer Awareness - The first opportunity lies in the invitation to educate forestry employers regarding the features and manageability of the curve. Each element is manageable and can benefit from employer attention. Once informed, forestry employers should welcome the ideas, expertise and innovations resident in formal forestry education/training programmes as they act to take advantage of improvements in employee on-the-job learning.

Formal short-term training offers the best opportunity for on-going functional interaction between the forestry education community and the employer of its graduates. This opportunity centers upon the Design and delivery of job-specific short-term training programmes and activities.

Refresher Training is often called for where standards, regulations or safety requirements call for regular reinforcement and monitoring of a particular level of performance or competence. Examples would include employees involved with quality control or emergency response (fire, etc.) responsibilities, where standards of performance and quality of service are vital.

In-Service Training is often called for when site-specific alterations in procedures or objectives need to be introduced and can benefit from a highly focused short-term training programme. Examples would include employees with shifting responsibilities or the introduction of a new technique or piece of equipment.

An additional opportunity to participate with the organizations and industries that employ forestry programme graduates exists in the introduction of new technology. The research function of forestry education often involves the development of new technology. However, this development does not guarantee delivery. Some educational institutions lack an active extension programme. Some educational institutions' research mandates do not automatically include responsibility for the transfer of new technology. For these and a number of other legitimate reasons, the introduction of new technology is often left to the manufacturer and sales force of some new equipment or procedure.

New Technology delivery is called for when innovations in equipment, methods and/or policies would benefit a forestry organization or industries employees with their productivity or efficiency. This is not limited to technology developed by a training institution, but can include any innovation relative to the organizations involved. Examples would include forest nursery practices, GIS, thin saw blades, etc.

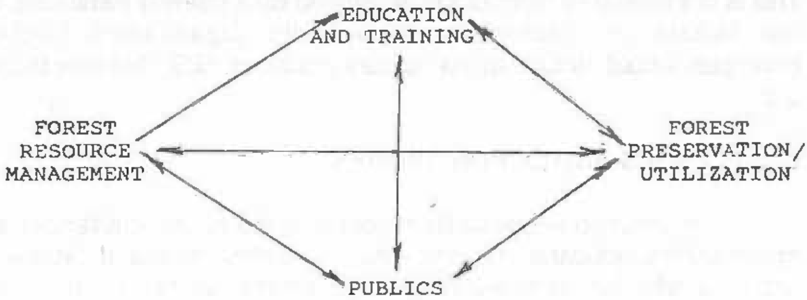
CHALLENGES AND OPPORTUNITIES

In order to successfully respond to the above challenges and opportunities, educators have to enrich their classroom and laboratory activities with an involved knowledge of the world in which their employees, their ideas and innovations are expected to function. Of equal importance is the need to develop rapport and an atmosphere of mutual confidence with forestry employers.

To ensure that this rapport with the forestry sector is truly effective, there needs to be a two-way exchange between all the potential producers and all the potential consumers of information with relevance to forestry education in general, and to refresher and in-service training in particular. The following diagram illustrates a model for this exchange. The institutions include both private and public, government and non-government and educationally focused activities.

Figure 3 illustrates the general functional categories wherein information, technology and policy direction reside and should be sought. The arrows illustrate the potential for exchange and purposefully include dual pathways between each of the categories. In essence, this chart emphasizes that forestry education must stay connected with, and attentive to, a number of distinctly different sources of direction and support. These sources are vital if programmes hope to remain current and in step with the forestry sector and community.

Figure Three FORESTRY INFORMATION EXCHANGE AND FEEDBACK SYSTEM



TECHNOLOGY DEVELOPMENT AND EXCHANGE

Specific mechanisms available to forestry education for the development and exchange of technology, policy and information are many and include:

* Formal seats on various public and private sector boards of directors.

* Establishment and use of advisory boards.

* Public hearings and community meetings.

* Various survey and questionnaire mechanisms.

* Fact-finding workshops and conferences,

* Various public media focused activities.

* Professional and associated scientific and legal, documentation, meetings, and organization memberships.

* Exchange of personnel.

Any and/or all of the above represent opportunities to promote exchanges vital to develop and maintain the relevance of forestry training programmes. Results vary with time and circumstances. However, the impact on the planning, decision-making, implementation, monitoring and evaluation, both within the forestry education community and the sector at a whole, is significant and growing. In spite of difficulties many education-focused forestry programs, including the one with which this author is associated, make use of this principle and find value and relevance in these exchanges.

CONCLUSION

Refresher and in-service training should be fundamental tools employed by the forestry education community. These tools need to be sharpened by a dedicated effort to connect forestry education institutions to the entire spectrum of responsibilities within the forestry sector. This connection requires functional exchange throughout the forestry sector. The key to success lies in a mutual appreciation among forestry educators, employers, and their various partners of the value of training and education and a commitment by all involved to coordinate and cooperate to provide the best training programmes possible. It is a key available to forestry educators everywhere.

APPENDIX 10

POSTGRADUATE LEVEL EDUCATION IN THE ASIA-PACIFIC REGION

by

I.S. Ferguson[1]

SUMMARY

Some of the factors influencing postgraduate education in the Asia-Pacific Region are reviewed, especially the challenges posed by sustainable forest management and by changes in public sector management. The needs for professional development education are also reviewed and the development of specialist options at the University of Melbourne outlined, including the use of block-release teaching for Australian students. Continuing education needs are discussed both for the profession and for special interest groups and members of the public. Postgraduate research training is reviewed, with special reference to the importance of industry linkages, and collaboration with other disciplines and research institutions.

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INTRODUCTION

Global concern about wise resource use has prompted all governments to examine their forestry practices. The International Tropical Timber Agreement illustrates these concerns, and has led to the

adoption of target by member countries that, by the year 2000, all tropical timber in international trade should be from forests managed on a sustainable basis.

Ferguson and Munöz-Reyes Navarro (1992) estimated the additional resources required to enable member countries to achieve the ITTO targets. Table 1 summarises the major items for the producer countries of the Asian Region who are members of ITTO and represent most of the major producers of tropical timber in the Region, including India, Indonesia, Malaysia, Papua New Guinea, Philippines, and Thailand.

TABLE 1: Additional resources (US$ million/yr) needed to achieve ITTO goals and targets

Item	Additional resources
1. Securing the permanent forest estate	
National forest inventory	9.4
Legislation and policy	4.4
2. Implementing sustainable forest production	
Sustainable wood and non-wood production	5.0
3. Improving resource utilisation	
Utilisation and technical information	2.5
4. Improving the social and political environment	
Social research	2.6
Political awareness	0.6
5. Preparing Strategy plans	
Collaborative study teams	1.5
6. Total	26.0

Source: Ferguson and Munöz-Reyes Navarro (1992)

Estimates of this kind need to treated with great suspicion, even by their authors. Some have argued that these estimates are far too low; others, that they are too high. Nevertheless, the order of magnitude highlights an enormous task to be undertaken, whether by the year 2000 or some time thereafter. In the Asian Region at least, these targets are believed to be capable of being funded from additional timber revenues that might be captured by the producer countries (Ferguson and Munöz-Reyes Navarro, 1992). All but the last three items in Table 1 have direct implications for forestry education and for postgraduate education in particular.

How relevant are these target items for other countries in the Asia-Pacific Region? Developments at the UNCED Conference at Rio de Janeiro in 1992 suggest that sustainable forest management is likely to become the subject of a more specific and binding international agreement by the end of the Century. Concerns over sustainable development, climate change and biodiversity are currently prominent in the continuing debates, Sustainable forest management is seen as an important mechanism for contributing to the resolution of these issues (Holdgate, 1993). Thus, the items enumerated in Table 1 are transferable to other relatively resource-rich countries in the region although the emphases and relative amounts of additional resources required differ.

National forest inventories provide an example of an item where both the problem and the technology have changed so much that most countries in the Region face somewhat similar challenges. As with the tropical timber countries enumerated above, even countries like Australia do not have national forest inventories equal to the task being asked of them today. Data on species abundance, distributions and habitat requirements are lacking or inadequate. Data on catchment properties are poorly developed and lack integration with forest data. Data on recreation and other 'minor' forest products are also deficient. Without these data, national planning of land and forest use to provide a permanent forest estate with a system of protection parks and reserves, associated buffer zones and corridors, special use and timber production zones, cannot respond as well as they should to these global concerns.

These deficiencies in national inventories affect the implementation of sustainable forest management, especially in relation to risk assessment where rare and endangered species are concerned (Burgman et al., 1993). The saving grace in the developed countries is that the demarcation of a permanent forest estate is largely complete and its status secure. The regional planning and codes of forest practice being implemented in Australia and elsewhere also represent major advances towards achieving sustainable forest management, even though based on scanty data in some cases.

For the relatively resource-poor countries, where fuelwood and simple building materials dominate the pattern of demand for wood products, the situation differs markedly in the sense that the priorities lie principally in achieving effective public participation through consultation, involvement in planning or in some cases in management, either jointly with the responsible agency or on a fully delegated basis. On the Indian sub-continent and elsewhere, local populations often derive a wide array of non-wood goods and services from local forests, including pharmaceuticals, honey, nuts, fruits, resins, tannins and oils. The value of these products, although not traded formally in markets and therefore not shown in official economic statistics, often exceeds that of timber. Effective public participation thus involves getting local populations to appreciate that they, albeit with the assistance of government agencies and non-government organisations, need to expand, protect and utilise the forest resource to provide a sustainable supply of all forest products. The problems in these countries therefore tend to be more related to people, their participation in social forestry, the efficient and equitable allocation of property rights, and the transfer of appropriate technology.

Lastly, all of these pressures are proceeding in an era in which institutional management, and public sector management in particular, are undergoing radical change in response to a shift to more decentralised and contestable management units, and changes in information technology. Among other things, this has placed new and urgent pressures on many forest agencies in the Region to improve their financial management and valuations of standing timber and other goods and services.

Postgraduate Education

While postgraduate education is not numerically the largest item of education that flows from these changes, it is one of the most important because it is concerned with equipping the best of the current middle-level managers and young scientists with improved skills to manage or conduct research.

Postgraduate education therefore has to take account of three needs in the Asia-Pacific Region:

(1) professional development to enable forest and project managers and professional staff to handle the very different demands of sustainable forest management, social forestry and forest product utilisation today;

(2) continuing education to prepare foresters, forest scientists, industrialists and interested members of the public for the changes in public sector and forest management;

(3) postgraduate research training to supply the scientists of the future for all sectors of the forestry and forest industries.

In the time and under the circumstances available to prepare this paper, it has not been possible to survey the current status of postgraduate education in the Region. The following observations therefore reflect my personal experience of needs in several countries in the Region and some of approaches adopted at the University of Melbourne. Many of these approaches may be found elsewhere in Australasia and Malaysia, at least.

Professional Development

Professional development of existing forest managers is an essential process in both developed and developing countries and is likely to focus on four principal goals:

1. the development, refinement and implementation of environmentally sound and economically efficient codes of forest practice;

2. the development and implementation of management plans that try to satisfy the relevant demands. In the case of public forests, they must encompass all forest uses, including those which have no direct market value such as the conservation of flora, fauna and ecosystems, the maintenance of quantity and quality of water, and the provision of opportunities for recreation or subsistence through traditional uses of minor forest products;

3. the development of policy and planning at a national level;

4. the development of more cost-competitive and complete utilisation of wood and other products and, where appropriate, further processing of them.

The development of codes of practice is in some ways the easiest of these because it draws on field experience at a local or compartment level and integrates it with research findings and common-sense measures. For public forests, or for private forests covered by codes, these measures are essentially a matter of managing the forest environment sensitively, as far as possible avoiding soil erosion and compaction and providing appropriate habitat for animals and local reserves to protect endangered fauna and flora species and water quality. Furthermore, these codes are not generally regarded as documents that are fixed forever. Indeed, periodic review and adjustment is generally an essential part. While there is scope for professional development to raise the standards involved, it is principally a matter of exchanging information and experience, especially relating to the implementation of sanctions.

Although management plans have been a standard requirement in many organisations for a long while, the history of effective completion and implementation has been chequered. The process of periodic inventory, estimation of results, and development and analysis of strategies was so slow as to be self-defeating. Improvements in information technology enable speeding up of the process and incorporation in normal business operations.

In pine plantations and other forests devoted predominantly to wood production, the character of the management plan has changed. It is now generally a formal part of the strategic business plan of the organisation and reviewed at least every three to five years. It is linked to, or includes, shorter term harvest plans as well as well as providing the longer-term analysis. Increasingly, it is linked to financial valuation of the estate for audit purposes based on a continuing inventory process. Continuing inventory entails annual or periodic re-inventory of those parts that have been thinned and delineation and measurement of those areas clear-felled. Using growth and yield models derived from re-measurement of a separate system of permanent plots, the entire array of old and new inventory plots can be brought forward to reflect the current status of the forest estate. This provides a current inventory base both for valuation of standing timber and for the simulation of alternative future strategies (Lewis and Ferguson, 1993). The detailed technologies involved are formidable; encompassing geographic information systems, and advanced inventory, biometrical, financial and accounting techniques and are beyond an undergraduate syllabus to adequately cover in any but an introductory manner.

For public native forests, some of the same technologies are involved in regional management plans but the requirements are very different and less well-integrated at present. Firstly, the inventory needs to encompass other forest uses besides wood and that introduces a different set of sampling and inventory problems, some of which, such as species diversity, have been little explored. Experience to date in Australia, suggests that the level of detail needed is about a 1:25 000 scale for geographic information systems. Few organisations anticipated such a level of detail initially and hence much more work remains to be done in developing the basic topographic and forest type overlays. Secondly, these uses are often unpriced or non-market in character and hence pricing and valuation is a problem, notwithstanding some useful research in this area. This greatly complicates the development of planning models because of the incomplete information. It is also another reason for ensuring public involvement in the development of strategies to reduce the possibility of conflict at the regional planning level.

In a sense, the role of the forest manager in public native forests is today more that of a facilitator and integrator who presents alternatives and ensures they are evaluated as far as is possible. Not only do managers have to be proficient in the technologies of geographic information systems and planning models, they have to be able to communicate the use and limitations of these tools to the public. It is simply not possible to develop adequately the skills needed to manage the technology and public involvement required for this planning at an undergraduate level. Staff need the benefit of field experience, maturity and then professional development at a later stage of their career.

Conceptually, long-accepted norms such as sustained yield which have dominated forestry education have become marginal to the process. Sustained yield focuses on achieving some static level of harvesting that can be maintained in perpetuity, often taken to be coincident with providing the maximum yield of timber possible on a sustained basis. Sustainable forest management is not about timber alone; it is about trying to satisfy the public's demands for all forest uses, including those which have no direct market value such as the conservation of flora, fauna and ecosystems, the maintenance of quantity and quality of water, and the provision of opportunities for recreation or subsistence through traditional uses of minor forest products. It acknowledges that one or more of the non-wood uses may have primacy over timber production in some areas to the point where no timber production is allowed or it may necessitate major modification of harvesting and silvicultural practices in others in order to maintain those other values. Public involvement is needed to guide and ensure that the planning and management process addresses public demands and perceptions of needs appropriately. Demands for improved utilisation are also evident throughout the resource-rich countries, especially for wood from public native forests.

The situation in social forestry is clearly very different because the concern is more for communal and private investment and projects. The development and transfer of appropriate technology therefore plays a much larger role. Here, the need is more for the development or strengthening of communication and sociological skills and a critical view of appropriate agro-forestry technology and the best means to transfer it.

Almost all universities in the Asia-Pacific Region now have some introduction to many if not all of these matters. Not all have the facilities or expertise for intensive professional development courses, however, because these are generally associated with substantial postgraduate research programs and the facilities that go with them.

The University of Melbourne Postgraduate Diploma in Forest Science, a coursework programme of, or equivalent to, one full-time academic year, is now offered in an array of professional development specialisations. Those in Forest Planning and Farm Forestry exemplify some of the current options especially designed for Australian students. Farm Forestry is to be delivered on a block-release teaching basis at some five regional centres across Australia. Each subject entails prior reading and sometimes assignments, an intensive five-to ten-day residential course on one or two subjects, and a follow-up assignment or exercise preferably based on local problems or planning. The Farm Forestry program is sponsored by the Commonwealth Department of Primary Industries and Energy and will, like many other specific professional development options, have a finite life. Professional development options for overseas students include Sustainable Forest Management, Agro-forestry, and Conservation Biology. Overseas students are encouraged to develop assignments around material from their own countries and to participate in the block-release teaching wherever possible in order to interact with local students. The specialisations offered will vary over time according to the needs of sponsoring organisations.

The situation is a little different in relation to the forest industries because we find that many people in those industries come from disciplines other than forestry. The Graduate Diploma in Forest Industries is therefore open to a wider range of backgrounds and includes specialisations in Forest Products and Forest Harvesting. There has to be greater flexibility in tailoring the content of the coursework to the background of the student but the programme is otherwise on a similar basis to that described for the Postgraduate Diploma in Forest Science. Some outlines of the array of professional development options will be provided separately or can be obtained from the author.

In both these Diploma programmes, all students are encouraged to undertake one subject in the form of a research or special project that involves individual reading, sometimes data collection and/or analysis and reporting. This is to provide some exposure to research and is a preparation for those who go on to pursue a research degree. Students who achieve satisfactory results are allowed to transfer into a Master of Forest or Wood Science programme by research. They can then complete the Master's thesis in a minimum of one calendar year or, in the case of especially gifted students, a Doctor of Philosophy by research over three years. Overseas students are encouraged to work on data or problems from their own country, where practicable.

Continuing Education

Continuing education courses fall into two categories. There are those for people such as teachers and interested members of the public about forestry or forestry issues that are essentially conducted as a public service, albeit at a price. These need little elaboration. The experience of the University of Melbourne over the last two years has been that well-planned and publicised Summer School courses have attracted much interest and have been useful in promoting the departments and University, as well as providing a small but much-needed source of discretionary funds for departments.

The other category is directed towards the needs of the forestry and forest industries. In the case of forestry, we have tried, so far without success, to interest the Institute of Foresters of Australia in taking the initiative in this area and contracting the conduct of the courses out. The feature that characterises a profession is the transmission of a body of knowledge about the technology it applies and a commitment to a set of common goals and ethics, regarding that the application of that technology (Ferguson, 1990). If there is to be an argument for continuation of a profession, it lies in its demonstrated competence to apply the technology rather than in the exclusive possession of knowledge. It is my personal view that any professional organisation ought to be initiating periodic short courses (of 3 to 5 days) and ought to require that members undertake some quantum of that further education as a demonstration of their commitment to maintaining competence.

As in many universities in the Region, the University of Melbourne's Department of Forestry aims to conduct at least two short courses per year for forest managers and/or forest scientists. The topics are normally of a specialised nature, often taking advantage of visiting staff, and these have included a range from morphometrics to recreation in recent times. The changes in public sector management, in particular, will provide a focus for short courses of this kind for some time. Many of the topics such as financial accounting, legal aspects of contracting out, business management, and performance monitoring and incentives, lie outside the mainstream of expertise in forestry schools and require involvement of experts from these fields.

Postgraduate Research Training

Postgraduate research training is an essential component of any major research university. However, as the present Australian system shows, not all universities can aspire to be major research universities, with strong programmes of excellence. Research training is the most expensive part, per caput, of the Australian Higher Education system and probably of any others. Given the need for expensive facilities and one-on-one tuition inherent in postgraduate research training, this is hardly surprising. However, it needs to be restated because there is a school of thought, at least in Australia, that argues for equal allocation of research funds to all universities without realising that very substantial additional funding and time is required to establish staff expertise, facilities and accommodation.

Because of the diversity of forestry in the Asia-Pacific Region, it is virtually impossible to indicate particular areas of postgraduate research that need strengthening, other than to reiterate the general lack of research on the non-wood goods and services, social forestry and forest policy. Conservation biology, hydrology, recreation, other 'minor' forest products, social forestry, agro-forestry and policy (for some of the latter see FAO Regional Office for Asia and Pacific,1992) all need greater attention but that is not to argue that other existing areas of research should be neglected. The broader scope of disciplinary areas involves also makes close collaboration with relevant departments such as botany, biochemistry, business management, economics, engineering, sociology, statistics and zoology essential to avoid duplication. The span is now so wide that no university department of forestry in Australia or New Zealand can afford to maintain exclusive and independent specialisation in all areas. Nor would it be academically desirable to do so because forest managers need exposure to working with people from other disciplines. They will have to utilise people in other disciplines in a good deal of the research and inventory needed to achieve sustainable forest management. Joint supervision of postgraduate research involving a co-supervisor from the other discipline is a common method of achieving this.

A common trend is to require an increasing amount of preparatory coursework, up to one year, prior to commencing the research topic. Some Masters programmes, of course, are based entirely on coursework but these represent professional development and do not constitute, in my view, an adequate training for the conduct of research. The completion of a thesis based on independent supervised research remains the critical element. While this sometimes shrinks to a minor dissertation relative to the coursework in some institutions, I am not convinced that this is always wise, even at the Master's level. The discipline of conducting and reporting a substantial piece of research has much to commend it, not least in sorting out those who are prepared to continue the hard intellectual grind of personal research.

Another trend in Australia is for major research universities to create a Graduate School at the central level with responsibilities for all Masters and Doctor of Philosophy programmes. This is principally a device to improve co-ordination of coursework offerings across faculties and to improve services and accommodation for postgraduate students but it highlights the growing importance of postgraduate education.

No mention of postgraduate research training would be complete without reference to the importance of forestry and forest industry linkages and support. Postgraduate research training is expensive and demanding of the individuals in time and intellectual effort. Those problems are much reduced where industry sponsorship of the research is available. Not only does this reduce the burden of cost to the university but it ensures that there is an interest in the outcome and in the potential application of it, and a correspondingly greater possibility of employment for the postgraduate.

Having said this, employers rightly deplore the tendency for persons with recent postgraduate degrees, especially Doctor of Philosophy degrees, to expect to be able to pursue the same area of research in their employment forever. In applied research , a greater flexibility is essential and this is an added reason for more coursework preparation prior to a substantial research project.

In Australia, industry linkages have been greatly assisted by the Commonwealth Government's program for specially funded centres of research excellence such as the Co-operative Research Centre for Hardwood Fibre and Paper Science involving the CSIRO Division of Forest Research, the Monash University Australian Pulp and Paper Institute, the University of Melbourne's Department of Forestry and the Pulp and Paper Manufacturers' Federation of Australia. Two other centres with relevance to forestry have been established - the Temperate Hardwood Forestry Centre in Hobart and the Tropical Forest Ecology Centre in Queensland. However, collaborative endeavours such as those between the Victorian Departments of Conservation and Natural Resources, and of Agriculture, the Rural Water Corporation, CSIRO Divisions of Forestry and Forest Research, the University of Melbourne Department of Forestry and private companies have also been successful in attracting funding for the Trees for Profit Research Centre, which is principally concerned with research into tree-growing on saline-affected irrigation areas. Major research projects stand a better chance of gaining industry support if collaborative teams are formed to utilise the best expertise available across the several research institutions.

In a large country like Australia with disparate forest areas, some flexibility in the location of applied research is essential on the part of the university, subject to a minimum period of residence and appropriate supervisory arrangements while away from the university. These arrangements have proved to be very successful recently because they often entail co-operation with industry partners who contribute heavily to the work in funds or in kind.

In conclusion, every university believes that its own particular system of postgraduate education is the most appropriate, and Melbourne is no exception. In the long run, however, the real test is whether:

(1) graduates find employment readily or progress in employment better,
(2) professional development and continuing education programmes are responsive to changing needs and gain support from members of the profession and others, and
(3) research programmes gain support from organisations engaged in forestry and forest industries and other funding agencies.

Melbourne performance will be so judged in continuing periodic internal and external reviews.

