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UNITED NATIONS  
ECONOMIC COMMISSION FOR AFRICA

BACK TO OFFICE REPORT  
ON  
SAREC WORKSHOP ON  
"FOREST AND FOREST-RELATED RESEARCH  
IN LESS DEVELOPED COUNTRIES"  
NORTHAMPTONSHIRE, U.K.  
17-20 APRIL 1990

by

REGIONAL ADVISOR ON DROUGHT AND DESERTIFICATION CONTROL

## Mission Objective

The objective of this mission was to attend and participate in the workshop on forest and forest-related research in developing countries. The workshop was sponsored by SAREC.

### 1. Mission Preparation

The organisers of the work-shop had requested me to prepare a paper for discussion at the workshop. A paper on the "Challenges of forestry research for desertification control in Africa" was prepared and presented at the workshop. The highlights of the paper are summarized here below while the details of my presentation appear in paragraph 9.

#### A. Formal Research and Institutional Arrangement

- (i) Forestry research in African countries is carried out mainly by the Government Forestry Department or Commission and that the type of research carried out is mainly of site provenance trials.
- (ii) A number of African countries are now involved in the conservation and utilization of their forests on a sustainable basis.
- (iii) The main factors that limit forest research in Africa include adequacy of well trained forest researchers, political instability, inavailability of scientific literature and equipment, low level of funding and the non-involvement of users of research findings in the formulation of research programmes.

#### B. Forestry Research Priorities

- (i) Forestry research is not very popular. A number of reasons can be advanced for the unpopularity, including the risk of having to stay in the "bush" in order to conduct the research.
- (ii) Research themes which can readily be carried out by most African institutions include: natural forest ecology and management, ecosystem conservation and maintenance of species diversity; tree selection, improvement and selection watershed management and agroforestry.
- (iii) Mass or communal forestry programmes have failed to take root in many African villages and communities.

### C. Management of Forests in selected African countries

This section describes management of forest research in four African countries, namely Zambia, Mozambique Mauritania and Somalia. The main areas discussed include:

- (i) Nature of research activities underway (e.g. agroforestry, inventory and wood properties);
- (ii) Tree species being used for research,
- (iii) Agencies involved in research and funding level of such research activities,
- (iv) Fuelwood research.

### D. Training

- (i) Short term training programmes,
- (ii) Long term training programmes including MSc & Ph.D studies,
- (iii) Retrieval of research data,
- (iv) Mycorrhizal and Rhizobium studies.

### E. Specific recommendations to SAREC

- (i) Support this establishment and development of research institution in Africa (centres of excellency) aimed at conducting forestry research;
- (ii) Support research programmes through the UNECA, particularly in the field of agroforestry for semi-arid lands;
- (iii) Promotion of collaborative forestry research between institutions of the north and those of the south;
- (iv) Identify and introduce funding mechanisms for supporting environmentally sound management of tropical forests;
- (v) Support the training in forestry of scientists and technical staff at all levels.

## THE SAREC WORKSHOP ON FOREST AND FOREST-RELATED RESEARCH IN DEVELOPING COUNTRIES

2. The SAREC "think tank" workshop on "Forest and Forest Related Research in Developing Countries" was held in Oundle, Northamptonshire from 17-20 April 1990. The main objective of the workshop was to discuss the effectiveness of forest research in developing countries and how to make research more relevant.

A draft report on the subject, which had been prepared by a consultant, formed the basis of discussion. Some of the issues which were reviewed include the following:

- (a) whether alternative strategies for research were needed in developing countries and how they should be structured;
- (b) whether decision makers were adequately informed about research;
- (c) the kinds of information that were needed;
- (d) whether conventional sectoral research boundaries were still applicable;
- (e) whether research based on geographical areas was more appropriate;
- (f) whether users should participate in research;
- (g) whether training approaches needed alteration;
- (h) whether governments were aware of pit-falls and
- (i) how donors such as SAREC should respond to such changing needs.

3. The list of participants in the workshop is attached as Appendix 1. A total of sixteen scientists (mainly foresters) attended the workshop. I was the only one representing the interests of the developing countries despite the fact that the out come of the discussions was aimed at benefiting the third world. Also attached as appendix 2 is the agenda for the meeting. A total of five sessions were held - all in plenary. The following is a summary of the general discussions and the recommendations:

#### GENERAL DISCUSSION

##### Planning and Execution of Research - Basic Problems

4. Dr. Caroline Sargent gave the key note speech in which she identified and summarized the main features of the working document. She emphasized the following points:

- (i) that the paper had identified problems associated with forest research but had not provided any solutions;
- (ii) need for definition of research and by whom;
- (iii) who should advise the policy makers;
- (iv) identification of research and criteria used in selection of research themes;
- (v) different forms of research - government, informal;
- (vi) institution arrangements and
- (vii) financial arrangements.