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APPENDIX 11

THE PROFESSIONAL AND TECHNICAL FORESTRY EDUCATION NETWORK IN THE ASIA-PACIFIC REGION:

— Present Working Inter-institutional linkages and Prospects —

by

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INTRODUCTION

The developing countries in the tropics of the Asia-Pacific Region are confronting a serious environmental crisis resulting from land degradation and deforestation. The annual deforestation rate during 1976-80 was 2.0 million ha, which accelerated to 3.9 million ha during 1981-90 according to the findings of FAO's global project, "Forest Resources Assessment 1990 Project (FRA 1990)". Frequent floods, droughts, and land-slides; soil erosion and siltation; and damage to and loss of biodiversity have become more widespread than at any previous time. The rural people living in or around the forests have been victimized, marginalized and further impoverished as a consequence.

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In contrast, some countries in the temperate zone such as China, Japan and Korea have increased or maintained the same level of forest lands as before. In China, the current annual afforestation rate is 4 million ha, and the total forest area reached 129 million ha in 1991. This accounts for 13.63 % of the total land area as against 12.98 % in 1989. In Japan, the forest cover remains unchanged at 67 % of the total land area. In Korea, the forest coverage decreased slightly from 67 % in 1975 to 65 % in 1991, due to the conversion of forests to other land uses through urbanization, industrialization, and the development of leisure and recreational facilities. In these countries, however, the natural forests were degraded or converted to other land uses in historic times and their present forest cover has been achieved by continuous tree planting efforts over a long period. Thus, the percentages of man-made forests are high, as high as 40 % in Japan.

A substantial and significant increase has been observed in the reforestation efforts made by the developing countries of the Region in recent years. According to the FRA 1990 Project, the total forest plantations in 17 developing countries of the tropical zone in the Region was estimated to be 32.15 million ha in 1990, with an annual increase of 2.1 million ha during 1981-90. In India, forest plantations cover 18.8 million ha, with 1.75 million ha planted during 1990-92. The forest plantations in Indonesia, Myanmar and Thailand have reached 8.75 million ha, 335,000 ha and 756,000 ha respectively. This trend will be further enhanced towards the turn of the century, according to a review of the national forestry development policies and implementation programmes. Major species involved differ from one country to another, according to growing conditions and objectives, but briefly speaking, fast-growing species such as eucalypts and acacias are very popular in the developing countries of the Region (Kashio, 1993).

A major effort to promote tree growing in rural areas has been made in almost every country in order to compensate for deforestation in the natural forests. One important aspect is that such reforestation programmes are often combined with components of: i) community or social forestry with the people's participation with the aim of improving fuelwood and fodder supply and other aspects of rural livelihood, ii) involvement of the private sector (for industrial plantations), and iii) rehabilitation of degraded forests and wastelands. Many countries are promoting forest plantations to compensate for the shortage of forest products traditionally derived from natural forests.

Between 1990 and 2000 demographic growth in the developing countries of the Region is estimated to be 472 million; if only the 16 tropical countries (excluding China, Iran and Singapore) are considered, the increase will be 290 million. Since more than 60 % of the populations of these countries are engaged in agriculture, the increasing scarcity of agricultural land will intensify the loss of forest land.

Shrinkage in the area of natural forests has led to calls for political and social countermeasures in the developing countries of the Region, resulting in logging or log export bans, review of conventional forest policies and management systems, and demands for nature conservation and environmental protection measures.

The eighth World Forestry Congress, held in Jakarta, Indonesia in 1978 under the theme "Forestry for People", triggered community forestry programmes in these countries. Agroforestry was highlighted as the most promising technical solution to accommodate the forestry and agriculture sectors.

At the same time, concern was expressed by many forestry experts that conventional forestry education systems at the professional level had to change and improve to meet the demands for a new type of forester who could exploit recent developments in areas such as computer-based remote sensing technology, geographic information system (GIS), biotechnology, community forestry and agroforestry. Accordingly, many attempts have been made to reorientate forestry education and research systems but the changes still have a long way to go to reach the desired level, mainly because human resources development requires time. Moreover, such changes in the forestry sector have to incorporate the global development concept of "environmentally sound and sustainable development".

This paper intends to briefly introduce the historical background, specific objectives and activities of the Asian Network on Forestry Education (ANFE). It reviews major issues and changes in forestry education in the Region, describes the inter-institutional linkages and considers the prospects of FAO activities in the Network. It also tries to make some suggestions to mitigate constraints.

ASIAN NETWORK ON FORESTRY EDUCATION

The FAO Regional Office for Asia and the Pacific (RAPA) organized an Expert Consultation on Forestry Education in June 1988 in Bangkok. The Consultation was attended by deans of forestry colleges or universities from 12 countries. The Consultation emphasized the need for establishing a regional framework to enhance cooperation in forestry education and recommended the establishment of an "Asian Network on Forestry Education" (ANFE). This network was created soon after the Consultation and it has since been serviced by the Forestry Section of RAPA as part of its its regular programme.

The specific objectives of the Network were accepted to be as follows:

1) To reorient forestry education and ensure that it is in line with the changes taking place in the wider system;

2) To compile a comprehensive data bank of existing forestry education curricula, to enable their widespread sharing, and to monitor future curriculum development;

3) To encourage compatibility of curricula so as to maintain the standard and quality of forestry education offered by the institutions in the Region; and

4) To promote information sharing and exchange of experience among member institutions for mutual benefit and collective self-reliance. (Rao, 1990)

During 1988-89 the Network facilitated two workshops on curriculum development in collaboration with Yale University and with funding support from USAID (Rao, 1990). The proceedings of the first Consultation were published in 1989 and have been widely disseminated.

The Network convened the second Consultation in June 1990, in Bangkok, to review the progress of curriculum development and to examine the linkages between the unfolding environmental crisis and forestry education. The Consultation noted that until recently, and even yet, forestry education was geared to imparting the ecological and biological disciplines which underpin natural and plantation forest management. However, the curricula were not broad-based and the holistic nature of the protection, production and social roles of forestry was not given adequate focus in some universities.

The Consultation strongly recommended the creation of a regional project to strengthen forestry education institutions and improve professional forestry education systems. To this end they recommended adopting the format used by the technical cooperation among developing countries (TCDC) network. The experts drafted a regional project proposal and FAO has tried to find international funding to provide support, unfortunately with no success as yet.

As mentioned above, the ANFE's activity has been run from our section using the RAPA Regular Programme budget. However, the budget and staff time that we could allocate for this activity has been very limited. Maintaining regular correspondence with the Network members for information exchange and organizing Network meetings every 2-3 years to monitor progress is the maximum that we can do. Though the progress and recommendations of the Network are always reported at the Asia-Pacific Forestry Commission (APFC) meetings held every 2-3 years, continuous and effective support to the member countries cannot be given unless there is an extra financial support. Thus, it has been concluded that the regional project approach would be the best way to enhance the forestry education support programme.

FORESTRY SCHOOLS IN THE REGION

Through these Consultations and Network investigations some basic facts have become clear. There are approximately 120 forestry schools or institutions in 17 countries of the Region, with 34 institutions in Japan alone. Among the developing countries, there are 27 in the Philippines; 15 each in China and India; 9 in Indonesia; and 3 in Vietnam. The remaining countries have only one faculty of forestry each. The following countries as yet have no facilities for professional level forestry education: Bhutan, Cambodia, Cook Islands, Democratic Republic of Korea, Fiji, Iran, Laos, Maldives, Solomon Islands, Tonga, Vanuatu, and Western Samoa (Srivastava, 1989).

Despite the efforts of the Network, accurate information on the forestry technical schools or vocational training schools is not yet available. Questionnaires sent have not been fully replied to and there seems to be a confusion in definition as to how to identify forestry related subjects being taught in schools of horticulture and agriculture.

In the developing countries of the Region, there are some old and well established forestry schools in China, India, Indonesia, Pakistan, Philippines, and Thailand. Some of them have been playing an important role as educational centres not only in their own country but also for neighbouring countries that have no forestry education facilities, e.g. the Indian Forest College in Dehra Dun. In the case of the Pacific island countries, Australia offers extensive services in this field and the facilities are well established in terms of staff and laboratories.

One remarkable development has been a rash since the 1970's of new forestry schools or formal forestry degree programmes in agricultural universities, e.g. the Faculty of Forestry in the Universiti Pertanian Malaysia, and the Forestry Department in the University of Technology of Papua New Guinea. The pressing demand for foresters in these countries, especially those trained in community forestry and agroforestry, was a driving force in the establishment of these new schools. They contrast with the older schools, several of which have not yet instituted degree courses or extensive research programmes in agroforestry, integrated land use planning, or forestry extension.

Another interesting development has been the establishment is the collaborative programmes between forestry education institutions, for example that which links the faculty of forestry at Kasetsart University, Thailand, the faculty of forestry at Universiti Pertanian Malaysia, and the College of Forestry of the University of the Philippines at Los Banos. The aim of this academic link is to foster collaboration through exchanging research and education information, and by organizing scientific meetings (Ruangpanit, 1990). They encourage staff and students to teach and to study in other institutions. The most recent joint scientific meeting under this programme was the International Symposium on Multipurpose Tree Species (MPTS) for Rural Livelihood, held in Manila in May 1993.

The continuous growth in the training programmes offered by the Regional Community Forestry Training Center (RECOFTC), which is attached to Faculty of Forestry of Kasetsart University under the financial support of the Asian Development Bank (ADB) and the Swiss Government, also illustrates the current direction of forestry education in the Region. This centre provides 4-6 month training courses on various subjects relating to community forestry and forest resource management for the foresters in service in developing countries, not only in Asia but also in Africa.

MAJOR ISSUES

Major issues recognized by the Network activities include:

1) The fragmentation of knowledge about modern technological advantages creates problems of excessive specialization and is an obstacle to collaboration in the long-range development of forestry education.

2) There is a need to realign and redefine the traditional disciplinary boundaries in forestry education, and this should be reflected in the improvement of present curricula or sometimes reorganization of departments.

3) Forestry schools must keep abreast of developments in forestry policies, laws, strategies, and programmes which affect the people; but they seem to be showing some reluctance in this respect.

4) There is no comparability in the number of credits, teaching hours, or time spent on practical work for the Bachelor of Forestry in the different institutions. This can cause problems for applicants seeking to enter internationally recognized forestry faculties for their post-graduate work.

5) The rearrangement of curricula to include community forestry and agroforestry is still inadequate. The importance of sociology and economics relating to these subjects is gradually being recognized, but is not yet well reflected in the curricula.

6) Environmental coverage in forestry education in response to global issues of tropical forests and forestry should be strengthened.

7) Mechanisms for the exchange of information and experience on shared problems and common approaches are still weak.

8) Computer literacy should be a requirement for both faculty members and students.

GAPS AND CHALLENGES

Forestry schools which provide professional level education are now being called upon to produce a new type of forester, a "natural resource professional", who has command both the old and modern technologies, and has the knowledge and tools to pursue technical and social solutions which reflect social reality and desires (Burch and Bopp, 1990). It is accepted globally that a healthy forest ecosystem is vital for the healthy development of other sectors. This philosophy must be adopted in each country. While many countries may have a specific demand for timber, rural communities also expect foresters to provide various kinds of forestry services, including ensuring water supply, soil conservation, fodder and fuelwood supply, etc. It seems that there are many difficult gaps between them, but the wide range of skills and knowledge necessary are a challenge for forestry education. Forestry schools are hard pressed to carry the burden and a sharing of responsibility or diversification should be sought.

One good example can be seen in community forestry and the associated agroforestry. This field covers a wide spectrum of disciplines and has a multi-disciplinary nature, ranging from natural science to social and economic science. Traditional forestry schools are not able to cover these subjects in their research and training programmes. Staff recruitment and preparation of necessary equipment and laboratories require significant funds for faculties or universities. There is also the typical response lag between demand and supply where human resources development is required.

However, when we consider other disciplines at universities it can be readily suggested that training programmes in geography, geology, horticulture, agronomy, sociology, anthropology, etc., can produce graduates that have the potential to work in community forestry and agroforestry programmes if first given some practical training in forestry. They are "ready to accept it". Such arrangements require flexibility in organizing and integrating the curricula in forestry and neighbouring subject areas. Extensive discussions to examine ways to reorganize the education systems in colleges or universities are essential. It may take time but must be done.

It is also a characteristic of universities that they are more involved with theory than with the practical application of what they teach — a case of knowing how a tree grows but not how to grow a tree in the field. Theoretical studies are mandated to university staff as **researchers**, but at the same time they are **teachers** to guide students in the practical implications of relevant research results.

Richardson (1990) discussed these points from a different angle when he stated, "A feature of the ideal university, therefore, is the free flow of ideas among faculty and students; and emphasis on learning rather than knowing (how, rather than what, to learn). It is my impression that too many universities nowadays are preoccupied with protecting society from incompetent professors and from intellectually inadequate students who undoubtedly exist. They do this by confining **discipline** within departments and pigeon-holing specialisms within disciplines". He continued, "But few attempts are made to integrate the separate disciplines into a **whole farm** system. Integration is left to the individual least able to do it — since he is furthest away from the source — the farmer".

FAO's RESPONSE

In the Region FAO operates many forestry projects at either country or regional basis. Some country projects are focussed on forestry education but there are no regional projects focussing upon thisn.

However, many other projects which have different objectives also have an educational and training component including research aspects. The regional projects, such as "Improved Productivity of Man-made Forests through Application of Technological Advances in Tree Breeding and Propagation (FORTIP - RAS/91/004), "Forestry Research Support Programme for Asia and the Pacific (FORSPA - GCP/RAS/134/ASB), "Regional Wood Energy Development Programme in Asia (RWEDP - GCP/RAS/131/NET), and "Asia-Pacific Agroforestry Network (APAN - GCP/RAS/133/JPN)" have strong components of manpower development, including scholarship programmes, research support funding programmes, short training courses, etc. FAO will continue to support its member countries through these activities.

RAPA will continue the ANFE Network support activities by enhancing its capacity (a new Regional Forestry Officer will join RAPA in January 1994). We will further improve the information database of forestry training institutions of the Region, in close collaboration with FAO, Rome, and other international and bilateral aid agencies. We will assist the curriculum development of regional forestry institutions. We will also try to realise a regional project on forestry education by seeking donors.

CONCLUSIONS

In the rapidly changing forestry climate that characterises developing countries foresters are confronting new challenges and opportunities. They should be able to handle a wider range of subjects such as socio-economic, environmental and cultural issues, in addition to technical and administrative capabilities in forestry. They should be fully aware of the specific characteristics and requirements of local communities and harmonize these conditions with a long term forest management plan. They are also required to command the state of art technologies such as GIS, remote sensing, biotechnology, etc. Thus, their profession will be that of an integrated resources manager in forest lands.

Forestry schools are responsible for producing a new type of forester from their education and training institutes. The rigid traditional boundaries and narrowly confined **disciplines** in forestry education need to be broken to ensure the free flow of ideas and knowledge. This direction may invite a revolution in faculties of forestry of universities, but when the stem of a tree is getting rotten, how we can bother about a shape of a branch. Gradually, steadily and bravely would seem to be the strategy that is called for.

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APPENDIX 12

TEACHING ECOLOGICALLY BENIGN LOGGING METHODS IN THE PROFESSIONAL AND TECHNICAL-LEVEL FORESTRY SCHOOLS OF THE ASIA-PACIFIC REGION

by

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SUMMARY

If environmentally benign logging methods are to be adopted widely in the Asia-Pacific Region, foresters must assume the primary leadership role in promoting these methods. Yet many foresters do not really believe that environmentally sound practices are possible at a level of cost that will permit an economically viable forest industry. Contrary to conventional wisdom, several recent studies have demonstrated that such practices can, in fact, result in *lower* operating costs than conventional logging operations. The key is that foresters be trained in these methods and that they insist that they applied. Thus, the most important step that can be taken to introduce environmentally benign logging methods is to teach these methods to *every* forestry student in *every* university and technical institute in the Asia-Pacific Region. This paper provides some general guidelines on environmentally sound practices in the five basic activities of logging: harvest planning; road layout, construction, and maintenance; felling; extraction; and transport. A series of field exercises is suggested to help students understand the principles of environmentally sound logging.

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INTRODUCTION

Many foresters, often including those responsible for the education of forestry students in universities and technical institutes, consider timber harvesting to be a subject that should not be discussed in polite society. Although nearly all foresters recognize that harvesting operations are essential if income is to be generated from forestry investments, there is a tendency to treat the harvesting operation in the way the farmer treats the slaughterhouse, hide it away in the hope that it will not disturb the customers.

There are at least two consequences of this tendency. First, harvesting operations seldom get the professional attention they require and therefore are often poorly planned, improperly executed, and inadequately supervised. Second, forestry students frequently have little appreciation for the positive benefits of timber harvesting and only a vague, uncomfortable sense of the very real environmental hazards that are associated with harvesting operations.

If industrial forestry is to contribute as it should to sustainable development, then timber harvesting operations must be, on the whole, environmentally benign. Otherwise the environment will deteriorate over time, the economic viability of the forest industry will collapse, and the potential of forestry as a sustained provider of renewable resources will be lost. Of course, these things can happen anyway; when forests are cleared for agriculture or pasture or urban expansion their potential as sources of economic development and environmental services also ceases. But when forestry itself causes the value of forests to decline, then surely something is wrong in the practice of our science.

It should be evident from the simple mathematics of population growth that, over time, forest operations must increasingly accommodate both environmental requirements and changing social needs. In many places the Earth is already uncomfortably crowded, and in perhaps 40 years there will be twice as many people to feed, twice as many who will need housing, and in all likelihood twice as many who will depend on fuelwood for the preparation of their meals. If the demand for wood products grows at even a fraction of the growth in population during this period, there will be an enormous increase in the frequency and extent of timber harvesting operations, especially in tropical countries where the greatest population growth will occur and where major forest areas remain. Foresters have moral and professional obligations to ensure that these operations are done in ways that will maximize benefits to society while minimizing any associated environmental hazards.

To meet these obligations foresters must under stand, first, that timber harvesting operations *can* be environmentally sound, and, second, that the education of foresters and forestry technicians *must* include training in the proper planning, execution, supervision, and assessment of timber harvesting operations. This will not guarantee automatically that forest operations will become environmentally sound. However, unless foresters and forestry technicians know how to recognize environmentally sound forest practices, and unless they insist that the operators under their supervision follow such practices, it is virtually certain that the profession of forestry will fail to meet its obligations to society.

Three key principles are essential for the application of any science in a socially responsible way: learning what must be done, learning how to do it properly, and then insisting that it be done properly or not at all. These principles are embodied in the medical practitioner's imperative,"Do no harm", and they must also become an indispensable part of forestry if it is to fulfil its promise in modern society.

CONDITIONS FOR SUSTAINABILITY

If forests are to be managed sustainably, two conditions must be imposed on activities associated with the utilization of products from those forests. One condition arises from the recognition that the multiple resources of the forest interact in complex ways. The other condition specifies the fundamental requirement for what foresters have long referred to as "sustained yield". These two conditions can be summarized as follows:

1. The activities must be carried out in a way that will minimize environmental impacts and will conform to the principle that all resources should be maintained as part of a healthy, dynamic ecosystem.

2. The activities must leave the forest in a condition that will promote its rapid recovery to the pre-harvest state or to some other state that is silviculturally, ecologically, and sociologically desirable.

The first condition implies that timber harvesting, for instance, must not compromise in a substantial way the ability of forests to provide the multitude of benefits for which they are appreciated the world over. These benefits include the production of a tremendous variety of non-timber forest products; provision of habitat for wild plants and animals; protection of watershed values; maintenance of biodiversity; regulation of the local climate; protection and improvement of soils; and provision for humans of a wide range of cultural, spiritual, and recreational benefits.

The second condition indicates that utilization activities must be undertaken in a way that will maintain the forest as a continuously productive entity. To assure the continued production of timber, for example, harvesting must follow a planned cycle of entries and fallow periods, and each entry must generate or release the future crop trees while protecting residual trees and seedlings from damage. Thus the harvesting operation must be part of a planned management regime which is designed to perpetuate the production of timber from the forest. This condition also implies that the forest itself must be protected so that its integrity as a productive unit is maintained.

LOGGING DAMAGE IN ASIA-PACIFIC TROPICAL FORESTS

Beginning in the 1950s, a series of comprehensive studies has quantified the nature and extent of damage associated with logging operations in the tropics of the Asia-Pacific Region (Nicholson 1958 and 1979, Wyatt-Smith and Foenander 1962, Fox 1968, Marn and Jonkers 1982). On the basis of these and similar studies in temperate forests, it seems clear that the degree of damage incurred during logging of tropical forests is significantly more severe than would be expected, for instance, in temperate mixed forests. In some cases, logging damage is so extensive that the fallow period required for the forest to recover may be two or three times longer than anticipated in management plans (Poore 1989). Even where this is not the case, the severe mechanical damage commonly inflicted during logging on half or more of the forest's residual trees will certainly interfere with the environmental services and other non-timber values of tropical forests.

Even more alarming is evidence from several studies that the degree of damage is increasing over time as logging operations become increasingly mechanized and rely to a greater extent on horsepower rather than on technical competence (Fox 1968, Nicholson 1979). There is a common tendency among loggers in the tropics to use machines that are overpowered, to employ machine operators who have not had adequate training, and to permit crews to work without sufficient supervisory control.

In spite of the rather dismal record of logging operations in tropical forests, the situation is not hopeless. At least three recent studies (Marn and Jonkers 1982, Hendrison 1989, and Schmitt 1989) have demonstrated conclusively that harvesting operations which are adequately planned and supervised can easily meet the conditions for sustainability listed earlier. Furthermore, such operations have the additional benefit of reducing harvesting costs by a substantial margin as compared to conventional operations.

Why, then, if they are both environmentally benign and also less expensive, are such logging methods not more widely used? There are probably two principal answers to this question. First, foresters are often willing to accept poor logging practices because they don't really believe that environmentally sound practices are possible at a level of cost that will permit an economically viable forest industry. This is because they have seldom witnessed harvesting operations that can truly be described as "environmentally sound", and because conventional wisdom is that environmental protection always costs more.

The second answer is that, although environmentally sound operations can be less expensive than conventional operations, these savings are due to better planning, better supervisory control, and better utilization of felled timber (for instance, by leaving fewer lost logs in the forest and by crosscutting stems in ways that achieve higher log values). To obtain these savings, therefore, it is necessary to have technically competent planners, loggers, and supervisors.

Thus, the discussion has come full circle. The education of forestry students in universities and technical institutes seldom emphasizes training in environmentally benign logging methods because logging is considered a "less professional" aspect of forestry (FAO 1988). Concessionaires do not adopt environmentally benign logging methods because they are unable to hire personnel with the necessary training to implement these methods, and because environmentally benign logging methods are not adopted, logging continues to be a "less professional" aspect of forestry.

THE WAY OUT

The way out of this trap is to ensure that all forestry students, both in universities and in technical institutes, receive adequate training in the proper planning, execution, supervision, and assessment of timber harvesting operations. Because logging can be either an effective tool or a terribly destructive force, this kind of training is essential for *every* forestry student, not just those who have a special interest in industrial forestry.

The specific details of what should be included in courses on environmentally benign logging methods will necessarily vary somewhat from country to country and between universities and technical institutes. As prerequisites, students should previously have had some instruction in silviculture, ecology, soils, hydrology and economics. This background will permit them to understand the concepts upon which environmentally sound harvesting practices are built, rather than simply learning the methods by rote.

PRINCIPLES OF ENVIRONMENTALLY SOUND HARVESTING

The key to environmentally sound harvesting is to utilize the best current knowledge as it applies to five critical activities: (1) harvest planning; (2) road layout, construction, and maintenance; (3) felling operations; (4) extraction; and (5) transport. In addition, it is also essential to periodically carry out post-harvest assessments in order to provide feedback to the logging crews about the quality of the operations. Some general guidelines relating to these activities are provided in the sections that follow. A more detailed treatment of these ideas is currently under preparation at FAO and will be available within the next year or so as part of a "Model Code of Forest Practices".

Harvest Planning

Comprehensive harvest planning is essential in order to properly set the stage so that sustainable harvesting practices can be followed, and also to reconcile the need for greater technical control during harvesting with the need to simultaneously reduce harvesting costs. Many logging operators believe that environmental protection can only be achieved through costly measures that reduce profitability. This is simply not true. Experience by concessionaires who thoroughly plan their operations and who then carry out the operations as planned has demonstrated conclusively that these procedures not only improve operational control and minimize environmental impacts, but also reduce costs and increase profits substantially.

The harvesting plan should specify the equipment to be used and the timing of operations, and should include contingency plans for severe storms and other extreme events. It should consider the possible complementarity of harvesting non-timber forest products (for example, cutting rattan or tapping resins prior to the timber harvest, or collecting fuelwood after the harvest). Local communities should be consulted about potential scheduling problems or opportunities (for instance, to take advantage of labour availability during slack agricultural periods). The time of normal onset of the rainy season should be considered, as should the time of seedfall in areas (such as deciduous forests) where seed is not produced year-round. In some cases, harvesting operations may need to be scheduled to avoid breeding seasons of primates or other sensitive animals.

The harvesting plan, including a completed topographic map showing the trees to be harvested and the transportation system, should be provided to the foreman of the harvesting crew. The foreman is then responsible for ensuring that the plan is carried out and that every member of the crew is familiar with the requirements and working procedures. A thorough understanding of what is to be done and the standard of work expected is perhaps the most important single requirement for a successful operation.

Forest Roads

Roads are unquestionably the most problematic features of timber harvesting operations. The major part of soil erosion resulting from timber harvesting – more than 90% in some studies - is associated with roads (FAO 1977). Nevertheless, except in cases where large waterways can be used, roads are essential not only for industrial timber extraction but also to provide access for management and control purposes. In some cases forest roads may even form part of the planned network of public roads and they can thus be an essential part of the development infrastructure.

Building roads involves removing vegetation and rearranging the soil so that it is more compatible with the passage of vehicles. Such actions are almost always accompanied by increased rates of erosion. To minimize the increase in erosion and reduce its destructive effects, the general principle is that both the total length of roads and the surface area disturbed through road construction should be minimized (FAO 1977, Hamilton 1988). Related ideas are that areas of high erosion risk should be avoided, roadside ditches and properly spaced cross-drains should be used to channel water away from the road, fill slopes and cutbanks should be revegetated as soon as possible after construction, and roads should be kept away from streams except where crossings are necessary.

Felling Operations

In itself felling approximately mimics natural treefalls and is often considered to be relatively benign from an environmental perspective (Hamilton 1988). From a silvicultural perspective, however, felling damage in tropical forest can be so extreme that it interferes with the attainment of silvicultural objectives (Nicholson 1979). Most felling operations in the tropics are performed by unskilled workers who are not closely supervised and are given little or no incentive to minimize damage through carefully controlled directional felling. Uncontrolled felling can cause considerable damage to advance regeneration and residual trees, and can also reduce efficiency in the subsequent skidding operation. When feasible, directional felling is thus an important step toward the protection of both timber and nontimber values.

In addition to directing the fall of the tree, damage from felling operations can be reduced by cutting climbers well in advance of the operation so that they are less likely to pull over nearby trees; by felling trees so that they fall away from streams; and by orienting the crowns of felled trees as much as possible so that any damage is concentrated. To maximize the volume (and value) of wood recovered from each tree, cutters should also be trained to follow proper cross-cutting procedures. This requires that the entire bole be measured prior to cross-cutting and that log lengths conform to mill requirements.

Extraction Operations

Most logging in tropical forest is done with ground-skidding systems which cause damage two ways in tropical forest operations: (a) the skidders tend to wander through the forest searching for felled trees, thus causing a proliferation of skidtrails and resulting in excessive damage to residual trees and advance regeneration; (b) the skidders cause soil disturbance and soil compaction, thus increasing the potential for erosion and retarding both regeneration and the growth of residual trees. Both of these problems can be reduced substantially by comprehensive pre-harvest planning and by a system of operational control to ensure that the plan is followed.

As a general rule, articulated skidders are preferable to crawler tractors for log extraction in tropical forests. Unlike crawler tractors, which are general-purpose machines designed especially for construction work, skidders have been developed explicitly for log skidding and their design permits logs to be partially suspended above the soil so that soil disturbance and compaction are reduced. On the other hand their rubber tyres exert greater ground pressure on the soil than do the wide tracks of crawler tractors. When operating on wet soils high-flotation tyres should be used to reduce the danger of rutting and soil compaction.

The following guidelines are useful for reducing damage associated with extraction operations in tropical forests:

1. The skidding equipment should be appropriate for the operation, without the excessive power capabilities that increasingly seem to be substituted for technical skill. The blade width should not normally exceed 3 m and the skidder should have a winch with at least 30 m of wire rope and an arch that will suspend the front end of the load off the ground to avoid ploughing by the logs as they are being skidded. Where appropriate, low-ground-pressure skidders can be used to reduce soil disturbance and soil compaction, particularly on steeper slopes or permanently damp soils (Buenaflor and Heinrich 1980). Animal skidding is also a feasible alternative in many areas, and the use of draught animals such as elephants, carabao and oxen has been shown to significantly reduce soil disturbance, soil compaction, and damage to residual trees. Animal skidding is particularly advantageous for silvicultural improvement operations such as thinnings.

   Cable yarding or aerial logging with equipment such as heavy-lift helicopters have the potential to substantially reduce road requirements and soil disturbance in steeper areas, but such systems require skilled crews and even so are likely to be more costly than ground skidding (Nicholson 1979). Nevertheless, there has recently been increased interest in using these systems to reduce damage in tropical forests, especially where operations have moved out of the lowlands into hill forests. It is likely that the application of such systems will increase substantially during the next few years as environmental pressures intensify.

2. Skidtrail locations should be clearly flagged on the ground and laid out using the topographic planning map (which shows the location of each tree to be harvested), a compass, and a clinometer.

3. Blading of skidtrails with the skidder or crawler blade should be minimized. In some tropical forests, blading of skidtrails has been prohibited entirely except when necessary to maintain safety (Ward and Kanowski 1985). Guidelines developed by French researchers for West Africa and South America stipulate that skidtrail construction should be limited to hand-cutting of brush by labourers (Schmitt 1989). Such procedures will reduce overall costs and will protect soils by leaving the vegetative mat in place.

4. Skidding equipment should remain on the skidtrails at all times. It is unnecessarily destructive to drive the skidder to every log; by staying on the skidtrail and pulling the winch line out to the log a significant reduction in soil disturbance and soil compaction can be achieved (Hendrison 1989). Damage to residual trees is also likely to be reduced by this practice.

5. Choker setters should be employed to pre-set chokers, locate the best approach to the log, and pull the winch line out to the log while the skidder remains on the skidtrail.

6. Landings, which are identified during the pre-harvest planning stage, should be located on slightly sloping ground, preferably on ridgetops or open areas away from streams and gullies. They should be as small as possible consistent with the need to sort and store logs temporarily and to provide for the loading

of trucks. Adequate drainage should be provided around landings to disperse runoff water into the surrounding vegetation.

7. Skidding operations should be suspended altogether during exceptionally wet weather. Skidding during such periods increases erosion and other damage, reduces operating efficiency, increases accident rates, and may double or triple operating costs (DeBonis 1986).

8. After the harvesting operation has been completed, adequate drainage in the form of water barriers and drainage ditches should be provided for skidtrails and landings, and they should be left in a state that will facilitate their rapid revegetation.

Long-Distance Transport

Most long-distance transport of logs from tropical forests to processing facilities is either by truck or by water. For the most part these are relatively low-impact operations. However, improper maintenance of roads can lead to excessive erosion as well as safety problems. Operators should avoid using earth roads and landings altogether when they are wet. Roads that are to be used during the rainy season should be properly drained and provided with a rock base and gravel or laterite surface. When concentration areas are located near streams (*e.g.*, where water transport is being used) filter strips of live vegetation should be maintained adjacent to the streams to reduce siltation.

FIELD EXERCISES FOR STUDENTS

If they are to obtain a firm understanding of the principles of environmentally benign logging methods, it is essential that students spend time in the field watching operations and making assessments of the environmental impacts resulting from the various activities. They 1should also be assigned exercises in which they learn the principles of harvest planning and road design. These exercises should include a field component in which the students transfer their designs to the field. If possible this should be done in connection with an actual harvest (e.g., on a training forest or in collaboration with a commercial timber concession).

Making post-harvest assessments of environmental impacts and silvicultural outcomes of completed harvesting operations can be one of the best ways possible for students to become proficient at judging the quality of harvesting operations. A series of one-day field exercises can be an excellent learning process. Each of these should be done by a team of several students working together. Where possible, more than one team should carry out the same type of exercise but in different areas so that results can be compared. Field exercises that might be incorporated into such a series could include the following.

1. Conducting logging-road traverses to measure road grade, surface width and condition, frequency and condition of cross drains, size and condition of roadside ditches, width and condition of fill areas, cut banks, and the roadside clearing area.

2. Visiting stream crossings to assess their condition and estimate the associated stream impacts.

3. Following skidtrails to measure skidtrail grade, surface width and degree of compaction, and the frequency and condition of water barriers constructed after the skidding operation was completed.

4. Making line transects through a harvested area to assess the frequency and depth of soil disturbance resulting from the operation. A separate transect through an unharvested "control" area will provide a basis for comparison.

5. Running line transects through a harvested area to determine the frequency and severity of damage to residual trees and seedlings of commercial species. Again, a separate transect through an unharvested "control" area will provide a basis for comparison.

After the field work for these exercises has been completed, the students should analyze the data in the classroom and then present the results as part of an overall discussion on the exercises. Regardless of whether the students will ever be directly involved in this type of work, they will acquire from such exercises an understanding of the problems and an appreciation for the fundamental principles of environmentally benign logging methods.

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APPENDIX 13

NON-WOOD FOREST PRODUCTS IN FORESTRY EDUCATION

by

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SUMMARY

The scope of forestry has expanded reflecting the fact that the importance of many non-wood forest products has increased, leading to new interfaces with related disciplines. This adds to the complexity of forestry and consequently of forestry education. However, in most cases forestry education and training programmes, particularly in developing countries, have not given adequate attention to non-wood forest products. Thus more consideration needs to be given to curriculum balance, to the availability of specific study programmes and electives related to the subject area, to course contents, to entry requirements and the pre-requisites for student selection, to the appointment of appropriately qualified teaching staff, and to the availability of teaching materials and related facilities. The situation calls for appropriate modifications and adjustments in the system of forestry education and training. In-service training can effect immediate to short term improvements and initiate urgent developments. More fundemental changes, however, are required to produce long term improvement and to ensure support for sustainable development. There are constraints to be faced, but with reasonable and rational efforts they can be surmounted.

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INTRODUCTION

Non-wood forest products (NWFP) play a crucial role in the daily life and welfare of people all over the world. They cover a wide range: food, fodder, fibre, fertiliser, flosses, organic construction materials, non-wood ligno-cellulosic products, natural dyes, tannin, gums, resins, latex and other excudates, waxes, essential oils, spices, edible oils, medicinal extracts, phyto-chemicals, aroma-chemicals, decorative articles, horns, bones, pelts, plumes, hides and skins. These products are derived from a variety of sources - plants (palms, grasses, herbs, shrubs, trees) and animals (insects, birds, reptiles, large animals). Different parts of a plant or animal often provide different products, simultaneously and/or at different times.

Non-wood forest products exhibit considerable variation in their use. Some of them are consumed immediately on harvest (e.g. fruits, fodder, wild meat) or after primary processing (e.g. edible nuts, bamboo products). Some others go through a series of downstream processing or refinements to meet the market specifications and standards, adding value to the product all along the way, as for example phyto-chemicals, food additives and flavourings. A large number of NWFP appear as ingredients of varying proportion in a large number of items of our everyday use such as medicines, perfumes, suntan lotions, nail polish, mouth wash, hair conditioners, cosmetic products, cheese, chewing gum, soft drinks, peanut butter, breakfast cereals, golf balls, paints, corrosion inhibitors, insecticides, fungicides and a host of others.

As plants and animals show regional, subregional and local variations due to differences in habitat conditions, so the nature and utility of the NWFP varies. Thus the NWFP which are important in a specific locality are usually a restricted number. In spite of this, however, the range of activities related to their production, management, processing and marketing is highly complex requiring adequate technology, support infrastructure, research facilities and skilled manpower. The technology currently in use in the area of NWFP varies between countries, and even within countries, ranging from crude to appropriate and sophisticated.

COMPLEX NATURE OF NWFP-RELATED ACTIVITIES

NWFP are comprised of different product groups involving different specific technologies, approaches, regulations and controls in the different aspects of their development. NWFP-related activities present a picture of considerable complexity.

Resource Management and Development

Foresters have been developing and refining silvicultural techniques of managing tropical forests for over 100 years. These systems, however, have been specifically designed to maximize the production of commercial timber. Silvicultural systems for non-wood resources in forests such as wild fruits, edible nuts, mushrooms, gums and latex which can be developed in combination with timber, have received much less attention. This is not to say that such systems are unknown or do not exist. Many indigenous or other local communities in the tropics have developed their own form of 'silviculture' for managing their non-timber resource. Jointly, indigenous silvicultural practices and conventional forestry can contribute in designing or improving systems wherein non-wood forest products can be managed along with wood in an integrated manner, thus increasing overall productivity. Often non-wood products can be harvested in an environmentally sound manner, without cutting down plants or destroying forests.

Many of the plants providing NWFP are found only in the biological rich and ecological complex primary forests. Some of them can only thrive within natural habitats and do not lend themselves to domestication of any sort. Those species that can be grown in plantations, as pure or mixed crops, are heavily dependant on regular infusion of germplasm from wild gene reservoirs (wild relatives). *In-situ* genetic conservation in areas with the greatest number of plant varieties of known economic value, as well as those with potential, should be part of integrated forest management.

Controlled extraction of NWFP may often be compatible with the objectives of management of natural forests that form part of a system of protected areas, especially from the buffer zones around these. Elsewhere the practice of managing natural forests for wood production alone will have to change.

An important consideration when contemplating management of natural forests is whether and to what extent NWFP production could be or should be domesticated in order to increase yields and ease collection. Wherever feasible domestication of plants yielding NWFP, involving their genetic improvement and growing them under intensive cultivation, is often considered as a means of ensuring controlled production and economic success. Intensive cultivation can take place under monoculture, mixed cropping or agroforestry systems.

<u>Harvesting Systems</u>

Harvesting of non-wood forest products, whether from the wild or from cultivated sources, differs from the harvest of wood in terms of the tools and equipment used, the technology involved, the necesary pre-harvest preparation and post harvest treatment and the requirement of intermediate processing. Harvesting does not normally involve a whole tree or plant, but only parts thereof. It varies from collection of nuts, buds and leaves to tapping of latex, harvesting of palm hearts, honey hunting, extraction of wax and gathering of decorative plant materials.

The harvesting techniques vary considerably for the various NWFP. For edible nuts it involves collecting raw nuts, cleaning, drying and grading; for fibres it involves cutting relevant parts of the plant (leaves, branches), removing thorns and hard coating, boiling, beating and separating fibres, dressing or treating, drying and bundling; for some latex products it involves making incisions on the tree trunk, treating as necessary with acid to enhance exudation, collecting the crude exudate, boiling it to pasty consistency, finally cooling it into balls or blocks for packing and transport; in the case of some medicinal tubers it involves digging up the plant material (ensuring that some reproductive materials are left in the ground), slicing, dehydrating, grading and packing. The cycle of harvesting also varies from a few weeks for tender shoots to longer periods in the case of mature fruits or rhizomes.

Since in most cases the volume of an individual NWFP harvested is small, and extractive in nature, little attention is given to developing harvesting techniques. The harvesting standard of many non-wood products are poor and rudimentary, and hence wasteful, destructive and unsustainable. Furthermore, generally little effort is made to harmonise the harvest of wood with that of non-wood products. The collectors are mostly unskilled and untrained in scientific methods. They are often exploited by middlemen who control access to the market, or by those who control access to the resource. Thus the millions of NWFP collectors have no adequate incentive for practising properly controlled and sustainable harvesting. In most cases post-harvest care is also poor and wastage is high. Wastage, in terms of loss of quantity or deterioration in quality, occurs during during collection, transport and storage. Planning and control of harvesting operations, the introduction of more efficient harvesting methods and systems, reduction of harvesting waste and keeping overall costs of operations at the lowest possible level are all essential.

Value Addition Through Processing

Non-wood forest products are often subject to a series of downstream processing operations leading to progresively more refined products. Primary and downstream processing of NWFP adds value to the product, provides local employment and helps to retain value in the country of origin. Such processing entails a range of technologies and equipment. The following are indicative of the range: simple distillation for essential oils involving passing of steam through a charge of fresh or partially withered grass or leaves and condensing the vapours; making ornamental baskets, bags, etc. from palm leaves, rattan and bamboo at cottage level; fairly sophisticated processing of wattle bark for producing tannin; and highly sophisticated facilities for producing medicinal preparations/pharmaceuticals and perfumes.

Most processing of non-wood products for local use, whether herbal medicine or straw baskets, is done in very small family units employing persons without any training, often working on a part-time basis. They are low-return activities. Their survivability is poor for they tend to be abandoned as wages rise and as alternative employment opportunities increase. With regards to those goods processed with modern technology in comparatively larger establishments, because most of the products are exported there is heavy stress on quality and on reliability of supply. However, due to the lack of technology, skilled manpower, management expertise, capital for investment, marketing information and mechanisms, coupled with inadequate information on resource availability, such sophisticated downstream processing is very insecure and so in most developing countries is only carried out to a very limited extent.

It is necessary to know the needs of specific markets, including product specifications and thestandards required, before deciding to embark on export oriented production. Although adding value locally is important, attempting to produce end-user commodities without adequate preparation or studies will be risky. Before launching on actual production, pilot trials are necessary.

Trade and End-Uses

Non-wood forest products have been traded over long distances for many centuries, while wood products have only become major international commodities comparatively recently. The ancient Egyptians, for example, imported gum arabic from Sudan and used it for preparation of colours for painting and mummifying.

Because of the variety of non-wood forest products, ranging from fruits and food to aroma chemicals and phyto-pharmaceuticals, the markets for them show corresponding variation, being traded in rural subsistence economies, local village markets, large city (national) markets and international markets. Some of the products meet bulk demands (e.g. edible nuts, resin) and others reach specific niches (special types of honey, aroma chemicals). Some non-wood product are not traded but only collected and consumed.

General quality standards for internationally traded products are established by the International Organization for Standards. In this regard, specifications and regulations by food and drug administrations and consumer protection groups of importing countries are often rigid in respect of items such as medicinal extracts, phytochemicals, food colourants and additives, essential oils and fragrances. Quality specifications, sanitary regulations, packaging standards (and lack of adequate knowledge about consumer preferences and competing products) often become a non-tariff barriers essentially denying some countries access to international markets. There is no way of coping with this situation except through improving efficiency and production standards.

For various reasons there has been an erosion of the international market share of NWFP over the years. Prices have generally fallen, considerably in some cases. Indeed for certain commodities prices have crashed. Apart from inadequate promotion, competition from synthetic substitutes are often the cause of this trend.

The new attitude of green consumerism, resulting from concern for environmental conservation and consequent preference for natural products, is providing to be an advantage for it is leading to renewed acceptance of NWFPs. An example is the emerging popularity of aroma therapy which is a fast growing area of natural therapy requiring high quality essential oils. The United Kingdom alone uses essential oils worth US$ 15 million annually for aroma therapy. At the beginning of this century plant derived materials constituted about 99% of the ingredients of perfumery products. With the emergence of petrochemical industry this proportion was reduced by 1950 to only 15%. The recent upsurge of preference for natural products has seen the proportion increase to about 25% and it could reach 50% by the beginning of the 21st century.

If technology is improved, collection and trade channels rationalized and made efficient, and appropriate processing developed, it will undoubtedly be possible to effect a positive changes that will encourage the sustainable development of non-wood forest products.

Research and Development Needs

The poor trading situation for NWFP in most producing countries is partly attributable to inadequate current technology and hence there has to be concern over the lack of research support.

There is a tremendous need for research into all aspects of the technology entailed in exploiting NWFP. Such research should cover, among others things: enhancing knowledge about the NWFP resource; methods of inventory for different NWFP; gathering scientific data on the nature of the products; prospecting, screening, evaluating and classifying plant species; techniques of domestication and cultivation, including aspects of monoculture and agroforestry; on-farm experimentation; species introduction trials; plant breeding and genetic improvement; improving of agronomic practices; improving harvesting methods and practices to reduce wastages and damages and to increase yield; adaptation of imported technology; improvements in processing, packaging and distribution of products; and product diversification including improvement of quality. An aspect to be stressed here is the importance of research-extension linkages and the dissemination of research information.

Development of a NWFP industry depends on how far the various products succeed in the market place. Therefore, to be effective research institutions need, among other things: competent scientists, support staff and research managers; the ability to conduct continual strategic evaluation of market conditions and opportunities, as it relates to research; opportunities to be autonomous and self-financing; and means to interact directly with producers and users and hence influence production and marketing.

Institutional Support

One of the major ills afflicting the NWFP sector is institutional neglect in relation to policy, strategy and plans, legal rights and arrangements, incentives, development of skills, health and safety considerations, access to information, controls and regulations related to production and marketing authorizations, and streamlined support from public administration. In most forest policies non-wood forest products get, at best, a mention in passing, but clear objectives and targets are not laid down, nor are strategies for development outlined. This lacuna leads to the lack of appropriate plans, programmes and projects related to NWFP, and inadequacy of investment. Because of this, there is hardly any emphasis on developing and maintaining a database on NWFP. There have been initiatives to improve the situation in some countries, but a lot more needs to be done, and urgently.

Participation of the local communities in the production and management of NWFP calls for appropriate provision regarding legal rights and organizational support to encourage long term investment and improvements. Apart from this, other economic incentives are also needed. Rational policy interventions are necessary to ensure access to credit and markets and remunerative prices for the product.

Constraints and Issues

The situation with regard to NWFP in most countries is riddled with constraints and problems. These include: lack of a clear definition and classification of NWFP; lack of basic information; inadequate resource development, management and conservation; lack of adequate integration of management of wood and non-wood products; deforestation and land degradation; wasteful and inappropriate harvesting practices; lack of incentives for introducing and implementing sound technology; hurdles in the development of organized people's participation and entrepreneurship; unscientific and uncontrolled system of NWFP collection and the influence of exploitative middlemen; lack of market orientation, supply fluctuations and inadequate adherence to quality; lack of competitiveness in the international market due to weaknesses in the chain of NWFP management and utilization; inadequate processing and storage technology and facilities; inadequate research, lack of appropriate extension facilities, lack of facilities for skill development and training in areas related to NWFP; lack of adequate investment, an appropriate policy and strategy for development of NWFP; and inadequacy of institutional support. These call for action on many interrelated fronts.

THE WAY AHEAD

The constraints mentioned above have meant that it has not been possible for most countries to realise the full potential and benefits of NWFP. This in spite of the fact that several investigations on the role of NWFP in different parts of the world have indicated that their relative socio-economic contribution, in comparison with that of timber, is significant and becoming increasingly important. Accordingly, in the UNCED Agenda 21 and Forest Principles (1992), NWFP have been identified as an important area requiring concerted action in order to capture their potential for contributing to economic development, employment and income generation in an environmentally sound and sustainable manner.

IMPLICATIONS ON FORESTRY EDUCATION

The above discussion on the problems and potentials of NWFP provides a backcloth to review the need for making suitable modifications and improvements in the system of forestry education and training. Forestry education, like other institutional aspects related to forestry, has not provided adequate attention to NWFP, especially in the developing countries.

Forestry education in the past was, and in many cases still is, weighed in favour of timber management, timber technology and timber utilisation. The multiple functions of the forests are generally recognised, but without much influence on the educational system except in the industrialised countries. Some efforts have been made in recent years, in some countries, to introduce courses in social forestry, agro-forestry, forest economics and environmental sciences. But, at best, NWFP receive only superficial treatment in most developing countries. The emerging importance of NWFP would imply that the past neglect can no longer continue and amends have to be made soon to meet the new demands.