5. Professor John Jeffers spoke on the fundamental precepts for institutional research. He stressed ten precepts as follows:

- (a) That research is not done by institutions; it is a creative activity of exceptionally gifted individuals;
- (b) Good research scientists represented a scarce resource that needs to be protected;
- (c) Research management must be recognized as being essentially the management of creativity;
- (d) Administration in a research institution has the sole purpose of enabling and enhancing the research activities;
- (e) The head of any research institution should be a scientist with recognizable scientific expertise;
- (f) Research planning should have a time horizon of 10-15 years, and should provide continuity rather than constant revision and change;
- (g) Modern research requires a high level of funding for capital equipment, and especially for instrumentation, computing and communication;
- (h) Good research and library services are essential for high research productivity;
- (i) Scientists need continuous access to new ideas, preferably through attendance at meetings, symposia and conferences;
- (j) Modern scientific research needs continuous statistical expertise, especially when experiments and surveys are being designed;

6. Professor Bob Johns spoke on the training of forestry students for research in developing countries. He discussed the problems associated with training of students for research in developing countries including the expected consequences. He also suggested some solutions to the problems he had enumerated.

The Problems:

- (i) Problems with educational standards at Universities in developing world are associated with poor secondary education, including low levels of entrance requirements as well as poor performance in maths, science and English.
- (ii) Restricted training to essential core-sectors of curriculum substitute general understanding for specialists abilities.
- (iii) Little training in research; priority is to produce field workers not research workers.

### Results

- (i) Many of the problems associated with research (and research effectiveness) in Tropics are directly a result of education problems.
- (ii) Production of low ability post graduates does not assist the third world. It results in perpetuating low standards.
- (iii) The Forestry profession continues to attract few quality students. Necessary to improve the image of Forestry to attract better students.
- (iv) Few trained graduates (or technical staff) to work on projects funded externally.
- (v) Lack of appropriate training manuals, etc for course work and development.

### Possible Solutions

- (i) Establish two year Post Graduate course(s) in Forest Research to train students to work in research institutes.
- (ii) Establish a course in Management of Research Institute in Forestry to encompass research design, evaluation of projects, project proposals, editing and publication, monitoring, planning. Students pursuing these courses should register for advanced degrees (MSc and Ph.D).

7. Mr. Gerald Leach discussed the additional items of forestry research which require further consideration. These included the following:

- (a) Lack of information on the economics of small holder tree growing. To support this case, he cited a recent ICRAF paper which had screened 170 publications on agroforestry economics from which only nine case histories contained sufficient information to assess the economic adoptability of an agroforestry technology.
- (b) Lack of data on carbon stocks and flows - especially on net carbon fixed in soils - for trees and grass ecosystems. He maintained that this ignorance had serious implications for the major biomass options for mitigating the greenhouse effect - afforestation and slowing deforestation.

- (c) The inavailability of economic models for the assessment of the impacts on wood product demand and prices - and hence on incentives for tree growing of large scale afforestation efforts. He felt that these economic models were needed before a lot of money could be spent on afforestation as a greenhouse mitigation strategy.

8. Ms. Joanne C. Barges spoke on the "Gum Arabic Rehabilitation in Sudan: Research Priorities for Government and producers." The issues she stressed in her talk include the following:

- (i) Gum arabic is a resin produced by the Acacia senegal tree, and is second to cotton as foreign exchange earner. The tree is considered as a cash crop and the collection of gum arabic provides seasonal employment and income to farmers. The old trees are valuable source of fuel wood while the young leafy trees are a source of fodder for sheep, goats and camels.
- (ii) There has been a decline in gum arabic exports while the export price has increased. This is best defined as a combination of demand sensitivity and supply variability.
- (iii) The demand for gum arabic is influenced by a number of factors including quality and reliability of the supply and the price. In addition, the existence of substitutes which tend to be cheaper also affect the supply of the gum. A low price of gum arabic makes farmers switch to alternative and more profitable crops.
- (iv) The supply of gum arabic has been influenced by both physical and biotic factors including droughts, pests and fires. Social economic factors such as income, credit, labour supply, land tenure have also contributed to the irregular supply of gum arabic.
- (v) A low domestic price in relation to a high world price for gum arabic has resulted in smuggling of the commodity from Darfur into Chad in recent years.
- (vi) The major issue pertaining to gum arabic in Sudan is, therefore, how to expand the production in order to maintain the output, and particularly in view of the competition from substitutes.
- (vii) The research priorities she identified included:
  - production targeting - e.g. commercial tree plantation in the traditional farming areas;

- quality control - construction of cleaning equipment in Sudan;
- marketing of gum arabic;
- coordination of the donors - collaboration of donor agencies.