In aspects related to inventory, conservation, expansion, management and utilization of resources, what is being applied to wood cannot be applied straightforwardly to non-wood products. Also, what is applicable to one non-wood forest product will not, in most cases, be suitable for another. Thus, development of NWFP calls for diverse skills and a multidisciplinary approach: involving agronomy, biology, ecology, entomology, ethnobotany, farming systems, food technology, fibre technology, information systems, mycology, nutrition, plant genetics, phyto-chemistry, polymer chemistry, rural sociology and other disciplines hitherto not involved in forestry.

Incorporating subjects related to NWFP, in an appropriate and balanced manner, in forestry education and training, with a view to widen the skill base of the profession, will necessitate adjustments in the existing systems. Also the lack of adequate scientific information and knowledge on NWFP emphasises the need for appropriate linkages between education and research in this important area.

It has to be stressed here that wood and non wood do not represent any sort of dichotomy of interests, but are complementary components in an integrated whole. Forestry education has to accept and promote this complementarity.

Types and Levels of Forestry Education and Training

There are different types and levels of forestry education and training under university and non-university systems, covering specialist, professional, technical and vocational requirements - both pre-service and in-service. These could be combined in many different ways to meet the specific needs of society and the organisation, industry or enterprise as relevant.

Forestry education and training normally take place, depending on its type and level, after primary, secondary or higher education. Therefore, the entry points, other pre-requisites, and the duration of the different types of forestry education and training, could also be adjusted according to needs. In addition, research, extension and dissemination of information (aimed at different target groups) involve components of education and training.

The inherent flexibility in the system of education and training ought to make it amenable to the necessary adjustments to modify its scope, nature and content. This, of course, would involve proper planning and implementation measures.

Some Conceptual Aspects

Conceptually there are differences and similarities between education and training, even though these terms are often used together and/or synonymously.

Education provides one with the capacity to learn. It involves the transfer of facts, the instruction of how to find more facts, the learning of how to use thought to judge facts and the assembling of these into knowledge. The term higher education is used to mean education at the university or equivalent level to produce personnel of managerial/ professional level capable of making policy decisions. As an attribute of human resource, education is related to expertise and experience, and the combined effects of these influence attitudes.

Training, normally, is related to specific skills covering the technical and operational aspects within defined fields. Accordingly, training is imparted with a view to produce technical and vocational personnel to be capable of translating plans into goods and services.

It is difficult, however, to draw a clear boundary between education and training. There is considerable overlap and one is not exclusive of the other. The extent of overlap will depend to some extent on the level of technology and the related levels of skills in the particular fields of discipline.

Suggestions for Enhancing the Content of NWFP in Forestry Education and Training

The situation of, and problems with, forestry education and training are quite different in different countries. Therefore, enhancing the content of NWFP in forestry education and training will have to be done within the overall context in the country and be aimed to meet its specific needs. The suggestions for different levels of education and training, as given in Table 1, are only indicative of the improvements/changes that would be needed, considering the general situation existing in most developing countries.

Some Institutional Issues

Theoretically, incorporating instructions on NWFP and balancing the content of forestry education and training should not pose serious problems. However, there are several issues to be addressed in that regard: who are the clientele requiring the services of personnel trained in NWFP?; who should initiate action to incorporate a strong component of NWFP in forestry education and training?; who should be involved in designing the needed changes?; what should precede - development of NWFP or education and training in NWFP?. If the importance of the role and contribution of NWFP are recognised, then it is vital to have clear policy support for it - in the national forest policies as well as in educational policies. The need for consideration under education policy is specially relevant for higher education, since it is imparted by universities, and hence outside the normal purview of the forestry sector.

Higher education is not intended to satisfy vocational needs, nor should it place its emphasis on the production feed stock for filling vacancies in government bureaucracies. It should inculcate entrepreneurship, it should help to develop an enquiring mind; it should promote capacity of leading opinion rather than following it. But public sector monopoly in forestry often becomes the bane of innovation in all aspects of the discipline, including forestry education. A policy in favour of involving the private sector in forestry can help to change the situation. The mission expected of universities - education, innovation, research and extension - can become effective in respect of forestry when there is greater involvement of the private sector. Lack of facilities and trained teaching staff are related institutional constraints.

Another policy related issue, which follows from the neglect being meted out to NWFP, is the lack of analyses of jobs and skill needs related to it, which would facilitate the development of appropriate curriculum for the different courses or levels of instruction.

Issues Related to Curricula

Curriculum construction and improvement is a continuing process in developing education and training. Often it may be necessary, in the absence of details of skill needs (as is the case with NWFP), to start with a provisional curriculum and refine it by stages. This is preferable to delaying action while awaiting for full details to become available.

In terms of their nature and orientation, curricula can be so constructed and structured at all levels of education and training that they can be capable of supporting policy objectives and needs. For professional education, for example, curricula accordingly can be generalist vs specialist, conservative vs radical, packaged vs open/flexible, ready to use vs ready to innovate, or a mixture of these.

Usually the undergraduate curriculum tends to be more general and post graduate curriculum more specialised. With economic growth and technological changes there is increasing need for specialisation in all disciplines and professions, including forestry. Furthermore, there have been numerous attempts to satisfy the need for increasingly complex professional skills without compromising the broader purposes of education. In some countries, first degrees require the choice of an option which may range from a social science to an ultra-narrow specialisation. Some institutions have attempted a "multi-disciplinary" approach. Some have advocated what is described as "meta-disciplinary" education - which aims to impart particular expertise together with a general knowledge of a problem area - that if it is successful produces is a specialist in terms of his expert knowledge but a generalist within the field to which he applies that expert knowledge. This concept has an obvious appeal in forestry. It can be argued that it is more cost-effective than establishing multi-disciplinary teams of experts, and that it can provide managerial and entrepreneurial, as well as scientific, skills.

Thus, in a four-year undergraduate programme, it is possible to offer general or compulsory courses for all students during the first and second years (or up to four semesters), with specialised programmes, sub-programmes and/or tracks according to the options chosen by students during the remaining period of the undergraduate years. In some universities several differentiated forestry study programmes are offered starting with the third year (or the fifth semester) - forest management, forest product technology, forestry planning and economics, environmental conservation and so on. In such cases, it is possible without much difficulty to incorporate a programme(s) or sub-programme(s) related to NWFP, and to include some subjects relevant to NWFP as electives along with other study programmes. The curriculum could also emphasise the educational role of research and enable specialisations based on research (e.g. on specifics of NWFP). Increasing the number of options in the final semesters can broaden the scope and content of education to meet the challenging requirements at sectoral interfaces.

It is also possible to provide flexibility and make modifications as needed in the course content (both theoretical and practical) of specific programmes to satisfy certain requirements of particular disciplinary areas or interfaces. For example, courses on forestry planning can include particular examples of NWFP, such as developing medicinal plants or gums and resins. Course contents are continuously modified to reflect the changing perceptions of the need and are meant to be adapted to local situations, ethos and cultural environments. But such modifications are subject to constraints of finance, time, teaching staff, background of students, and motivation. This also raises the need that teachers should be able to integrate the teaching - rather than compartmentalising the teaching by disciplines or specific subjects.

Yet another possibility to widen the exposure of students (to NWFP) is by encouraging practical work experience (e.g. harvesting NWFP) and considering it as a complement to the academic curriculum. These can be sandwiched between academic sessions. But in most developing countries facilities and employer willingness for such apprenticeship do not exist.

It is easy to suggest that specialisations should be offered and taken as post graduate (Masters and PhD) programmes; but in practice it is not easy. Actually, the most serious problem of professional forestry education in developing countries is in the field of post graduate programmes, due to several practical problems such as lack of financial resources, lack of facilities, lack of qualified experts to guide the specialised programmes and inadequate policy support. Since the number of participants in the post graduate programmes are small, it tends to be uneconomical and this acts as a disincentive. Emphasis, therefore, has to be on incorporating NWFP in general courses and special programmes up to and including those of professional (under graduate) level, by adding to, and balancing, the curriculum content. Improved teaching methods, video presentations and improved information technology have made it possible to add to the content of education without extending its duration.

Addition of a wider range of subjects, such as the diverse groups of NWFP in all its related aspects, will broaden the nature of forestry education. This will provide the students with better capability for planning and policy analysis, it will also qualify them for entry to a much wider range of professions than hitherto.

CONCLUSION

There are no conceptual problems in appropriately incorporating NWFP in forestry education and training programmes, adding to the multi-disciplinary content of forestry education. This can be done through balancing the curriculum, improving the curriculum contents, encouraging practical on-the-job training, promoting the educational role of research and so on. There are, however, practical and institutional difficulties to be addressed, relating to financial resources, facilities, trained teaching staff, teaching materials, controls and regulations, institutional flexibility, motivation and incentives and policy support. This has to be done in a rationally phased manner.

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APPENDIX 14

INTEGRATING MULTIPLE LAND-USE APPROACHES INTO FORESTRY EDUCATION WITH EMPHASIS ON WAYS TO TRAIN TEACHING STAFF AND FOCUS ON FIELD EXERCISES AND THE DEVELOPMENT OF INSTRUCTIONAL MATERIALS

by

A.B. Temu [1]

SUMMARY

Agenda 21 of the Earth Summit (Rio de Janeiro, June 1992) considered education as the vehicle for providing "Environmental and ethical awareness, values and attitudes, skills and behaviour needed for sustainable development". Integrating multiple land-use (MLU) approaches into forestry education is an appropriate response to Agenda 21. However, independent action in forestry education may not bring about the desired results without complementary actions in Agriculture, Animal Science and Wildlife Management, given the need for collective responsibility of all land use disciplines in the management of the environment. Educational programmes have an important role to play in widening interdisciplinary boundaries.

The objectives of forestry education should be re-examined in the light of sustainable environmental management. Curricula should be reviewed to reflect real world situations. Human and other resources should be strengthened for proper implementation of the curricula.

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In the short term, teaching staff can be strengthened through colloquia, short courses, research internships and staff exchange programmes. In the long term, consideration can be given to the establishment of postgraduate programmes with MLU orientation, and MLU research fellowships.

Joint efforts by universities and other institutions can be expected in the development of teaching materials. Field research and development projects are essential components of teaching materials and good sources of experienced staff.

To achieve all these, educators in each country should initiate efforts towards the development of a policy environment which can promote strong inter-disciplinary linkages, and the integration of education, research and field practice in all fields related to land-use.

INTRODUCTION

Unintegrated land use approaches in education, in research and in development activities are partly responsible for the current mismanagement and even abuse of land resources world-wide. Slash and burn agriculture and overgrazing continue to shrink forest areas, reduce land productivity and threaten the environment. The Rio summit in 1992 noted that these actions threaten the survival of many life forms. It called for the maintenance of biodiversity, rehabilitation of degraded areas and the practice of sustainable agriculture.

For sustainable changes to occur in the management of land resources, there must be fundamental changes in education and research programmes and in attitudes. Education programmes in all disciplines relating to land use need to incorporate Multiple Land Use (MLU) approaches into their teaching. Forestry education has hitherto focussed on the sustainable management of specially demarcated forest areas. Pressures on forest resources now demand forestry expertise at the village level, to develop wood resources there. Environmental consciousness and the need to maintain biodiversity has also affected traditional forestry practices significantly. It follows therefore, that a review of the objectives and contents of forestry education is appropriate and opportune.

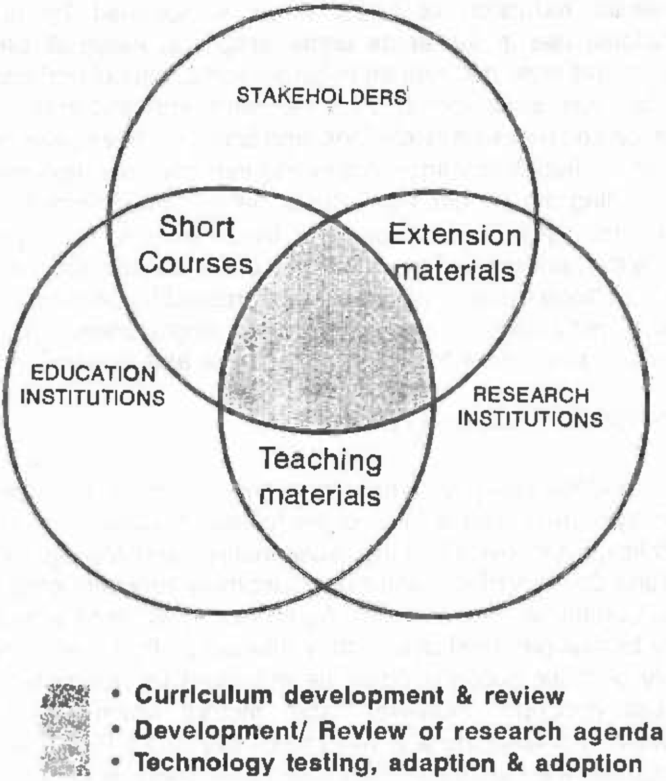
INTERACTION OF EDUCATION, RESEARCH AND STAKEHOLDERS

Educators and researchers in forestry, (and I believe in many other land use disciplines especially in developing countries) tend to ignore, consciously or otherwise, the roles of stakeholders in shaping their programmes and activities. Education and research are mutually supporting systems and it is convenient to discuss the duo together. Linking them provides the opportunity to ensure that actions taken in education and research are complementary and interactive.

Figure 1 presents an oversimplified impression of the interactions which should occur between educators, researchers and stakeholders. The latter includes all interest groups and individuals, but most especially the farming community. The forestry professional must learn to interact with these groups and individuals in a way that promotes sustainable land management. One important question is whether or not the **knowledge, skills** and **attitudes** learned at the forestry school are adequate for this task. If the answer is affirmative, it is well and good. The follow-up question would be "Why are land resources and the environment so badly threatened today?" If the answer to the former question is not affirmative, then answers to the following questions need to be processed in collaboration with stakeholders:

a) Do we need additional objectives of forestry education?
b) Do the existing curricula adequately address the concept of sustainable land use? If not, how best can we incorporate land use approaches into existing programmes?
c) What resources are needed to implement the additional objectives and/or approaches?

Figure 1. Interaction among Forestry Education, Research and Stakeholders



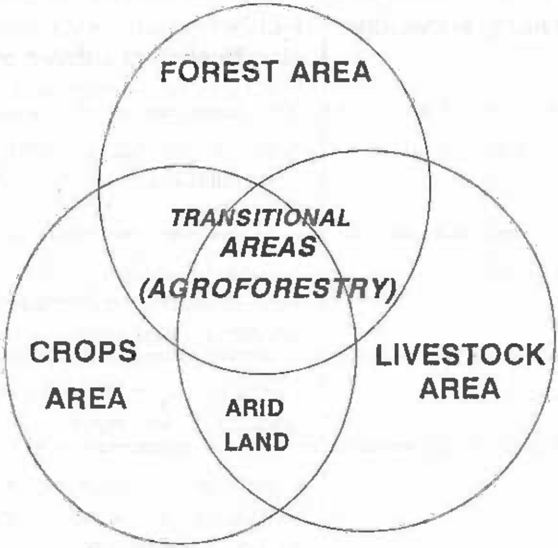
THE EDUCATION AND RESEARCH GAPS

In many developing countries, loss of the productive capacity of land often proceeds from slash and burn activities, through farming and livestock grazing to semi-arid and arid conditions. This implies that incremental reduction of forest areas is followed by an almost proportional rise in the areas under crop and livestock production. However, this does not happen because some agricultural and grazing lands degrade each year and fall into semi arid and arid conditions. Education and research institutions, and activities, have been developed along strict disciplinary lines, not taking into consideration the amount of land falling out of pure agriculture, forestry and animal grazing into "transitional" uses. Figure 2 presents these areas in conceptual form, showing the continuous flow of land out of conservation and production areas. The "transitional" uses must be addressed by both education and research institutions to save them from degradation. This requires additional inputs into education programmes and research.

STAFF TRAINING AND ATTITUDES

A close analysis of forestry curricula around the world shows that many of them have several of the following subjects: Land use Law and Policy, Land use Planning, Sustainable Land Management, Soils and Water Conservation, Resource Economics, Environmental Forestry, Social/Community Forestry and Agroforestry. All these subjects relate closely to multiple land use. With a little extra effort, the contents and delivery of these subjects could be improved to incorporate multiple land use concepts. However, other factors which can affect the effectiveness of teaching also need to be evaluated. Firstly, we need to be satisfied that teaching objectives are being achieved. Table 1 presents a six-step list of teaching objectives. While it may be easy to achieve steps 1 and 2, the didactic aspects (steps 3 through 6) are harder to achieve. They should be emphasized in forestry education.

Figure 2. Education and Research Gaps



Notes: Forest area ever shrinking

Transitional areas ever expanding

Table 1. The six-step teaching objectives

STEP	TEACHING OBJECTIVE	DESCRIPTION
1	Imparting knowledge	Familiarity with terms, facts, classification of subject matter, abstraction, theories,e.t.c.
2	Comprehension	Ability to manipulate and present materialin own words and illustrations
3	Application	Relating knowledge and skills to new situations. Extrapolation of universal principles.
4	Analysis	Recognizing relationships, packaging knowledge in own order.
5	Synthesis	Combining elements of subject matter to form a whole. Ability to relate and deduce
6	Evaluation	Setting criteria and using them to judge the quality of material

(Modified from: Schoultz,1990)

Secondly, in developing countries many courses are taught at theoretical level, without adequate presentation of local case studies. Lack of relevant publications and/or teaching aids and equipment strongly affect the effectiveness with which a course is received. This delimits the practical utilization of the learned concepts. Production and/or acquisition of relevant teaching materials and equipment need strengthening. Special attention should be given to the development and/or acquisition of suitable MLU field training facilities. Contacts with research sites, field attachment of students, graduate intenships and outreach programmes (e.g. exhibitions, demonstrations, e.t.c. in collaboration with industry) are good examples for strengthening field practicum.

Thirdly, the educator's exposure to MLU concepts and his/her attitudes are quite important. We cannot expect serious re-orientation of education programmes without substantial changes in the vehicles delivering them. Serving academic staff need short training programmes in MLU approaches as proposed in Table 2.

Table 2. Short term strategy for training academic staff

	SCALE			
TRAINING APPROACH	LOCAL	NATIONAL	REGIONAL	GLOBAL
Awareness forums	***	***	***	**
Thematic colloquia	***	**	*	
Short courses	**	***	***	**
Staff research	***	***	**	*
Staff exchange	***	***	**	*

***Very intensive ** Regular * Occasional

As a long term staff training strategy, the following could be considered:

a) Research fellowships in MLU subjects for serving staff
b) Post graduate fellowships for young staff
c) Initiation and support for post graduate programmes with MLU components.

Other efforts such as recruitment of staff with field experience, using researchers as guest/ short-term lecturers and overall improvement of the teaching environment (incentives, facilities, etc.) should be made.

Lastly, the graduates of forestry programmes should have access to the rural communities. All too often, the number of foresters trained is based on the needs of the forest department to manage forest land, with no consideration of the needs of rural communities. Forestry education plans should take this into consideration. Forestry professionals should be trained in adequate numbers to serve the rural communities.

THE FORESTRY CURRICULUM

Roche (1992) correctly points out the need to identify teachable and researchable elements in subjects like social and community forestry. Huxley (1993) cautions against what he calls perpetuation of unproven hypotheses. A number of subjects have gained currency through international fora and media, but little attention has been paid to the new principles and or concepts they represent. Incorporating them into any degree programme requires thorough analysis. Firstly, it is necessary to identify the core courses which define the professional forestry degree. This would be the same irrespective of the location of such a degree programme, and may constitute about 60% to 70% of the whole programme. The rest of it should be composed of regionally and nationally relevant courses. This serves to define the forestry degree in a generic way, and may be used as an instrument for evaluating forestry curricula.

This argumentation differs from that given by Roche (1992) who tried to outline a special forestry curriculum for developing countries. A professional forester, like any other professional, should be recognized by the contents of the education programme he/she underwent, and it must be independent of the geographical location of the programme.

ICRAF'S INITIATIVE IN MLU EDUCATION

In 1992, ICRAF established an education programme, whose objective is "To strengthen the capacity of universities and colleges in developing and delivering multi-disciplinary land use education." The programme uses the mechanisms available to educational institutions to support activities such as development and review of curricula, exchange of teaching staff and post graduate students, development of teaching materials, and running of colloquia and workshops. Post graduate fellowships are available for students wishing to carry out their researches in MLU subjects. Senior fellowships are also available for lecturers and professors to carry out MLU research, and for researchers to contribute to education programmes. Institutions whose graduate programmes have MLU components may apply for equipment to support their programmes.

The above-mentioned activities are operational within Africa through the African Network for Agroforestry Education (ANAFE) co-ordinated by the programme and supported financially by the Swedish International Development Authority (SIDA). Plans are underway to secure support for similar activities in Southeast Asia and Latin America.

CONCLUSION

The global initiatives on multiple land use, environmental management and maintenance of biodiversity expand the mandates of land use disciplines, and especially forestry. Forestry educators should respond to this by reviewing the objectives of their programmes and the competencies required of forestry professionals.

Forestry curricula should be adapted to meet the diverse needs of the local, regional and global communities. The integrity of the forestry profession globally can be maintained through a generic description of the core courses, while adequate room is made for courses to meet regional and national objectives.

Strong links should be developed between education and research. International Agricultural Research Centres (IARCS) in particular, should establish mechanisms to ascertain that visible effort is made to transform their research findings into educational materials.

Additional resources are needed to meet the costs of training of teaching staff in multiple land use approaches and to develop teaching materials, especially relevant case studies to support theoretical treatise. Special emphasis is needed on the didactic aspects of teaching objectives.

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APPENDIX 15

PROFESSIONAL FORESTRY EDUCATION WITH PRIVATE OR PUBLIC FINANCING. STRENGTHS, WEAKNESSES AND STANDARDS OF QUALITY

by

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SUMMARY

An historical analysis of the development of the Chilean higher education leads to the conclusion that the system is no longer serving the real needs of the country. Its administration is inoperative and the quality of its institutions is very variable. The provision of forestry vocational education within this general framework, both with and without state financial support, is discussed in terms of the strengths, weaknesses and performance quality standards. The conclusion is that the system as a whole needs to be regulated to ensure its suitability, quality and appropriate size. In addition, strategies are proposed that are considered to be essential if Chilean forestry education is to meet the minimum requirements for international recognition.

THE HIGHER EDUCATION SYSTEM AS A WHOLE

Academic discussion in Chile gradually became ideological after the Reform of the 1960s. Developments during Allende's popular government were suddenly interrupted by the coming to power of the Military Government which lead to the most traumatic and important

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processes of change experienced by the Chilean university system. Deep structural and functional changes were introduced encompassing: a) *loss of autonomy by the universities*, with the virtual military occupation leading to removal of pluralism and free discussion, the continuous dismissal of "unsuitable" staff and a reduction in enrolment and vacancies (mainly due to the expulsion of students and the closing of university faculties following the 1973 coup d'état); b) *changes in university funding*, which lead to the introduction of university registration fees[1] and encouraged the hiring out of university services and consultancies in order to increase the proportion of total funds generated internally; and c) *academic and pedagogical changes*, which did not have any substantial influence either on the academic structure or in the pedagogical practices at the universities, but impacted on the academic suitability of the staff, which was subject to dismissal or recruitment in the basis of their observance or resistance to the imposed legislation.

An educational policy to complement these administrative measures only emerged in 1981. This consisted of the following four Decrees, each with the force of law, that were adopted by the Legislative which at that time comprised four members of the Military Junta, all subordinate in rank to the then Head of State.

1) The first Decree specified norms about existing universities and established procedures to simplify the creation of new ones. It gave universities the exclusive right to award academic titles such as Bachelor, Master, PhD and professional titles, which

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1 Annual registration fees varied with the field of specialization, amounting to between 20 000 and 60 000 $ ch. in 1981. The **annual minimum wage** in that year did not reach 58 000 $ ch., which was the income of at least 50% of the adult population (National Statistics Institute, 1982).

according to regulations, required a previous Bachelor's Degree in a related discipline (such as in the case of Forestry Experts).

2) the second Decree established norms related to university funding, comprising: a) direct Government funding; b) indirect Government funding, the amount of which depended on the number of students in the top 20 000 scores in the Scholastic Aptitude Test who enrolled in the first year of each institution; c) a Government loan to pay all or part of the registration fees of those students who applied for this support; and d) Government funding available per course and aimed at developing scientific and technological research and the supporting university infrastructure.

These three funding sources were available to the old and new universities and to vocational institutes resulting from their restructuring. The last funding source was open to all higher education institutions.

3) the third Decree made vocational institutes legally responsible for vocational training leading to titles that did not require a Bachelor's Degree.

4) the fourth Decree established the technical trade schools with two main objectives: meeting the country's growing demand for post-secondary training and creating a system of articulation within higher education which provided for the progressive specialization of the students concerned.

PRESENT STATUS OF THE HIGHER EDUCATION SYSTEM AS A WHOLE

Two years after the new legislation for higher education was enforced, the Military Government redesigned the tertiary education system. The existing eight traditional universities were maintained; 12 new derived universities were created (originating from the transformation or merging of the regional centres of some traditional universities); three private universities were established, as were four vocational institutes stemming from the traditional universities and their regional centres.

Between 1983 and 1987 there was a period of implementation of change, of adjustment and of review at both existing and planned institutions. From 1987, there was the sharpest increase in number and quality of higher education institutions ever recorded in the country.

The original concept of vocational institutes has been completely nullified since almost all those created in 1981 with state funding have now become universities. The same applies to approximately a third of the private vocational institutes. Enrolment to these has shown a student preference in the order: traditional universities, derived universities, new private universities and, last, vocational institutes.

Total current enrolment in higher education is: 53% universities, 16% vocational institutes and 31% technical trade schools. There is now an inverted work pyramid, with a clear disproportion between the large number of planners and supervisors and a considerably smaller number of executive and supervised staff. As such it does not comply with recognised international standards in this regard. Even more significant is the fact that in spite of all the changes made, theoretically aimed at enhancing the coverage of higher education, which up to 1981 was the monopoly of traditional universities, only 7% of the national population with lower incomes has access to higher education.

The resources committed by the new higher education legislation never materialized, so that the beneficiary institutions had to rely on other options to alleviate their situation. This has resulted both in academic staff devoting an increasing proportion of their time to paid consultancy work and to low morale consequent on low wages. In turn, this has reduced both the quality of education delivered and the standard of facilities available for education and research. Fee increases have not been a solution either, since they have a heavy social impact especially on the lower income groups.

VOCATIONAL FORESTRY EDUCATION IN THIS CONTEXT

Vocational forestry education in Chile is no exception to the general trend, since the Expert/Technician ratio is inverted in the institutions with state funding. The FAO advocates a ratios of 1:3 for the planning levels and 1:5 for the implementation of forestry management, and the actual ratio achieved in Sweden is 1:3. In Chile the professional ratio based on all training institutions is 1:1.1.

In order to analyze objectively the behaviour of the institutions, with or without state funding, a pattern integrating traditional approaches used in previous surveys of this kind was chosen (Figure 1).

Figure 1. Components of the evaluation pattern

CONTEXT
COST PER STUDENT
SIZE OF STUDENT COMMUNITY
CURRICULUM STRUCTURE
TEACHING STAFF QUALITY
IMPLEMENTATION
INSTITUTIONAL AIMS AND BACKGROUND

COMMITMENT
INSTITUTIONAL INVOLVEMENT
TEACHING METHODS
LEARNING EFFICIENCY

HIGHER EDUCATION QUALITY

ENTRY
STUDENT CALIBRE
ENTRY TEST
ADMISSION EXAMINATIONS

DROP-OUT RATES
% OF GRADUATES
% WITH EMPLOYMENT
GRADUATE FOLLOW-UP
RESULTS

Modified presentation of the original (Ramirez and Toro, 1990)

This pattern presents four sets of indicators: **context**, taking into account cost per student, size of the student community, curriculum structures, quality of teaching staff, implementation, institutional aims and background; **entry**, mainly related to students intelectual calibre (acccording to marks scored in the entry tests), admission examinations, average marks at secondary school; **commitment**, including issues such as institutional involvement, teaching methods, learning efficiency; and **results**, comprissing issues such as drop-out and student "mortality" rates, all-round development of students, rates of employment of graduates.

Of the above indicators, the most attractive for education evaluation experts is the entry indicator, closely followed by results; while the commitment indicator is the least studied. In this regard, we will analyse them following this sequence.

Entry analysis. - *Selection requirements* based on the Scholastic Aptitude Test and average marks at secondary school are applied by all state-funded institutions in both levels of professional education. The aptitude test is held at national level and consists of a general part aimed at evaluating mathematical skills, language fluency and knowledge of Chile's history and geography; and a specific part evaluating knowledge of a selected subject, such as mathematics or biology in the case of vocational forestry institutes. Some institutes regard both parts at the same time as a selection criterion.

Universities and vocational institutes without state funding do not ask for a minimum mark in the Scholastic Aptitude Test, considering a pass as sufficient. In most cases, the average marks at secondary school and a personal interview are also included.

After 23 years of continuous evaluation of the selection criteria analyzed above, it has been found out that irrespective of the entry test score of a candidate (the minimum score is 450) his chance of succeeding is over 60%. This increases in direct proportion to the score

(a score of 600-700 will have a 78% success rate; a score of 700-800, 90%; and scores over 800, 100%).

Results analysis.- This is an issue that is hardly ever studied in the institutions analyzed, and is particularly neglected by state-funded institutions due to the higher immobility within the system. The *survival and graduation rates* help evaluate the teaching-learning process and introduce the relevant adjustments. *Follow-up actions* are even more important since they endorse the validity of the professional profiles and these, in turn, influence the changes needed in the curricula.

The lack of this kind of survey has seriously blurred the profiles of the forestry professional studies in the country and has led to an increase need for retraining of forestry technicians. Although the first evidence in this regard was reported by the Forestry Education Commission in 1972, and confirmed by FAO in 1988 with the establishment of training requirements for forestry management in Latin America, the training of technicias continues to be the mainly carried out by the forestry experts.

Context analysis. The *cost per student* has gradually increased in all state-funded institutions due to the new funding policy for higher education inherited from the Military Government, a policy that has been maintained by the current Government and their are no plans for change in the near future. This means that annually there is an increasingly large percentage of students applying for loans from the University Loan Service, which is unable to meet the growing demand. In some instances a measure that has been adopted to offset the lack of state funding is to raise tuition fees, but usually this has resulted in a drop in enrolment on the corresponding courses.

In all institutions without state funding, cost per student is higher than in state-funded institutions, this difference exceeding 40% in some universities. Students in these institutions have no access to university loans, a fact that is of no importance so long as almost all of them belong to the middle and upper socio-economic groups.

In all the institutions examined *curriculum structure and programmes* at undergraduate level were not, and are still not, related to reality; encompassing too many unimportant subjects and giving excessive priority to information trasfer rather than to education. The curricula of the two oldest universities, which gave rise to the various forestry courses in the country, were originally adapted from European institutions. Some minor isolated changes have been introduced without any significant effect on the core curriculum. The remaining universities, whether derived or private, have used these as a model, introducing, in turn, other minor modifications. The subject is considered the basic element of the curriculum, which must comply with certain prerequisites usually established by the teacher in charge of the core subject. This produces a curriculum network with prerequisites of very little, if any, relevance, without goals established by the teacher of the subject and, in general, characterised by badly coordinated contents with, in most cases, disconnected or fragmentary sequence of facts and ideas.

These shortcomings were also pointed out by the Forestry Education Commission in 1972, subsequently reasserted by FAO in 1988 and, today, have become not only a Chilean problem, but a characteristic of higher agricultural education throughout Latin America.

Of the two institutions concerned about these issues, only the Southern University has a Forestry Education Office that formally addresses them, but, at present, lacks a president due to insufficient institutional support. The topic has been addressed in the Concepción and Southern universities of Chile only because of the interest shown by certain individuals. Paradoxically, the idea of a modern and distinct approach to training future forestry professionals is becoming increasingly important.

At the *postgraduate level*, only the University of Chile and the Southern University of Chile have developed regular Master's courses, and these have not yet been totally consolidated. The programme proposed by the Southern University, which has been kept unchanged since its creation, has not managed to acquire a permanent critical mass of students. On the other hand, the University of Chile's course has gone through ups and downs, with long periods of inactivity. Both courses are based on a flexible curriculum structure, which ends with the submission and defence of a thesis. Both of them suffer from the same shortcoming as the undergraduate curricula, which is why they are being thoroughly revised.

The traditional, derived and private universities have all developed occasional *postgraduate courses* based on specialized or postgraduate activities. In this regard, the national trend is to keep both categories of courses concurrently, with special emphasis on occasional activities. According to postgraduates projections, national demand in the short term will not be enough to develop further regular courses. Nor do other universities have the critical mass of postgraduates, or adequate research facilities, needed to initiate them.

With regard to the *quality of teaching staff*, there is evidence, both in Latin America and nationally, that there has been insufficient qualified teaching staff in both instances to meet such an upsurge in demand. Consequently, it is common to find recent graduates or professionals without teaching experience in important professorial chairs in state-funded institutions. Furthermore, at present it is not essential to have a postgraduate degree to become a university teacher, although it is regarded as desirable when there is competition in filling vacancies. All this has resulted in cosiderable mobility of teaching staff, particularly there has been a loss of academic staff from traditional universities to derived universities in the expectation, on one hand, of higher wages and, on the other, of more rapid career prospects due to the relatively lower academic demands that currently, and perhaps temporarily, characterise these institutions.

As a result of the difficult working conditions discussed above the state-funded institutions taken as a whole have only slightly over 50% of their staff working for them on a full-time basis, with the minimum being 16% in Temuco Catholic University and the maximum being 100% in the Pontifical Catholic University of Chile. The same variation can be found for these institutions when analyzing the proportion of full-time staff with postgraduate qualifications. In this case, the average falls to 40%.

Furthermore, the teaching staff in most of the institutions without state funding are almost exclusively part-time, for the most part paid on an hourly basis. In some cases even the Head of Department or Principal have a part-time contract, in which case, there is usually a full-time alternate or assistant. In private universities, lectures are given in most cases by professionals without teaching experience and, increasingly, by professors from state-funded universities, a commentary on the administrative laxity of the latter. The percentage of professors involved in postgraduate teaching in private universities is notably inferior to that in state-funded universities, and research financed by grants is almost nonexistent.

When considering vocational institutes and training schools the situation is even more sensitive because in most cases teaching responsability is delegated in newly graduated students or to students in their last year of vocational education. Exceptions are the vocational institutes of Osorno and Adolfo Matthei, where lectures, as in the case of state-funded institutions, are given by forestry experts.

On a national level, discussions on this issue have become ideological with an emphasis on the political and economic dimension. This has resulted in a loss of the objectivity needed for such an important issue. A further factor is the administrative slackness that has developed in traditional universities, a slackness that lead to professors being allowed to perform their functions in more than one higher education institution, with consequent evident and proven neglect of their duties in their home institution. There is, therefore, a conflict of distinct personal interests that reduces still further the already low level of objectivity in discussions of education reform. This lack of objectivity occurs in the face of developments in the wider world, such as the fact that some European countries are already advocating teaching quality standards and the annual ranking of universities on the basis of results, as has happened in the USA. Recognition that research is an integral part of the university is more than just a romantic interpretation of the university's role according to Ortega y Gasset; it adds weight, validity and prestige to university teaching.

The *ability to implement* of degree programmes at the traditional institutions is normally adequate and appropriate for the profession. They all have sufficient physical space, well-resourced laboratories and up-to-date libraries with an average number of volumes that is proportionate to the student population they cater for. They also have field facilities or experimental plants that enable them to conduct practical work in parallel with the teaching activities. Institutions whose field facilities are at some distance from the teaching centre have included summer practical courses in their curricula to supplement adequately the hours of theoretical teaching during the academic year.

For their part, the derived institutions have undertaken sizeable infrastructural investment either with their own funds or with funds obtained from national competitions (FONDEF), the value of which has increased considerably over recent years. If this trend continues over the coming years there will be some equilibration of standards of degree programmes offered across all the state-funded institutions, reflecting the renewed efforts of the traditional institutions to ensure that they attract the best qualified students.

It has not been possible to form an objective picture of actual course implementation in institutions without government funding because of their reluctance to help in the matter and the extent to which they disguise the facts. It would appear that in some cases, particularly with regard to field facilities, resources are more theoretical than real or are only in the process of being acquired. Laboratories are generally shared with other faculties and the lecture rooms are sometimes spread across a number of buildings, particularly in certain universities. This is generally because these institutions initiated their activities in large private mansions or in appartment buildings that were inadequate for university purposes. The current trend of the older universities is to concentrate their activities in one centre. None of the private institutions with forestry faculties was awarded a project in FONDEF's last two national competitions.

Commitment analysis. Institutional involvement by students is relatively easy and unavoidable in almost all state-funded institutions, since they usually follow the concept of the traditional university and operate on a campus thus giving the students of all subjects the chance to interact. Isolated attempts have been made to excessively professionalize some derived institutions, but most of them, and particularly the traditional ones, continue to consider that science, art and literature should coexist materially and spiritually in the same place.

In the case of private institutions it is difficult to find an impartial way of assessing how they perform with regards to institutional involvement. The great increase in numbers of private institutions in higher education stems from political considerations and is based on legal provisions to ensure their establishment and growth. Therefore, there is neither a cultural need nor a regional demand for their creation, nor do they obey any previously formulated national development plan which might justify their creation.

The greater institutional involvement of state-funded institutions has not resulted in a better and more integrated training of the future professionals. Students are increasingly heared to complain about the growing impersonal behaviour of the teachers in all the institutions examined. Whereas in the institutions without state funding the explanation could be the prevailing type of contract, in traditional or derived universities this is unacceptable.

Teaching methods in Chilean universities, as in Latin America and the world in general, are being questioned by those who have studied this issue. Unfortunately, a national critical mass sufficient to provoke a deep and lasting change in this regard has not yet been reached. There seems to be two reasons for this. The first has already been mentioned and refers to the lack of incentive and commitment by the academic staff. The second is the fact that the youth have got used to authoritarianism over the long period in which the Military Government was in office. As a result, students have lost their capacity to defend their right to a quality of education that is in line with the high registration fees.

Teaching, irrespective of whether the institution does or does not recieve state funding, is at present focused on training, with the emphasis being on the teacher and the transfer of information, instead of on the education of the student through imparting knowledge, skills, ability and attitudes. Thus, there is a preference for irrelevant contents and the curricula are increasingly loaded with poorly designed courses, where more importance is given to attendance than to training itself. As a result of this way of teaching, the evaluation of learning effectiveness is defective and simplistic. Summative evaluation is prefered to formative evaluation, and critical appraisal is hardly used. Rating is commonly based on scale, and both students and teachers exclude *a priori* rating based on targets. Case studies are hardly used and performance evaluation is virtually unknown.

CONCLUSIONS

The Chilean higher education national system as a whole is the result of a political and ideological proposals enforced by decree on a society, the majority of which does not accept it. However, although imposed this does not mean that it does not have to abide by internationally recognized technical criteria or standards. It lacks comparative validity with other systems because its implementation is the result a political situation which, although perhaps desirable in economic terms, should be seriously questioned in terms of social costs.

Professional training cannot be regulated solely by the laws of market supply and demand. The critical size of each profession needs to be defined, the occupational pyramid needs to be established and the perfomance quality standards need to be set according to recognized international levels. The legislation regulating all these issues should have operational control mechanisms and the broad and effective authority to rectify mistakes, before they affect the user.

Regarding vocational forestry education, we can conclude that:

- it is impossible to establish an impartial comparison between the registration and further performance of students in these two systems because different criteria are used in each type of institution. A single validated entry system as used for state-funded universities should be recommended for the higher education system as a whole.

- even though it is recognized that results are important in evaluating institutional performance and checking whether the professional profiles and curricula are relevant, no records were found in any of the institutions examined.

- with regard to the context issues, there is a manifest difference in fees and method of payment which masks institutional performance efficiency and prevents objective comparison.

- in all the institutions analysed, deficiencies were found related to curriculum structure and programmes at undergraduate level and urgent revision of these by specialized teams is needed.

- it would seem that demand for regular postgraduate courses will not increase significantly in the short term, so the existing provision is adequate. The main need is for refresher courses or further training. In both cases, it is advisable to recruit qualified staff from institutions which do not provide these kinds of courses, so as to strengthen and extend the scope and quality of those that exist.

- it seems irrelevant to continue with national discussion as to how to evaluate teaching staff quality, in all the aspects stated above, considering the evidence accumulated on this issue worldwide. Teaching accreditation should be established at the national level, based on criteria that are objective and accepted as valid internationally.

- there appear to be clear differences in implementation between institutions with and without state funding. However, the lack of transparency in the whole system does not permit more objective comparisons.

- with regard to the commitment issues, it is difficult to evaluate institutional involvement objectively. However, there is no doubt that as the other variables become gradually regulated this will become clearer and, hence, easier to compare.

- there are deficiencies in teaching methods and evaluation of learning effectiveness in all the institutions analysed, requiring urgent and thorough revision.

The global conclusions of the present work would be:

- *continuation with a freemarket approach to this subject requires the assumption of the attendant responsibilities. Free choice is only possible with transparency and objective, updated comparisons. There should therefore be an Annual Bulletin* reporting the level of compliance with standards of each higher education institution, and a ranking of institutional performance.

- *the control of the formulation of, and compliance with, the proposed standards could be done by reinstating the Standing Commission on Forestry Education that was previously answerable to the Board of Chancellors.*

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APPENDIX 16

PRIVATE SECTOR CONTRIBUTION TO FORESTRY TRAINING PROGRAMMES IN FRANCE

by

J. Bedel[1]

ABSTRACT

Forestry training is one component of the agricultural training system, which is currently undergoing reform. The aim of this reform is to ensure that the training and skills acquired in order to exercise a profession are better matched to the requirements set out in each job description. Qualifications may be obtained in different ways, including block release schemes and further training courses. The system allows maximum flexibility and is able to adapt at all times to changing demand from the forestry professions. These have changed considerably over the last 20 years, and the use of modern techniques has created a demand for more highly qualified skilled workers, and technicians in particular. Companies are contributing to forestry training by taking in trainees and taking an active part in the apprenticeship schemes that the public authorities are trying to promote through various measures. Forestry training courses are organised with the practice of a trade in view, and they combine general training with specialised technical skills. The forestry training system plays an active part in the forestry and timber sector, and operates in close collaboration with the employers concerned.

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Private sector contribution to forestry training programmes in France

1. INTRODUCTION

Vocational forestry courses in France are set up as part of the agricultural training system, which runs a large number of training establishments reaching a wide sector of the public. This means that to understand how forestry training courses operate, it is necessary to acquire some knowledge of the organisation and method of operation of the agricultural training system as a whole. With the current reform of the system, the Ministry of Agriculture, which acts as the supervisory authority, aims to improve the response to demand from the various professional sectors concerned and in particular from the private sector, which provides most of the qualified posts available, especially for skilled workers and technicians.

2. THE AGRICULTURAL TRAINING SYSTEM

2.1 Qualifications and organisation of training

Five different levels of training are available within the agricultural training system. These range from level 5 (the lowest, providing qualifications for skilled workers) to level 1 (engineers qualifying after 5 to 6 years of study after Baccalaureate level). Each level of training leads to one or more qualifications which may be obtained in three different ways :

- through **school-based courses** for students in secondary education (levels 5,4 and 3) or in higher education (levels 2 and 1);

- through **sandwich courses** where trainees, pupils or students (depending on the level of qualification sought) spend part of their time at school and part within a professional organisation (private or semi-public company, government body, etc.). Sandwich courses may be of several types and include apprenticeship schemes in particular (see Section 5.5). Employers have an essential part to play in these sandwich courses, and some (especially the "Maison Familiale Rurale" organisations, see Section 2.3.2) use this type of scheme systematically ;

- **further training courses** are aimed at adults with work experience who are currently employed and wish to improve their skills, and in particular to adapt to new techniques. Government organisations and the Office National des Forêts (French forestry office, see Section 4.5) offer their employees training sessions to meet these needs. Further training courses may also be open to adults seeking occupational re-training, either through choice or because of the loss of a job, and in this case they lead to a vocational qualification (CAP or Brevet Professionnel (1)). Some of these (the Brevet Professionnel in particular) can enable qualification holders to qualify for professional status (forestry contractor for example) and / or state aid schemes such as low-interest loans to invest in equipment.

2.2 Reform of agricultural training qualifications

The content of training courses leading to qualifications has been undergoing reform since 1985. This began with level 5 courses and should reach completion by 1994 with level 3 qualifications. The reform is being carried out in response to new developments in agricultural and forestry technology and to changes in the management of natural resources.

Training courses and qualifications are being reformed because new needs are arising from :

- mechanisation of agricultural and forestry activities, which requires site workers to learn new skills ;

- greater awareness of environmental issues, which apply not only to national parks and reserves, but to the rural environment as a whole;

- the demand for vocational qualifications of a higher standard and for career advancement, and the need find solutions to reduce the failure rate at school.

The essential objective of the reform is to achieve a better match between vocational training and professional activities.

With the implementation of a reformed system of training, it is essential for a descriptive definition of each relevant activity, or "job description", to be drawn up. If job descriptions of this type are made available, training courses may be matched with an accurately defined family of professional activities. A thorough knowledge of the imperatives associated with each trade, of the relevant type of labour organisation and of the skills required at each stage in the production process is essential in defining appropriate training programmes.

The reform of the agricultural training system has two further objectives :

- **to ensure maximum flexibility** : training courses may be based on a credit system, especially in the case of level 5 and 4 qualifications. 10 course credits are required to obtain a qualification, and each course credit remains valid for a period of up to 5 years. This system provides adults with the opportunity to plan careers individually and to benefit from sandwich or block release courses,

- **to meet local demand:** The reform breaks with previous practice where a group of students followed a common, non-individualised and pre-set study programme over the entire duration of the course (6 months to 3 years depending on the desired qualification and the student's experience). The qualification acquired was supposed to be a guarantee as to the acquisition of a given type of knowledge, which had no particular link with a specific trade or with the skills needed to exercise that trade.

2.3 Training establishments

2.3.1 Status of the different establishments

A great many establishments offer training in forestry activities at all the different levels, from the 47 establishments running 92 different courses of training for level 5, to the 2 establishments running level 1 courses (excluding those dealing with wood as a raw material and wood processing, especially for the paper pulp industry).

The status of these establishments varies considerably:

- State-run administrative establishments where the staff is essentially made up of government employees ;

- Private denominational or non-denominational establishments (the Catholic church has been very much involved in the agricultural training system since it was set up in the 19th century);

- Associations, set up by a local authority, by an individual or by a group of families, as in the case of the "Maisons Familiales Rurales" (see Section 2.3.2).

All these establishments provide for and award national diplomas. **The quality of training is guaranteed by stringent procedures, despite the varied status of the different establishments.** The establishments all come under Ministry of Agriculture supervision through two different procedures leading to approval and accreditation :

- **the approval procedure concerns the resources provided by the establishment**: material facilities (areas for practical work, workshops and machines) and human resources (qualifications of teaching staff).

- **the accreditation procedure concerns the course of training itself** (training sanctioned by a national diploma gained through taking up a Ministry-approved option or specialised course). Accreditation is granted on examination of a **dossier proving that local employers in the professional sector concerned consider that the course of training meets a need**, and that they are willing to co-operate with the training establishment in various ways (by taking in apprentices or trainees, organising site visits, etc.).

The approval and accreditation procedures are complemented by a **procedure providing for continuous assessment of students' knowledge and skills, of the means implemented and the results obtained** (percentage of students obtaining a qualification), **and of the extent of co-operation from professional organisations** (offers of on-the-job training, participation of professionals in examination panels).

Despite their varying status, the training establishments thus operate within the terms of a contract under flexible but solid Ministry of Agriculture supervision which is exercised through procedures which **guarantee both quality and a close relationship between the training courses and the employers within the professional sector concerned**.

2.3.2 "Maisons Familiales Rurales" (MFR) (2)

A "Maison Familiale Rurale" is an association set up on the initiative of a group of families to provide training.

The MFR are based on three guiding principles:

a) They are set up and run by families in association. Each association is run by the parents of the young people in training and by ex-students.

b) All MFR training courses are based on the "sandwich course" principle, where training sequences take place in alternation between the training centre and an employer. As a general rule the companies taking part are run by an ex-MFR student and co-operate in a **"participatory" block release system, where responsibility for training is shared equally between the employer, the training centre and the family. Each party must have a sense of involvement in the content of the course, in teaching methods and in the acquisition of the skills defined in the "job description" associated with the desired qualification.**

c) Training is linked to local development needs, and the MFR system prepares young people to take on technical tasks associated with the practice of a trade and also to take an active part in local economic and social life.

The first MFR was set up in 1935 in a small rural community, by a group of families who were attempting to find a solution to the problems encountered by local young people wanting to take up agricultural training in a school. **This explains why the "sandwich" system was adopted**, to enable young people to carry on working on the family farm during their course of training.

The MFR movement has grown rapidly and has now become well established **outside France**, especially in the southern European countries but also in Latin America (it is expanding rapidly in Brazil) and over the last few years in Africa (especially in the Ivory Coast, Mali and Burkina Faso). The French MFR Association has set up a system of active co-operation with associations pursuing the same aims abroad. It aims to share the benefits of experience acquired in France, and can provide grass-roots associations requesting this with teachers who already have a sound knowledge of the MFR system. This is a valuable opportunity for many African countries where State-funded vocational agricultural training which is almost exclusively staffed by government employees is encountering very serious problems and does not extend to young people in rural areas.

3. RECENT CHANGES IN THE FORESTRY PROFESSIONS

3.1 The private sector

3.1.1 The logging industry (industrial timber and roundwood)

Demand for industrial timber (mostly from pulp mills) **is expected to rise considerably**, and it is estimated that **an additional quantity of some 1.4 million m3 will be required annually over the next 5 years** (increase in production capacity of existing units and implementation of new production units).

A study was carried out in 1990 on the basis of the following observations :

- There have been considerable gains in felling productivity per man-hour over the last 20 years, and this is still rising. Productivity in industrial softwood production has risen 5 to 10 times with the introduction of logging machines, and new equipment is still producing further gains.

- Productivity in timber extraction has risen by some 50 % in 15 years, as a result of the widespread use of cranes, improved sylvicultural techniques, the production of much longer stemwood and technical improvements to haulage gear.

- Forestry contractors are still employing largely foreign and unqualified labour at the minimum legal rate of pay. These workers are willing to work under extremely difficult conditions, which **does not encourage employers to mechanise their activities on site.**

Changes in labour organisation methods are creating favourable conditions for increased mechanisation and hiring qualified personnel.

This study, based on realistic assumptions with regard to rising industrial timber production and higher labour force productivity, **estimated that an additional labour force amounting to some 550 loggers and 180 machine drivers** (including about 40 for logging machines) **will be needed each year. The additional training needs involved would require double the overall capacity of the establishments providing training for these jobs.** This forecast has not changed in spite of the current forestry and timber crisis in France, which has merely delayed anticipated developments .

3.1.2 Management of privately held forest lands

Any person owning more than 25 hectares of forest land is legally bound to draw up a simple forest management plan. If he does not have the required competence, which is usually the case, a forestry consultant or a forestry co-operative is called in.

A forestry consultant is usually an engineer (holding a level 1 qualification) who carries out technical tasks for different clients, such as management plans, assessments of the value of forest property, or studies on forestry and forest-based industries or on the management of non-cultivated lands.

A forestry co-operative is an association set up by the profession and / or by forest land owners in order to enhance the use of forest resources and act against the fragmentation of forest holdings. Co-operatives organise the timber supply offered by forest proprietors. The aim is to attract as many buyers as possible to group sales of timber in order to sell wood supplied by co-operative members at the best possible price. Co-operatives do not have a commercial role only, as they may also co-ordinate job requests (replanting, maintenance of young forest plantations etc.) by running a "job exchange" where jobs offered by forest proprietors are put up to forestry contractors.

Forestry co-operatives act as service providers having the authority to take in trainees.

3.1.3 Reforestation and forest maintenance

Reforestation is being encouraged by funds provided by the French government and administered by the Fonds Forestier National (FFN) (2), by the European Community (especially during the 1980s), and by various tax relief schemes. Funds provided by the FFN since 1945 through different schemes have proved to be particularly effective, as they have resulted in the reforestation of several million hectares of land.

The reforestation sector is very active and involves :

- forest nurseries
- forestry contractors.

The production of forest seedlings is subject to more and more stringent norms. Moreover, competition in this sector is severe and has encouraged nurseries to rationalise and mechanise their methods of production in order to cut costs. **This has resulted in a demand for skilled, well-trained labour.**

Forestry contractors carry out replanting work and forest maintenance. These are generally small businesses which rely to a large extent on sub-contracting and piece work which is entrusted to foreign, poorly-qualified seasonal workers. **Mechanisation is slowly making its way into this sector** and equipment is improving, but forest contractors have great difficulty in investing in machinery as they have no guarantee as to regular work.

3.2 Supervisory authority for activities in the forestry and forest-based industries

The supervisory authority for this sector is the Ministry of Agriculture, acting through various bodies at national, regional and department level. The technical staff is made up of government employees. **The tasks they carry out are clearly defined, which means that it has been possible to draw up job descriptions** and to set up courses preparing students for a first job with a government body.

3.3 The Office National des Forêts - ONF (3)

ONF is a public body with an industrial and commercial mandate, which therefore has an autonomous budget with accounts balanced by the sale of products and services. It has two main roles :

- management of state forest lands (1.78 million hectares) ;
- enforcement of forest regulations within municipal forest lands and those belonging to public bodies (2.6 million hectares).

ONF is the tenth largest public-sector employer in France, and employs two categories of personnel :

- government employees (7 400 including 5 700 technical staff)
- permanent or temporary employees covered by private sector labour laws : forest workers, loggers, fire-fighting personnel.

There are four categories of government employees in technical posts : ONF technical staff, forestry technicians, engineers in forest and water resource management, and GREF engineers (4). **Technical staff and technicians are recruited through competitive examinations and ONF has set up a scheme to train first-time employees for this branch.** The other two categories (engineers) are trained by the Ecole National du Génie Rural Eaux et Forêts - ENGREF (5) (see Section 4.4). ONF provides further training for all its staff, including administrative personnel (see Section 4.5).

ONF operates as a private-sector employer and takes in large numbers of trainees, pupils and students.

4. TRAINING PROGRAMMES FOR THE FORESTRY PROFESSIONS

4.1 Level 5 training programmes

There are three level 5 forestry qualifications : CAPA (6), BEPA (7) and BPA (8).

- The CAPA qualification (Certificat d'Aptitude Professionnelle Agricole) covers three specialised forestry options.

- The BEPA qualification (Brevet d'Etude Professionnel Agricole) covers only one specialisation, entitled "environmental management and protection, specialisation in forestry work".

- The BPA qualification (Brevet Professionnel Agricole) covers 5 specialised forestry options, similar in title to those covered by the CAPA. The BPA qualifications are for those intending to become self-employed contractors and therefore include training in business management. The BPA is intended for adults who have already gained work experience.

Level 5 training programmes are very demanding in terms of practical experience, especially in mechanised haulage and logging techniques. These can only be learnt through the use of machinery run by Training Centres, with a small number of trainees at a time (the optimum trainee / teacher ratio is considered to be 4 to 2 on one logging machine). **This means that these training programmes are very expensive : apprenticeship schemes help to cut costs, but these are limited by various constraints** (see Section 5.5).

4.2 Level 4 training programmes : BTA (9)

There is only one BTA forestry qualification (Brevet de Technicien Agricole), which sanctions a training course in forest management, business management and forestry team management. This has been reformed recently to take in environmental aspects, and was set up in 1992 in place of the former "Forestry Production" BTA. **Holders of a BTA in forestry are particularly sought after on the labour market, especially by private companies and forestry co-operatives,** 4.3 Level 3 training programmes : BTSA (10)

There are two BTSA forestry qualifications (Brevet de Technicien Supérieur Agricole):

a) The "Forestry Production" BTSA leads to both public and private sector employment.

b) The BTSA in "market development, timber and roundwood option" was designed in response to new needs.

4.4 Level 2 and 1 training programmes

Level 2 programmes (technical engineering qualification for 3 or 4 years of study after baccalaureate level) were phased out in 1990.

There are three level 1 forestry diplomas : two of these, in forestry engineering and rural engineering, are awarded by the "Ecole National du Génie Rural, des Eaux et des Forêts" - ENGREF (5), the third (engineer in tropical agronomy, rural forestry option) is awarded by the Ecole Supérieure d'Agronomie Tropicale - ESAT (11).

4.4.1 Forestry engineering programmes - FIF (12)

Set up in 1990, this course recruits students at BAC + 2 level, on competitive examination results. A few students holding a BAC + 4 university degree are taken in after examination of their dossier and an interview. The course lasts for 3 years and includes third-year specialisation and **three training courses, at least one of which takes place within a company.**

Four specialised options were organised for the first cohort of students (those who obtained their qualification in 1993), including one business management option.

The aim of the FIF programmes is to open up four different options for graduates :

- University posts (recruitment of university graduates) ;
- Research posts : some third-year students may apply for the Diploma of Advanced Studies - DEA (13) ;
- **Private sector** (practical training course at the end of the first year, business management option)
- Sectors other than forestry management, in particular natural environment engineering and tree management in areas other than forestry.

4.4.2 Training of GREF engineers

This is a post-graduate vocational training course. Some 60 students taking courses in rural engineering and water and forest management (GREF) are recruited each year at BAC + 4 level at least, either on the strength of degree results or on passing an examination (depending on their situation on application). Recruitment is highly selective. The course lasts for 27 months and includes :

- First common core year
- Second year in specialised options (VA) (14). The ENGREF Centre in Nancy runs a forestry option VA.

The curriculum includes several practical training courses, including an on-the-job business course during the first year, which takes place as part of an "enterprise module" within the curriculum.

4.4.3 Training of engineers in Tropical Agronomy

This is also a postgraduate vocational training course organised by the Ecole Supérieure d'Agronomie Tropicale (ESAT) in Montpellier. Students are recruited at BAC + 4 or 5 level. ESAT is an international establishment and takes in some twenty foreign students a year (half the annual numbers) from developing countries and especially Africa. The course lasts for 2 years with a first common core year including a 6 month practical course, and a specialised option in the second year, with another 6-month practical course. Several specialised options are available, including Rural Forestry for tropical regions.

Teaching for this option is run on a module system and includes an agro-forestry module and an annual group course for all students in one year which takes place in a tropical country. This lays emphasis on woodland management by rural communities, on a systems analysis (agricultural systems applied to individual plots, production systems applied in production units and agrarian systems within the community and the area it exploits), and on the relationship between rural community practice (agricultural, pastoral and forestry) and tree management (in stands, isolated trees, individual or group management).

These courses generally take place within a tropical country, in association with a project or research organisation or more rarely with private sector production

company (forestry contractor, sawmill etc.) or a service provider (consultancy).

4.5 Training of ONF personnel

ONF (the National forestry office) functions as a very large company (see Section 3.3) which lays particular emphasis on achieving maximum performance and productivity, and on training for its personnel. In 1992, ONF devoted 7.2 % of its total wage and salary bill (108 734 KF or 20 million US$) to personnel training, placing the organisation in first place among the leading public-sector companies. A special training centre was set up to this purpose, the Centre National de Formation Forestière - CNFF (15) in Nancy.

The CNFF provides several forms of training :

a) "First job" training for newly recruited personnel. This varies according to the level of knowledge of employees.

b) Vocational re-training courses for employees moving to a different job category or taking on new responsibilities within the same category.

c) Courses to prepare employees for internal competitive examinations.

d) Further training courses which are available by right to all ONF employees. These aim to improve knowledge and know-how among staff and therefore to increase productivity, by providing access to new means (especially information technology which has spread throughout all levels of activity and responsibility). Training sessions are short (rarely more than a week) to avoid disrupting the normal course of operations within each department. **Further training courses are largely taught by**

auxiliary staff (248 in 1992, including 111 ONF teachers) some of whom are business managers (especially from the service sector). In 1992, courses for technical staff alone amounted to 38 665 UF (16) or "training units" (number of sessions multiplied by the number of trainees), in which 5 635 employees took part. This gives an average of 6.9 training units per employee. The training units are classified under four main headings : forestry techniques (53 % of the total), human relations (13 %), information technology (16 %), management (6 %) and others (12%).

5. PRIVATE SECTOR CONTRIBUTION TO TRAINING IN THE FORESTRY PROFESSIONS

Most of the preceding chapters have mentioned the role of private businesses in training programmes for the forestry professions.

Private businesses act in the following fields, either through professional organisations or in their own capacity :

- reform of qualifications and training ;
- setting up training courses ;
- funding of equipment and training ;
- teaching in training courses
- taking in trainees or apprentices.

5.1 Reform of qualifications and training

The various actors in the private forestry and forest-based industrial sector are represented by professional organisations acting on their behalf in on-going discussions with the public authorities, to make problems known, to defend the interests of the professions, and to seek support and financial assistance.

The Ministry of Agriculture has brought these organisations into the agricultural qualifications reform process (begun in 1985), and more generally into the definition of a training policy aiming to promote the integration of qualified people into professional sectors. As we mentioned in Section 2.2, professional associations are co-operating closely on the development of job descriptions.

5.2 Creation of new courses of training within a region

As we mentioned in Section 2.3.1, any training establishment wishing to set up a new course (BTA for example) has to receive accreditation. **This is requested by drawing up a dossier proving that the new course meets local demand or at least provides good local employment prospects for those who take the course. The dossier therefore has to be drawn up in consultation with the employers in the relevant sector.** Training can thus be adapted to meet any local demand from the profession : in the UC (17) or credit system described in Section 2.2, three of the 10 course credits which are essential to obtain the qualification are of a regional nature.

This approach helps to consolidate the unity of a professional sector which does have some difficulty in organising itself as such, since it includes only a small proportion of all forest land owners playing an active role in forestry production. The sector is very keen to achieve full recognition on account of its economic and productive capacity, in the same way as the agricultural sector, which still provides the frame of reference, achieved recognition in earlier days.

In parallel, this problematical situation is reflected and reinforced by the underlying precepts and the workings of an administrative authority staffed by civil servants who are for the most part recruited from corporative technical institutions, and who see no reason to seek interlocutors other than those who already benefit from its funding arrangements (which are also frequently based on the logic of production alone), although these beneficiaries are not very well served as they lack cohesion and lobbying power.

Possible lines of study and action :

The fundamental problem in attempting to tackle very diverse forms of reasoning is to identify appropriate items of information and to present these to the different categories of forest owners :information on the current economic situation and economic forecasts if possible, as well as information on the social and environmental issues, enabling forest land owners to gain more or better knowledge, whatever their level, of the range of costs and available benefits on which their decisions on forest management - or non-management - are based.

This identification process must be undertaken to avoid "short-term" decision making and also to ensure that the sum of rational individual choices does not produce a globally aberrant course of action, or at least one which is regarded as such by society as a whole.
This implies that a course of action based on the logic of "demand" should be adopted, which would require :

- *much greater detail and accuracy than is currently provided for in classifications and market surveys of the different requirements for training, information and advisory services ;*

- *following on from this, actions should be targeted more accurately while management options and technical training courses should be better matched to needs, more flexible and more diversified ;*

- *actions undertaken should provide all the actors involved at all levels with the opportunity to enhance and improve upon the content of the social and civic debate on the function, the role and the management of forest lands ;*

- *more detailed research should be undertaken on the impact of development policies and actions implemented up to the present.*

The organisations involved in a course of action of this kind would naturally have to understand how far they fall short of requirements and how far their role needs to change, and the means to achieve this should be made available.

This of courses brings in the problem, which we shall go into later, of how to seek wider-ranging and more autonomous sources of finance for the development of these means.

An exceptional credit facility was released in 1992 to promote apprenticeship schemes in forestry training centres (setting up of new courses in economic or regional sectors needing skilled workers ; assessment of knowledge and skills acquired on the job ; training for employers of apprentices).

Apprenticeship schemes are a very efficient means of promoting employment, as ex-apprentices who become business managers are generally willing to take on apprentices themselves.

6. OVERALL CONCLUSIONS

The agricultural training sector (and forestry training in particular) is doing well. New training programmes were set up in 1991 and 1992 in response to heightened public awareness of environmental issues : the new courses include 27 BEPA courses on rural management and maintenance, 7 BTA courses in fauna management and 2 BTSA courses in the management and protection of the natural environment. The BTA courses in industrial forestry management and landscape design were expanded by the provision of 24 new options, while 35 new options were added to the BEPA courses in forestry.

Forestry training has changed considerably over the last ten years : the system essentially aims to provide vocational training and is organised in such as way as to combine general education of constantly increasing quality with the acquisition of specialised knowledge and skills to enhance professional practice as far as possible. The forestry training system is supported by steadily increasing means and modern teaching methods to ensure that all the requirements of tomorrow's employers are met.

Operating in close alliance with their environment and providing the means to understand it, forestry training establishments have opened up numerous possibilities for further training, for participation in community life and for promoting local development. They seek the active participation of employers, involving them in training programmes, promoting the advantages of apprenticeship schemes and organising seminars and conferences. The contractual system operating between training establishments and the administrative authorities ensures consistent high quality in the training provided, and while leaving establishments with scope for initiative, it also compels them to sustained and enterprising efforts to secure funds. **Forestry training establishments actively contribute to the vigour of the professional forestry sector, by providing training resources but also by playing an active part in local development.** Established throughout the country within the rapidly changing rural environment, they are participating actively in a process which is leading to new forms of rural and environmental resource management.

List of abbreviations

CAP	Certificat d'Aptitude Professionnelle - Certificate of vocational aptitude Brevet Professional - Certificate of vocational aptitude (technical)
FFN	Fonds Forestier National - National Forestry Fund
ONF	Office National des Forêts - National Forestry Office
GREF	Génie Rural Eaux et Forêts - Rural Engineering, Water and Forest Management
ENGREF	Ecole National du Génie Rural, des Eaux et des Forêts
CAPA	Certificat d'Aptitude Professionnelle Agricole
BEPA	Brevet d'Etude Professionnel Agricole
BPA	Brevet Professionnel Agricole
BTA	Brevet de Technicien Agricole
BTSA	Brevet de Technicien Supérieur Agricole
ESAT	Ecole Supérieure d'Agronomie Tropicale
FIF	Formations d'Ingénieur Forestier - Forestry engineering courses
DEA	Diplôme d'Etudes Approfondies - Diploma of Advanced Studies
VA	Voie d'approfondissement - specialised option in 2nd. year postgraduate course
CNFF	Centre National de Formation Forestière - Training establishment run by ONF for its employees.
UF	Unité de Formation - training course unit
UC	Unité Capitalisable - course credit

APPENDIX 17

TRAINING FOR PRIVATE FOREST OWNERS: OPTIONS, PROSPECTS AND IMPLICATIONS FOR VOCATIONAL TRAINING

by

C. Giry[1]

SUMMARY

Private forests in France are rich and diverse, but their varied nature means the resource is not readily exploitable. The sociological pattern of forest ownership is also extremely varied, as a result it is difficult to bring the interests of different categories of owners together, despite rapid expansion of the co-operative movement. Training and development programmes in France are organised into a layered system of different structures, but comparison with various examples from abroad clearly shows that the French forest development and training system is not always adequate in view of both the large number of forest owners and the scale of forest resources ...

What are the reasons for these deficiencies ?
How can the situation be improved ?
How can vocational training be of help ?

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[1] Head of Training Department, Institut pour le Développement Forestier, Paris, France.

The scene presented by today's forest industry is such that powerful tools are required to analyse and discuss the range of ideas and thoughts that have to be taken into account. The "productive approach needs to be extended and diversified, but this is hampered by two major difficulties : the system is based on the logic of technical "supply" - generally to productive activities - and this option is central to a number of institutional issues involving professional representation. Nevertheless, several lines of thought and action remain open.

The training and development system could be improved upon in terms of both quality and quantity. The funding system for further vocational training operates by specific professional sector and fails to includes the majority of forest owners. Funding sources should become more extensive and more diversified.

INTRODUCTION

A recent contribution to the World Forestry Congress[1] outlined the general characteristics of private forest ownership in France and discussed the key lessons learnt from several innovative forest awareness and training programmes specifically organised for forest owners in France, in the United States, in Sweden and in Quebec.

There is now fairly good understanding of the conditions necessary for the success of such operations, in particular the best means of implementation and the foundation principles that ensure maximum performance. However, despite this knowledge of what needs to be done and how best to do it, there is still much that needs to be improved upon in France, especially when we look at what has been attempted abroad.

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[1] "La formation des propriétaires forestiers sylviculteurs", M. Neveux, Minutes of the World Forestry Congress, 1991

What is obstructing up the application of sound principles ? Who or what is preventing the conditions for success from being brought about ? What are the factors that can change the situation ? What are the various possibilities for vocational training ?

These questions form the basis of this contribution. First it is necessary to review and place into context the current training and forest awareness system, following which the weaknesses and material difficulties will be analysed as will the larger question of the mechanisms and factors that underlie or perpetuate them.

Our approach rests not on pessimism, but on the conviction that a better understanding of the hindrances and handicaps will enable us to avoid the temptation of falling back on stock phrases and pious hopes, thus enabling us to pinpoint where effective action can begin.

PATTERNS OF FOREST OWNERSHIP IN FRANCE

> **Forests in France are rich and diversified, but their varied nature means that resources can be difficult to exploit.**

First, some key statistics[2] :

Forests cover 28 % of France (i.e. 1/4 of total EEC forest land) with 65 % of this being under broadleaved trees and 35 % under conifers. The forested area has increased by 40 % over the past 80 years, largely because of agricultural decline. Annual production is 28 million cubic metres. Imports account for 30 % of timber consumption, with 83 % of this timber trade

[2] The following figures and conclusions have been given by M. Normandin (Station d'Economie et de Sociologie rurale, ENGREF Nancy).

deficit being attributable to the furniture, paper and pulp industries. The deficit appears to be due to :

- The nature of the forest resource, which is not only biologically diverse but also extremely heterogenous, is one that presents problems in matching products to the demands of the existing processing industry, an industry that performs poorly in relation to international competion.

- Resource management and roundwood marketing structures.

Private forests cover some 10 million hectares or almost 3/4 (71%) of total forest area of France. The other 29% belong to the state and to local authorities and are managed by the ONF - Office National des Forêts (National forestry office).

Private forests account for 2/3 of timber stocks (with broadleaved trees, especially oaks, predominating), for 3/4 of annual increment and for 72 % of the total volume of timber harvested. Since 1945 there has been considerable expansion in the area of privately owned forests, of which half is due to natural invasion. Coniferous forests have expanded by some 50% per year over twelve years, while the area of productive forest has increased by 30 000 hectares per year.

> The varied pattern of private forest ownership in France

Here again we shall give only a few key statistics
(for more details, see appended tables). In particular, of the 3.8 million forest owners (the highest percentage in Europe) :

- 89 %, or 1 300 000 owners, own 1/4 of forested land (with an average area of just over one hectare per property) ;
- 11 %, or 400 000 owners, own the rest (with an average area of 19 hectares per property).

Briefly, the dominant features are as follows :

- Forested areas are very unevenly distributed and are highly fragmented (3 parcels per owner on average).
- Ownership units, acquired through inheritance in 2/3 of cases, are nearly always the same as management units. This is in distinct contrast to agricultural patterns and is something of a handicap where resource exploitation and supply to industry are concerned (the linkage of supplier to manufacturer is very poor, in contrast to the situation in the USA or Scandinavia).
- Though forest ownership is distributed throughout the social scale, farmers and retired people predominate while foresters who derive a regular income from forestry are few and far between.
- The population of forest owners tends to be elderly and rural (90 % of forest lands are managed by owners of more than 50 years of age ; 80 % of these live in the department where their forests are situated ; 73 % live in communes of less than 5 000 inhabitants) ;
- 86 % of those owning more than 1 hectare also own other land.

The characteristics of forest management and exploitation stem from the following factors :

- The "intergenerational" nature of management options predominates and usually follows a patrimonial pattern (preserve and pass on to the next generation), rather than a simple production pattern (of short-term supply and income).
- We have little reliable information on management means, but we do know that family labour is often used for the smaller tasks while the larger properties employ paid staff.
- With regard to management activities, there appears to be a strong link between work load and property size, although this is not systematic.

Owner categories are not easily grouped together despite the rapid expansion of co-operative organisations

- *Forest owners associations* (accounting for only 500 000 hectares) have been a relative failure, probably because of the strong attachment to family land ownership (individual heritage), and to the fact that forest revenues are not obviously remunerative.

- By contrast, there has been a considerable increase, notably between 1985 and 1991, in the activities of *co-operatives and service-providing associations of* varying legal status that aim to provide management and marketing assistance to owners (though without joint property management).These 80 organisations, which employ some 500 people, bring together widely dispersed supplies of timber to match the particular needs of industry. They offer a wide range of services (management, forestry supplies, sale of timber whether felled or not) to owners of some 1.3 million hectares of forest land. Their main customers are the large forest properties (33 100 to be precise, 90 % of which are properties of more than 25 hectares), and they mainly operate as low-cost service-providers, with the help of various subsidies and indirect financial assistance.

  In 1991, these co-operatives sold about 20 % of privately owned timber (other sales were carried out by forest experts and contractors), and now rank second only to the ONF in timber sales.

- *Trade union associations* (17 regional unions and 76 departmental forest owners' unions) fulfil their traditional role of representing and protecting the interests of the profession, but they may also play a part in certain activities such as road construction to link up fragmented forest areas.

- Finally, a number of *owners' associations* have been set up. Their aims tend to be technical and they made considerable contributions both to the launching of the forest development process during the 1960s and to the setting up of the forestry training and awareness programmes that we shall be describing below. The 77 CETEF- Centres d'Etudes des Techniques Forestières (training centres in forestry techniques) and GVF - Groupements de Vulgarisation Forestière (forestry extension associations) now involve about 1 000 people.

> **Layered system of different training and development structures**

- The 17 CRPF organisations (Centres Régionaux de la Propriété Forestière - regional forest owner centres) employ 264 agents. Besides setting up information networks, contributing to forestry engineering activities and conducting the study and approval of simple management plans[3], they also :

    - support forestry association and co-operative management or sales activities ;

    - improve, publicise and develop sylvicultural and management techniques for their members (individual advisory services are becoming more and more common) ;

- Nearly one hundred Chamber of Agriculture forestry advisors have the same role, in some departments - but not including the study and approval of simple management plans - as the CRPF agents, with whom they sometimes co-operate.

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[3] Compulsory for all plots with an area of 25 ha or more.

- The FOGEFOR organisations (Formation à la Gestion Forestière) run training courses in forest management.

The latter organisation is run jointly by all the organisations working in private forestry and is described in detail by Neveux[4]. It organises courses on three levels for some twenty foresters at each session : initiation, proficiency and execution of a study or project.

The courses alternate teaching sessions with visits to sites. The basic programme provides a balanced content of technical, economic and fiscal aspects. Sessions are held at weekends or evenings or at the end of the working week, and aim to provide owners with the minimum knowledge they require to be able to discuss technical matters with forestry technicians and make their choices on a sound basis.

4 000 foresters have followed the basic training cycle since the FOGEFOR began its operations. Eight out of ten of these have gone on to further training. The forest owners involved in this scheme are those whom development organisations often do not reach, either because of the size of their property or because they have little time to spare (see tables in annex).

> IDF

The IDF (Institut pour le Développement Forestier - Forestry Development Institute) employs some forty people including 5 engineers, and runs regional agencies. It aims to meet the technical needs of users through applied research programmes based as far as possible on fundamental research studies.

Its results are communicated in journals and publications, and it contributes to the training of personnel working for on-site

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[4] See bibliographic reference on pg. 258.

development organisations, who then relay these results to users (CRPF, Chamber of Agriculture forestry advisors).

> Finally, the following organisations must also be mentioned in connection with this overview :
- INRA and CEMAGREF, two important research organisations which in some cases are also involved in development-type activities ;
- A few "borderline" technical institutes such as the Centre Technique du Bois et de l'Ameublement (technical centre for wood and furniture), the Centre National Interprofessionnel de l'Horticulture, and AFOCEL which is involved in the paper industry.
- The supervisory authorities for the regional and departmental agencies of the Ministry of Agriculture and Forests.

An overall picture emerges of an institutional and professional environment involving many different actors, whose image and missions sometimes become blurred but who always interact with each other, and who operate on the principle on attribution rather than contribution. This principle in fact comes into play as a regulatory mechanism, since neither the profession itself nor the state provide any particular co-ordinating mechanisms.

> **Forest lands of the future: towards segmentation ?**

Before moving on to the next topic, we should mention some of the prospects for change which are liable to transform the future structure of the private forest estate as well as the behaviour and options of tomorrow's forest owners, and hence their needs withs regard to training and information.

According to a number of observers and researchers[5], current changes indicate a move towards a separation of the classic functions of forests, leading to a scheme whereby forests would fall into three distinct categories :

- classic "top ranking" forests which would be similar to today's forests but which would no longer be held up as the archetype for all to achieve;
- forests for intensive production (fast-growing species) ;
- ordinary forests (probably the majority), where a more "natural" types of sylviculture would provide the most appropriate forms of management in a site of good quality, but whose value in other cases would lie in the enhanced landscape, in the biodiversity and in the store of carbon they represent (in which case a principle requirement to be thought through and promoted is the means of remunerating those who help to produce a quality environment and allow the communal use of forests, goods which today are free of charge).

In comparison to various examples from abroad, it is obvious that the French system of forest development and training is not always adequate in relation to the large number of forest owners and to the scale of forest resources.

In some northern countries, where extension work is carried out by government agencies and private owners' associations, there is provision of one agent for every 300 to 500 owners (80 in Denmark). In Japan, where the structure of private forestry is similar in some ways to that in France, 444 specialists advise 2229 County agents, who in turn are in direct contact with 2 530 000 owners and provide them with practical and theoretical training.

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[5] J. de Montgolfier. Forêt Entreprise n° 91.

The quality aspects associated with these statistics are just as important but we shall not go into them in detail here (incentive schemes, integration of extension and development techniques in primary school programmes, etc.).

In comparison, the proportion of forestry agents to owners in France, including all CRPF and Chamber of Agriculture agents, is roughly one to 10 000 (and 28 000 hectares).

As for foresters' associations and co-operatives, these number barely 200 and they involve only some 50 000 owners at most, or no more than 60 % of total forest areas.

WHAT ARE THE REASONS FOR THESE DEFICIENCIES ?

HOW CAN THE SITUATION BE IMPROVED ?

HOW CAN VOCATIONAL TRAINING BE OF HELP ?

> **The forestry scene is complex and requires powerful tools for analysis**

It is clear from a comparison of systems in different countries that factors such as forest culture and tradition, economic incentives and diversity in social and patrimonial ownership patterns are of great importance.

However, we lack the right tools to analyse how and why these factors combine, the mechanisms of decision making and the effect of official policies upon these. Furthermore, we are unable to analyse the rationale and the strategies of the various institutional and professional actors which underlie the choices that have to be made in the field of forestry education.

A more detailed study of these aspects, of the reasons for success and failure and the financial and institutional means applied to such operations would certainly enable progress to be made.

There is a real need to set up a monitoring body to study the way forest owner training is implemented. A common method of analysis and presentation would allow the systematic circulation of information on forestry, so enabling the sharing of experience and hence assist in producing more imaginative recommendations.

International organisations undoubtedly have an important part to play in this respect.

> **Forms of reasoning are highly diversified and must all be taken into account**

The need to expand and diversify the "productive" approach

The figures quoted in our introductory section make one essential point clear : owner-producers who are also professionally trained foresters are the exception rather than the rule, for the vast majority of owners who make up the rest motives differ widely (patrimony, economic benefit, prestige) and depend on their particular situation, attitudes, cultural outlook, social status, ambitions, and management and inheritance strategies, to which has to be added the geographical conditions and land use management issues with which they are confronted.

In all likelihood this diversity will become greater in the future. A radical reappraisal, therefore, of the dominant "productive" approach in relation to all categories of owners appears to be essential. The question is not only to manage and/or sell, but to express attachment to forests, to transfer them to the next generation, to allow them to survive and flourish ... and even simply to awaken an interest which is sometimes altogether lacking (a study carried out recently in the south of France showed that among forest owners in the region only a very few were really enthusiastic about their forests, while the majority showed no interest whatsoever).

History has shown[6] that a well-established national interest in forests and forestry is at least as effective in educational terms as demonstrating that forestry is an important economic sector (this is confirmed by several recent opinion polls on the way forests are perceived by the general public - which includes many forest owners).

This all the more true in a context which highlights the social and environmental functions of forests and where forest management will have to give increasing attention to these aspects, requiring energetic awareness campaigns on communal rights and duties (especially of forest owners) in this regard.

The forest owner training schemes that have been tried out (whether in Norway, France or New Brunswick) are always based more or less on the premise of subsequent timber marketing, and neglect the other symbolic, emotional or social keys to forest ownership, although these could form a powerfully persuasive set of motivations. The usual approach still rests on decision making modes which are based a priori on technical and economic aspects only, though these can sometimes lead to more imaginative prospects.

In arguing that forest awareness and training programmes should no longer be systematically dominated by production aspects, it doess not mean that the need to optimise production and marketing has to be abandoned.

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[6] "Enseigner et apprendre la forêt - XIXème siècle et XXème siècle" Ed. L'Hartamattan, Groupe d'histoire des forêts françaises.

It is quite true that any choice which is not based on the logic of economics still has economic consequences that can be analysed as such. Indeed, the chances are that this wider approach is likely to have an extremely positive indirect impact on the quality of the production chain as a whole, in the sense that as more and more different types of forest owners become involved, they become more and more effective in passing on new ideas and giving examples within their own owner category, while the increased impetus and incentive to make progress contributes to meeting the classic objectives of development.

There are two major factors which hamper this process : the system operates according to the logic of technical "supply" - generally to productive activities - and this remains central to a number of institutional and professional organisations.

The development and training system for private forest lands is still largely pervaded by the idea that an "ideal" type of training exists to make "ideal" owners, who implement "ideal" sylvicultural practices - and perpetuates as a corollary the myth that only the forest expert can integrate all relevant information and that only he can decide on an "optimum" solution.

Even if there were such a thing as a "basic sylvicultural technique", a kind of lowest common denominator in this field, it would only be serving the interests of a unanimist approach which obliterates any alternative motivations with regard to the choice of management options.

Moreover, this approach in itself merely helps to maintain the relative cohesion of a profession which is in any case finding it difficult to organise itself (as it involves only a small proportion of owner-producers) and which hankers after full recognition of its economic and productive importance, just as the agricultural sector, which still provides the frame of reference, achieved such recognition in earlier times.

This problem is compounded and reinforced by the underlying precepts and workings of an administrative authority staffed by civil servants who are for the most part recruited from corporate technical institutions, and who see no reason to seek interlocutors other than those who already benefit from its funding arrangements (which are also frequently based on the logic of production alone), although these beneficiaries are not very well served as they lack cohesion and lobbying power.

Nevertheless, several lines of thought and action remain open.

The fundamental problem in attempting to deal with very diverse forms of reasoning is to identify appropriate items of information and to present these to the different categories of forest owners : information on the current economic situation and economic forecasts if possible, as well as information on the social and environmental issues, enabling forest land owners to gain more or better knowledge, whatever their level, of the range of costs and available benefits on which their decisions on forest management - or non-management - are based.

This identification process must be undertaken to avoid"short-term" decision making and also to ensure that the sum of rational individual choices does not produce a globally aberrant course of action, or at least one which is regarded as such by society as a whole.

This implies that a course of action based on the logic of "demand" should be adopted, which would require :

- *much greater detail and accuracy than is currently provided for in classifications and market surveys of the different requirements for training, information and advisory services;*

- *following on from this, actions should be targeted more accurately while management options and technical training courses should be more flexible and more diversified and better matched to needs;*
- *actions undertaken should provide all the actors involved at all levels with the opportunity to enhance and improve upon the content of the social and civic debate on the function, the role and the management of forest lands;*
- *more detailed research should be undertaken on the impact of development policies and actions implemented up to the present.*

The organisations involved in a course of action of this kind would naturally have to find out how far they fall short of requirements and how far their role needs to change, and the means to achieve this should be made available.

This of courses brings in the problem, which we shall go into later, of how to seek wider-ranging and more autonomous sources of finance for the development of these means.

Need for qualitative and quantitative improvements in the forest training and development system

This is not a priority for the public authorities, and the means to implement it are limited in relation to needs

For reasons which are related to those we have outlined above (relative lack of strength and cohesion of the profession as a whole, dispersal of forest owners, poor perception of political and economic issues - or the low profile given to these by public agents), it is apparent that in terms of funds and priorities, initial forestry training is considered more important than further training for technicians and owners, and public forest lands are given a higher priority than private forests (the FOGEFOR organisations are a small but encouraging exception).

Nevertheless, various deficiencies have to be remedied (as noted in general terms during previous sessions) with regard to initial as well as further training for development agents, and with regard to the way organisations operate.

Basic notions in social sciences and in communications, in group management and social changes, and in socio-cultural questions should be incorporated into initial training programmes, while training establishments and their students could act at this point to strengthen links with forest owners.

As for further training, while the relationship between technical forestry agents and owners needs to be improved (see AICEF report mentioned in bibliographic references) and overall economic changes require both more general and more complex levels of skills and understanding of technical equipment and methods (which implies the need for more investment in human and financial resources), the following steps need to be taken :

- *An overall review of training for forest development agents, leading to the definition of overall policies, specific funding and co-operation between organisations providing training.*
- *More importance should be given to educational methods, to communication techniques and to providing support for changes in practice. So far, the main emphasis has been on technical subjects, which are the only ones receiving subsidies.*
- *Multimedia resources should be much more widely used, as well as what are commonly known as "open" training methods. These are by far the most appropriate for development agents as well as forest owners, because of the diversity and dispersion of the public concerned, and the specific difficulties which are inherent to forest training and information.*

Finally, an important paradox should be mentioned: although the forest development system is organised on the same lines as its model, the agricultural system, the former has kept its distance from the latter so that, in the name of specific needs, a further and unfortunate split has hardened between the two at a time when the combination of changes in the rural environment, lack of financial means and divergent interests within the forestry community demand close co-operation - especially with regard to the reafforestation of abandoned agricultural land.

> **Funding of further training : programmes do not reach the majority of forest owners, as they are based on the interests on specific branches of the forest professions.**

In France, the only people who are likely to benefit from the attribution of funds for training are those who are employed. These have only recently included employees in companies employing less than 10 people.

Each of the numerous and widely dispersed providers of funds redistributes these to its own public, according to the way its mutual insurance system operates, and to its individual limitations and priorities.

The nature of this system means that practically all forest owners (except institutions) are excluded from access to these funds, while many are already largely excluded from access to development schemes.

Moreover, the training schemes funded by agricultural and co-operative organisations (those most directly involved) are more and more often linked to regional development projects which integrate economic and employment imperatives more readily than land use aspects. In addition, forests are not necessarily a priority in these projects, all the more so as the forest "professions" have little lobbying power, whether at regional or national level, and the organisations which represent these professions are not usually integrated well into local land use strategies.

> **For all these reasons, funding sources need to be more extensive and more diversified**

At present, the funding for all research, development and training activities involving private forests comes from a special tax levied on timber products and by-products. Revenues from this tax (which was cut by 40 % in 1992 for reasons partly relating to the method of collection) are redistributed among all the relevant organisations in each field.

The creation of an autonomous forest fund with less dependence on public authorities (even though the latter would continue to exercise legitimate supervision, and to contribute in part to the funds), where funds are derived not from products but from productive activities (defined on the basis of revenue or extent of wooded areas and according to tax brackets which will have to be defined) would :

- Broaden the forest taxpayer base to nearly 4 million forest owners whilst restricting it to production as such. Downstream activities in the sector would thus become autonomous as regards financial resources as well as expenditure, which would clarify the situation, while upstream activities would be less constrained to strictly productive activities.

- Provide for more flexible, more autonomous and more extensive funding for training and awareness schemes, which could then be directed towards all forest owners and provide themselves with the necessary means to meet highly diversified needs.

Various forms of funding derived from the environmental, social and landscape enhancement functions of forest lands could also be used in these schemes.

CONCLUSION

It is often felt by those involved in the forest sector, or by their closest partners, that the lack of a true professional corpus, backed up by a well-established productive vocation, is a handicap. However, as it is unlikely that forest ownership, with all the richness of its highly diverse characteristics, can be forced into what could be a rather restrictively uniform mould, this lack may well become an opportunity to be made the most of.

"True" foresters can only gain by the recognition of their unique function, which can provide them with the means to take up their rightful place as economic actors within the sector.

Other forest owners would also gain the opportunity to manage their forests as they would wish, in accordance with their own aims.

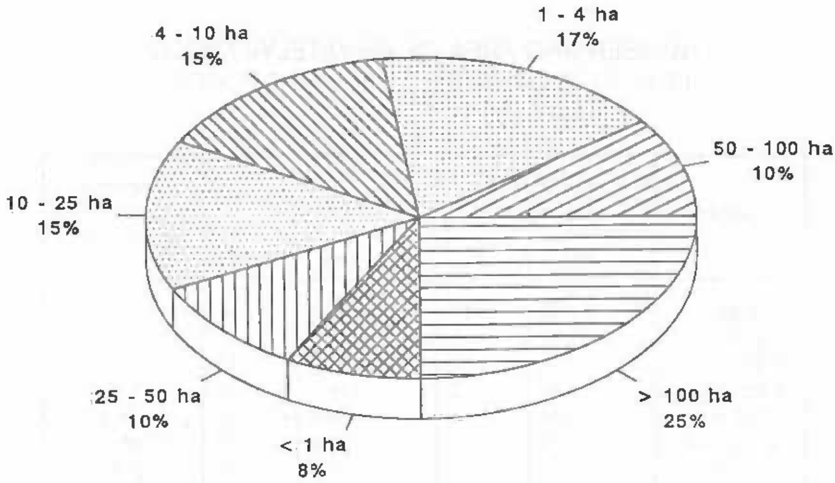
Finally, this approach would benefit the community as a whole - the citizens who feel that French forest lands, irrespective of ownership, are in some way the heritage of all.

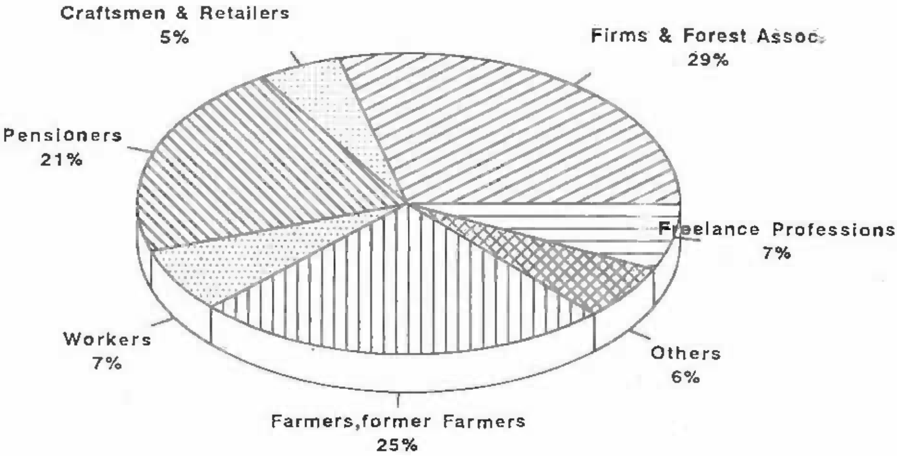
A new and coherent approach thus needs to be defined, in which a better match between the mission and the means of organisations in charge of private forest development, together with more extensive and more balanced funding mechanisms, should be able to provide more appropriate, well-endowed training and awareness schemes, and thus develop each of the economic, social and environmental functions of forest lands.

NUMBER AND AREA OF PRIVATELY-OWNED FOREST PROPERTIES BY SIZE OF FOREST

Hectares	Number of properties		Area		Average area (ha)
	1 000	%	1 000 ha	%	
< 1 ha	2 360	64	773	8	0.3
1-4 ha	911	25	1 689	17	1.9
4-10 ha	254	7	1 499	15	5.9
10-25 ha	100	3	1 464	15	14.6
25-50 ha	28	1	966	10	34.2
50-100 ha	14		939	10	68.2
> 100 ha	9		2 410	25	258.0

TOTAL FOREST OWNERS





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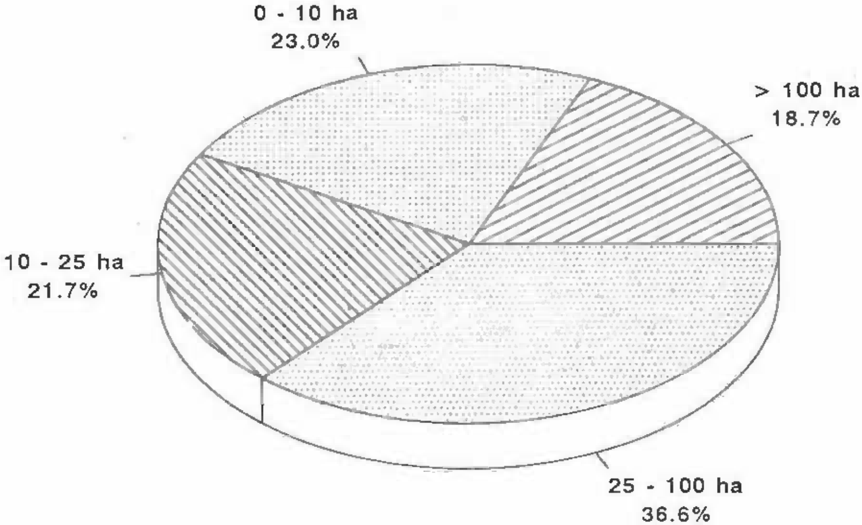

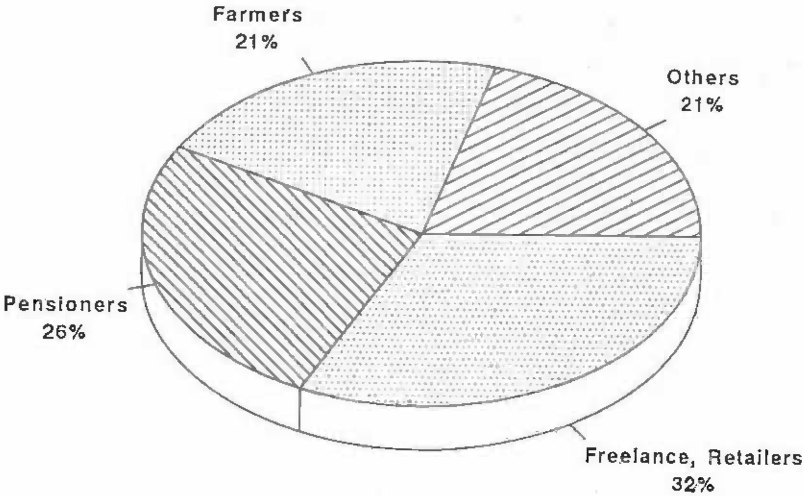

ANNEX A
ANNEXE A
ANEXO A

MEMBERSHIP OF THE FAO ADVISORY COMMITTEE ON FORESTRY EDUCATION
COMPOSITION DU COMITE CONSULTATIF FAO DE L'ENSEIGNEMENT FORESTIER
COMPOSICION DEL COMITE ASESOR DE LA FAO SOBRE ENSEÑANZA FORESTAL

December/décembre/diciembre 1993

Member Nations Etats membres Estados miembros		Present term ending on Designation valable jusqu'au El nombramiento expira el
ARGENTINA ARGENTINE	Ing.Agr. Raul Marlats Profesor Escuela de Bosques de la Universidad Nacional de la Plata Calle 609 y 110 La Plata	VII.1994
AUSTRALIA AUSTRALIE	Prof. D.M. Griffin Pro Vice-Chancellor Chairman, Board of the Faculties The Australian National University P.O. Box 4 Canberra A.C.T 2601	IV.1994

BRAZIL BRESIL BRASIL	Dr. Martha T.B. Wallauer Head, Dept. of Technical-Scientific Information & Environmental Education Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) C.P. 04424 Brasilia, D.F.	IV.1997
CANADA	Dr. John K. Naysmith Director, School of Forestry Lakehead University 995 Oliver Road Thunder Bay, Ontario, P7B 5E1	IX.1997
CHILE CHILI	Sr. Juan Moya Cerpa Director Ejecutivo Corporación Nacional Forestal (CONAF) Avenida Bulnes 285, Of.501 Santiago	I.1994
COSTA RICA	Ing. Ronald Vargas Director General Forestal Ministerio de Recursos Naturales, Energía y Minas A.P. 8-5810 1.000 San José	X.1997
COTE D'IVOIRE	Dr. Kouakou N'Dri Direction de la Programmation Ministère de l'Agriculture et des Ressources Animales Abidjan	IV.1997

EGYPT EGIPTO	Dr. Mamdouh Riad Under-Secretary of State for Afforestation c/o FAO Rep. Egypt P.O. Box 100 12311 Dokki-Giza Cairo	IV.1997
FINLAND FINLANDIE FINLANDIA	Prof. Päiviö Riihinen Department of Social Economics of Forestry University of Helsinki Unioninkatu 40 B SF-00170 Helsinki 17	IV.1997
FRANCE FRANCIA	M. Jean Bedel Ingénieur en Chef du Génie Rural des Eaux et des Forêts Chef du Département "Forêts en régions chaudes" ENGREF B.P. 5093 34033 Montpellier CEDEX	VII.1997
GERMANY ALLEMAGNE ALEMANIA	Prof. Dr. M. Becker Arbeitsbereich Holzmarktlehre Forstwissenschaftliche Fakultät Universität Freiburg Kaiser-Joseph Str. 239 79085 Freiburg	I.1994

INDONESIA INDONESIE	Mr. T.H. Madyana Director, Forestry Education and Training Centre Jalan Gunung Batu Kotak Pos 141 Bogor, 16001	IV.1997
ITALY ITALIE	Prof. E. Giordano Preside della Facoltá di Scienze Forestali Universitá della Tuscia Via S. Giovanni Decollate 01100 Viterbo	VI.1994
JAPAN JAPON	Mr. Koji Mashiba Director, Research and Extension Division Private Forest Department Forestry Agency Ministry of Agriculture, Forestry and Fisheries 2-1 Kasumigaseki 1 Chome, Chiyoda-ku Tokyo	II.1997
KENYA	Mr. J.O. Angwenyi c/o Ministry of Environment & Natural Resources P.O. Box 30513 Nairobi	IX.1996
KOREA, Republic of COREE, République de COREA, República de	Prof. Tai Sik Park Professor Emeritus Department of Forestry College of Agriculture Seoul National University Suwon	II.1997

MALAYSIA MALAISIE MALASIA	Mr. Tuan Sheikh Ibrahim bin Sheikh Ali Assistant Director-General Department of Forestry Jalan Sultan Salahuddin 50660 Kuala Lumpur	V.1997
MOROCCO MAROC MARRUECOS	M. Saïd Messat Chef, Division de l'Economie Forestière Direction des Eaux et des Forêts et de la Conservation des Sols Rabat-Chellah	IX.1996
NIGERIA	Mr. I.I. Ero Head, Education and Training Division (Assistant Chief Research Officer) Forestry Research Institute of Nigeria P.M.B. 5054 Ibadan	IX.1996
NORWAY NORVEGE NORUEGA	Mr. Finn Kristian Brevig Director, Skogbrukets Kursinstitutt Honne N-2820 Biri	VII.1994
PHILIPPINES FILIPINAS	Dr. Armando A. Villaflor Associate Dean Dept. of Wood Science and Technology University of the Philippines at Los Baños College, Laguna 3720	IV.1997

SPAIN ESPAGNE ESPAÑA	Sr. José Javier N. Isasa Inspector Regional Instituto Nacional para la Conservación de la Naturaleza (ICONA) Gran Vía de San Francisco 35-41 28005 Madrid	IX.1996
SWEDEN SUEDE SUECIA	Mr. Sven-Gunnar Larsson Director Skogsmästarskol School for Forest Engineers Sveriges Lantbruksuniversitet P.O. Box 43 739 21 Skinnskatteberg	IV.1997
SWITZERLAND SUISSE SUIZA	Dr. Jean-Pierre Sorg Institut Fédéral de Technologie Service de Conseil et de Recherche en Sylviculture Tropicale Rämistrasse 101 8092 Zürich	IX.1996
UNITED KINGDOM ROYAUME-UNI REINO UNIDO	Prof. H.G. Miller Head, Department of Forestry University of Aberdeen Cruickshank Building St. Machar Drive Aberdeen AB9 2UD	IX.1996
UNITED STATES OF AMERICA ETATS-UNIS D'AMERIQUE ESTADOS UNIDOS DE AMERICA	Dr. Richard F. Fisher Texas A & M University College of Agriculture and Life Sciences Dept. of Forest Science Room 305, Horticulture/Forest Science Building College Station, Texas 77843-2135	I.1994

ANNEX B

LIST OF MEETINGS OF THE FAO PANEL ON EDUCATION IN FORESTRY AND THE FAO ADVISORY COMMITTEE ON FORESTRY EDUCATION

FAO PANEL ON EDUCATION IN FORESTRY*

First meeting	Oxford, U.K.	13 July 1956
Second meeting	Seattle, U.S.A.	2 & 6 September 1960
Third meeting	Vienna, Austria	8-9 September 1961
Fourth meeting**	Mérida, Venezuela	22-29 February 1964

FAO ADVISORY COMMITTEE ON FORESTRY EDUCATION

First session	Mérida, Venezuela	22-29 February 1964
First Working Group meeting***	Bangkok, Thailand	18-28 October 1965
Second session	Madrid, Spain	8 June 1966
Third session	Munich, Fed. Rep. of Germany	1-3 September 1967

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* Converted into an Advisory Committee in 1964.

** Held jointly with the First Session of the FAO Advisory Committee on Forestry Education.

*** Held jointly with the First FAO Regional Seminar on Higher and Intermediate-Level Agricultural Education for Asia and the Far East.

Fourth session	Ibadan, Nigeria	11-13 July 1969
Fifth session	Stockholm, Sweden	27 September and 7-8 October 1971
Sixth session	Buenos Aires, Argentina	10-11 October 1972
Seventh session	Hyvinkää, Finland	14-16 August 1974
Eighth session	Rome, Italy	10-12 November 1976
Ninth session	Jakarta, Indonesia	29-31 October 1978
Tenth session	Rome, Italy	29-31 October 1980
Eleventh session	Kyoto, Japan	3-4 September 1981
Twelfth session	Nairobi, Kenya	26-29 April 1983
Thirteenth session	Mexico City, Mexico	26-28 June 1985
Fourteenth session	Ljubljana, Yugoslavia	2-5 September 1986
Fifteenth session	Antalya, Turkey	20-24 November 1989
Sixteenth session	Paris, France	25 September 1991
Seventeenth session	Bangkok, Thailand	13-15 December 1993

ANNEX C

LIST OF SELECTED PAPERS PRESENTED TO SESSIONS AND AD HOC MEETINGS OF THE FAO PANEL ON EDUCATION IN FORESTRY (1956-1964) AND THE FAO ADVISORY COMMITTEE ON FORESTRY EDUCATION (1964-1993)

FAO PANEL ON EDUCATION IN FORESTRY

Third Meeting - Vienna, Austria, 8-9 September 1961

Costantino, I.N.	Forestry Education and Outlook in Latin America
FAO Secretariat	Forestry Education and Outlook in Asia
Glesinger, E.	The World Outlook in Forestry and Forest Products and Professional Manpower Supply and Requirements in Some Regions
Heiberg, S.O.	Comparison of American and European Degrees and Diplomas in Forestry
Parewicz, R.	- Forestry Education and Outlook in Africa - Progress in Collection of Detailed Programmes of Study of Forestry Schools.

FAO ADVISORY COMMITTEE ON FORESTRY EDUCATION

First Session - Mérida, Venezuela, 22-29 February 1964

François, T.	Manpower Assessment and Educational Planning in Forestry and Forest Products Industries
Freidrich, A.G.	An FAO Long-Term Programme in Forestry Education
Shirley, H.L.	- Organization of Professional Education in Forestry for Developing Countries - Priorities in World Forestry
Sisam, J.W.B.	Basic Curriculum for Forestry and Forest Products Colleges/Faculties/Departments in Developing Countries
Tortorelli, L.	Present Situation of Higher Forestry Education in Latin America.

First Working Group Meeting - Bangkok, Thailand 18-28 October 1965

FAO Secretariat	Forestry Education in Developing Countries in the Asia and Far East Regions
Jacobs, M.R.	Training for Forestry in Asia and the South Pacific

Komkris, T.	The Possibilities and Limits of Intra-Regional Cooperation for the Purpose of Accelerating the Level of Education and Training in Forestry in Asia and the Far East
Kulkarni, D.H.	Intra-Regional Cooperation for Forestry Education in Asia and the Far East
Shirley, H.L.	A Programme of Education in Forestry for Tropical Countries of the Far East.

<u>**Second Session - Madrid, Spain, 8 June 1966**</u>

Carare, O.	Current Progress in Educational Programmes at New National Institutions Being Developed by FAO with the Financial Assistance of the United Nations Development Programme
Degos, G.	Technical Training in Forestry
Dürr, H.	Professional Education in Austrian Forestry
Kaufert, F.H.	New Scientific Developments Affecting Graduate Education and Research in Forestry
Shirley, H.L.	Forestry Education in a Changing World
Speidel, G.H.F.	Establishing Graduate Education and Research in a Developing Country
Wyatt-Smith, J.	Some Problems of Forestry Education at the Professional Level in Developing Tropical Countries, with Particular Reference to the University of Ibadan, Nigeria.

Third Session - Munich, Federal Republic of Germany 1-3 September 1967

Costantino, I.N.	Scope for Forestry Education in Latin America
Hilmi, H.A.	Review of Textbook Requirements for Forestry Education and Training in Developing Countries
Prats Llauradó, J.	Current Progress in Educational Programmes at New National Institutions Being Developed by FAO with the Financial Assistance of the United Nations Development Programme
Richardson, S.D.	Manpower and Training Requirements in Forestry Development Planning
Shirley, H.L.	Post-graduate and Research Centres for Tropical Forestry
Speidel, G.H.F.	University-to-University Arrangements for the Promotion of Forestry Education in Developing Countries.

Fourth Session - Ibadan, Nigeria, 11-13 July 1969

Hilmi, H.A.	World Consultation on Forestry Education and Training
Lafond, A.	Forestry Education in Africa: Future Needs of Forestry and Forest Industries
Prats Llauradó, J.	Current Progress in FAO Programmes in the Field of Forestry Education (Summary)
Preston, S.B.	The Need for Wood Technology Education in English-speaking West Africa

Richardson, S.D.	Training for Forest Industries and Timber Marketing
Shirley, H.L. and Prats Llauradó, J.	Forestry Education and Training in Latin America
Wyatt-Smith, J.	Review of the Forestry Department, University of Ibadan.

Fifth Session - Stockholm, Sweden, 27 September and 7-8 October 1971

Sisam, J.W.B. and Prats Llauradó, J.	Review of the Committee's Recommendations and of their Implementation.

Sixth Session - Buenos Aires, Argentina, 10-11 October 1972

Elliott, G.K.	A Certificate in Forest Products Technology, with Special Reference to Developing Countries - A Possible Approach and a Suggested Syllabus.

Seventh Session - Hyvinkää, Finland, 14-16 August 1974

Hilmi, H.A.	Review of the Committee's Recommendations and of their Implementation
Mustanoja, J.J.	FAO's Role in Forest Industries Education and Training
Paavola, P.	Formal Education and Training for Forest Industries in Finland
Prats Llauradó, J. and Hilmi, H.A.	FAO Activities in the Field of Forestry Education and Training

Ranta, J.-P.	Continuing Training and On-Job Training
Sainio, J.	Training for Forest Products Marketing in Finland
Secretariat Note	Assessment of the Impact of the World Consultation on Forestry Education and Training.

Eighth Session - Rome, Italy, 10-12 November 1976

Claver Torrente, I. & Prats Zapiraín, M.	Importance of Research in Spain for Revitalizing Forestry Education (Summary)
Harley, J.L.	The Place of Education Institutions in Research (Summary)
Hilmi, H.A.	FAO Activities in the Field of Forestry Education and Training
Lantican, D.M.	Training for Forest Industries in the Philippines (Summary)
Prats Llauradó, J.	Training for Forest Industries.

Ninth Session - Jakarta, Indonesia, 29-31 October 1978

Albin, R.H.	Survey of Education and Training Requirements and Personnel Needs for Primary Mechanical Wood Industries in Some Latin American Countries
Contreras Salas, M., Eisenhauer, G. and Hartwig, F.	Reappraisal of Forestry Education and Training Requirements in Latin America

de Steiguer, J.E. and Merrifield, R.G.	Forestry Environmental Education in North America
Forestry Department, FAO	Implementing Forestry Programmes for Local Community Development
Guillard, J.P.	Review of the Conclusions and Recommendations of the Eighth World Forestry Congress
Lantican, D.M.	- Reappraisal of Forestry Education and Training Needs in the Asia/Far East Region
	- Environmental Forestry Education in Developing Countries
Mahlberg, F.-C.	Survey of Education and Training Needs for the Primary Mechanical Wood Industries in Selected Countries in Asia and the Far East Region
Mikola, P.	Environmental Content of Forestry Education in Europe
Miller, A.	Conceptual Systems and the Teacher-Learning Process in Forestry Schools.

Tenth Session - Rome, Italy, 29-31 October 1980

Béldi, F.	Graduate and Post-Graduate Forestry Education in Hungary
Child, G.S.	Training in Wildlife and National Park Management

Contreras Salas, M.	Post-Graduate Education Requirements in Latin America
Daryadi, Lukito, Sumardja, Effendy A. and van Lavieren, B.	Education and Training for Wildlife and National Parks Management in Tropical Countries
Davis, L.S. and Gardner, J.A.F.	Post-Graduate Education in Forestry in North America
Griffin, D.M.	Post-Graduate Education in Forestry in Oceania
Hilmi, H.A.	Reappraisal of Education and Training Needs for Forestry and Forest Industries in Africa
Lantican, D.M. and del Castillo, R.A.	Post-Graduate Education in Forestry in Southeast Asia
Larsson, S.-G.	Introducing Ergonomics into Forestry Curricula
Nyyssönen, A.	Post-Graduate Forestry Education in Europe, with Special Emphasis on the Needs of Developing Countries
Roche, L.	Post-Graduate Education in Forestry and Forest Resources in Africa.

Eleventh Session - Kyoto, Japan, 3-4 September 1981

Arap-Sang, F.K.	A Review of Agroforestry Practices in East Africa, with Special Reference to Agroforestry in Kenya

Béldi, F.	Training for Mechanical Wood Industries in Eastern Europe
Deherve, L.	Needs and Issues in Education and Training for Mechanical Forest Industries in Africa
Griffin, D.M.	Education in Forestry for Local Community Development
Imamura, K.	Education and Training for Forestry and Forest Products Industries in Japan
Leslie, A.J.	Education and Training for Mechanical Forest Industries
Manandhar, P.K. and Pelinck, E.	Communication and Training Support Programme for Community Forestry Development in Nepal
Poore, M.E.D.	Links Between Forestry Research, Education, Training and Extension.

Twelfth Session - Nairobi, Kenya, 26-29 April 1983

Bedel, J.	Note Presenting Two University Post-Graduate Courses for Tropical Foresters
Botero, L.S.	Educational Implications of the FAO/Finland Training Course on Watershed Management for Africa
Burley, J. and Wood, P.J.	Development of Curricula for Community Forestry

Deherve, L.	Technical Education and Vocational Training in Mechanical Wood Industries - Estimate of Annual Requirements - Guidelines for a Development Policy for Africa
Frykman, B.	Need for Forestry Teacher Training in Africa
Griffin, D.M.	Attitudes and Problems Underlying Forestry Education
Hilmi, H.A.	- Report on the FAO/SIDA Seminar on Forestry Extension, Semarang, Indonesia, 18-30 January 1982
	- Report on the FAO Manual on Forestry Extension
	- Needs for Training in Forestry Development Planning in Africa
Huxley, P.A. and Zulberti, E.	Report on the ICRAF/DSE International Workshop on Professional Education in Agroforestry
Jerkedal, A.	Evaluation of the Centre for Forestry Education Development, Los Baños, Philippines
Jingu, R.A. and Child, G.S.	Assessment of Trained Manpower Requirements for Wildlife and National Parks Management
Juhola, A.	Finnish Support to Training for Forest Industries in Africa

Lantican, C.B.	The Centre for Forestry Education Development for the Asia and Southwest Pacific Regions (CFED)
Michaelsen, T.	The Start of a Forestry Training Programme in Lesotho
Odera, J.A.	Narrowing the Gap between Agriculture and Forestry Education for Rural Development: the Kenyan Context
Owino, F.	Forestry Education and Training in Kenya: Issues and Perspectives in Forestry, Forest Industries and Wildlife Management Training
Rukuba, M.L.S.B. and Hopper, R.L.	Technical Forestry Education and Training Needs in Zimbabwe
Trotter, J.A.	Centre for Forestry Education Development for the Asia and Southwest Pacific Regions (CFED) - Course Planning, Management and Development (Abstract)
Yavorsky, J.M.	Continuing Education Needs of Professional Foresters in Selected Member Countries of FAO.

Thirteenth Session - Mexico City, Mexico, 26-28 June 1985

Acosta de Fortín, I. and Membreño, B.	Educational Credit in the Socio-Economic Development of Honduras
Aldrete Terrazas, V.	- Forestry Education Prospects in Mexico - Structure of Forestry Education in Mexico

Bostrand, L.	Ergonomics in Forestry
Brevig, F.Kr.	Forestry Extension Service in the Nordic Countries
Cooper, R.J.	Development of Courses in Forest Products Marketing
Garrido González, F.	Forestry Education and Training in Latin America: Problems and Perspectives
Hermelin, J.A. and Murphy, P.J.	'Triple A' Rated Method to Help Private Woodlot Owners to Help Themselves
Kenny-Jordan, C.B.	Rural Development: A New World for Foresters, a Difficult Challenge for Teachers of Forestry
Lantican, C.B.	Education and Training for Forest Industries in the Philippines
Ofosu-Asiedu, A. and Liese, W.	Managerial Training in Wood Utilization at the University of Science and Technology, Kumasi, Ghana
Paveri Anziani, M.	Training Needs for Forestry Teaching Staff in Latin America
Redhead, J.F. and Ruangpanit, Niwat	Curriculum Development in Social Forestry in Thailand
Richter, H.G. and Früwald, A.	Wood Science and Technology Education in Latin American Universities - Present Status and Future Needs

Romero Pastor, M.	Forestry Education in Rural Schools in the Peruvian Highlands
Strehlke, B.	Issues and Trends in Forest Worker Training

Fourteenth Session, Ljubljana, Yugoslavia, 2-5 September 1986

Brevig, G. and F.Kr.	Forestry Education within the General School System in Norway
de Viedma, Manuel G.	Trends in the Development of Forestry Education in Spain
Guillard, J.	Trends and Prospects in Education for the Forestry and Wood Utilization Sector in France
Hilmi, H.A.	- Public Education in Forestry - Special Action Programme on Forestry Education for Developing Countries
Kyrklund, B.	FAO's Training Activities in Forest Industries
Loeschau, M.A.	Trends and Prospects in Professional and Technical Forestry Education and Training in the centrally-planned Economies in Europe, with particular Reference to the German Democratic Republic
Morandini, R.	Forestry Education in Italy
Murphy, P.J.	Collaboration between Forestry Schools and the Forestry and Forest Products Sector in Canada

Riihnen, P.	Forestry Education in Finland
Roche, L.	Trends and Prospects in Professional and Technical Forestry Education and Training in the United Kingdom
Schmithüsen, F.	Trends and Prospects in the Employment and Education of Professional Foresters in Switzerland
Sim, D. and Hilmi, H.A.	Forestry Extension Curricula.

Fifteenth Session - Antalya, Turkey, 20-24 November 1989

Bedel, J.	Some Reflections on the Systematic Analysis and Training of Foresters
Bedel, J. and Bousquet, B.	The National School of Agricultural Engineering and Forestry: Experience in Wildlife Management Training
Demetçi, E.Y.	In-Service Training Programmes of the General Directorate of Forestry in Turkey
Fleming, W.M.	The Research Basis of Forest Hydrology and Watershed Management Education
Frykman, B.	Survey of Trained Forestry Personnel Requirements to 1995 in the Near East
Gack, N.	Forestry Extension in Sudan with Emphasis on the Training and Role of Women

Griffin, D.M.	The Management of Forestry Education Institutions
Heinrich. R.	International Survey of Forest Harvesting Training Needs in Developing Countries
Hilmi, H.A.	Professional Forestry Education in Turkey
Laban, P. and van Leeuween, N.	Development of International Courses on the Design of Community Forestry
Özen, R.	Education for Forest Products and Forest Product Engineering in Turkey.

Sixteenth Session - Paris, France, 25 September 1991

Ellefson, Paul V.	Forest Resource Policy and Administration: A Teaching Challenge in University Professional Forestry Schools
Giordano, E.	Suggestions for the Realization of the Declaration of the International Conference on Forestry Education, Viterbo, Italy, 17-22 September 1990
Poschen, P.	Forest Worker Training - A step-child no longer?
Schlegel, F.M.	Şecretariat Note.

Seventeenth Session - Bangkok, Thailand, 13-15 December 1993

Awang, K.	Response to Users' Needs in Forestry Education, with Special Reference to Technical and Socio-Economic Aspects of Silviculture and Management Teaching in the Asia-Pacific Region
Bachelard, E.P. and Griffin, D.M.	Continuing Professional Forestry Education: A Survey of Issues
Becker, M. and Schmidt, P.	Integration of University Courses and Exchange of Forestry Students in Europe under the ERASMUS/Silva-Network Scheme
Bedel, J.	Vocational Level Forestry Education in France. The Contribution of Private Enterprise to this Training
Chandrasekharan, C.	Non-Wood Forest Products in Forestry Education
Dykstra, D.	Teaching Ecologically Benign Logging Methods in the Professional and Technical-Level Forestry Schools of the Asia-Pacific Region
Ferguson, I.S.	Postgraduate Level Education in the Asia-Pacific Region
Gilbert, F.	Forestry Education's Response to Changing Social Values and Other Resources Knowledge

Giry, C.	Education of Private Forest Owners. Alternatives, Perspectives and Implications for Vocational Training
Higgs, J.M.	Refresher and In-Service Forestry Training: Responding to the Challenges of Maintaining Quality Forestry Faculty, Government and Industrial Personnel
Kashio, M.	The Professional and Technical Forestry Education Network in the Asia-Pacific Region. Present Working Inter-Institutional Linkages and Prospects
Miller, H.G.	How to Interlink Social Sciences and Extension and Communication in Professional and Technical Level Forestry Education Curricula
Peredo, H.	Professional Forestry Education with Private or Public Financing. Strengths, Weaknesses and Standards of Quality
Schlegel, F.M.	Secretariat Note
Temu, A.	Integrating Multiple Land-Use Approaches into Forestry Education with Emphasis on Ways to Train Teaching Staff and Focus on Field Exercises and the Development of Instruction Materials.

FAO TECHNICAL PAPERS

FAO FORESTRY PAPERS

1	Forest utilization contracts on public land, 1977 (E F S)
2	Planning forest roads and harvesting systems, 1977 (E F S)
3	World list of forestry schools, 1977 (E/F/S)
3 Rev.1	World list of forestry schools, 1981 (E/F/S)
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