9. Professor S.K. Imbamba spoke on Research for Desertification Control in Africa. A copy of the paper presented (ECA/NRD/ENV. 16/90) is attached as appendix 3. The following constitutes a summary of the main points which he discussed:

- (i) Definitions - desertification vs drought; the interdisciplinary nature of desertification research,
- (ii) Afforestation: areas which require immediate attention
  - agroforestry - use of tree species with multiple use and the need for selection of appropriate species;
  - mass forestry - has failed at the village level but been successful around urban centres. Need to use religious groups and local administration for mass forestry at the village level;
  - promotion of afforestation by individuals on their farms to be intensified;
  - fruit tree plantations around homesteads needed;
  - urban fuel-wood crisis;
  - alternative sources of energy to fuelwood (solar, hydropower, wind energy).
- (iii) Research needs on soil conservation including sand dune stabilization,
  - mechanism of desertification process,
  - desert sand morphology and sand movement,
  - sand dune stabilization with emphasis on biological and mechanical stabilization,
  - drought tolerant crop plants;
  - rangeland monitoring and management;
  - tissue culture techniques for rapid multiplication of selected plant species for rehabilitation of semi-arid and degraded habitats,
  - development of teaching aids on desertification and its control for primary and secondary schools and the University,
  - inventory of natural resources including woodlands in semi-arid environments.
- (iv) Public awareness on desertification control
  - role of political leaders,
  - role of public media,
  - role of women and youth.



- (v) Monitoring of environmental changes
  - use of remote sensing techniques
  - use of ground and aerial photograph.
- (vi) Specific comments on forestry research in Africa.
  - level of training local scientists (University forestry departments and Govt. forestry departments),
  - formulation of research programmes based on non-indigenous forestry policies,
  - making forestry research popular,
  - priority forestry research needs in Africa,
    - natural forest ecology and management,
    - ecosystem conservation and maintenance of species diversity,
    - tree selection, improvement and establishment,
    - watershed management.
  - forestry research capacity and constraints in Africa,
    - inavailability of equipment, relevant reference books and journals,
    - low level of funding.
- (vii) Specific recommendations to SAREC on how the above problems might be tackled.
  - institutional development (existing or new ones).
  - collaborative research (South-North linkages).
  - strengthening of forestry research through ECA.

10. Presentation by Dr. Philip Adlard: Monitoring and Evaluation of Forestry Research:

- (i) Failure rate of forestry research is high; monitoring and evaluation should identify failing missions and projects at an early stage,
- (ii) Current approaches include peer review of missions and their reports. Progress may also be measured against self-set targets by research worker himself,
- (iii) The main problems of monitoring and evaluation of research have included:
  - inappropriate methods to type of research,
  - criteria for success ill-defined,
  - ecosystem components not integrated,
  - relevance to management and society ignored.

- (iv) Improving project monitoring and evaluation;
  - a well-designed project should be self-monitoring,
  - objective criteria must be set; qualitative criteria to be quantified,
  - use project planning and resource management techniques,
  - use statistical models, mathematical models and computers science to structure the research,
  - replace ad-hoc research (crisis research management) by structured approach.

11. Dr. Edward B. Barbier: Economics Research on Tropical Deforestation: Evaluating the costs and Benefits of Development Options.

Salient points:

- (i) The total economic value of tropical forests ecological functions, its services and resources exceeds the economic gains of converting the area to an alternative use.
- (ii) Because of insufficient studies on the economic value of tropical forest benefits, forest conversion will proceed in the developing countries as long as the economic gains from conversion or mining exceed the direct costs incurred in conversion and extraction activities.
- (iii) In deforestation, the "prices" determined for tropical timber products or the products from converted forest land do not incorporate the lost economic values in terms of the foregone timber rentals, minor forest products as well as tourism, loss of biological diversity, etc.
- (iv) In deforestation, direct costs of harvesting and converting tropical forests are often subsidized and/or distorted, thus encouraging needless destruction.
- (v) Suggested research priorities:
  - (a) further analysis of the total economic value of tropical forests, including existence and option values, as part of overall evaluation of development options,
  - (b) instigating multi-disciplinary research into complex socio-economic issues surrounding deforestation, such as the linkages among land clearing, tenure security, rural population pressure and the factors determining agricultural rents on converted forest lands and

- (c) exploring economic aspects of international agreements and timber trade policies to protect tropical forests, including debt-for-nature swaps and compensatory flows to countries fore going exploitation of their tropical forests.

12. Dr. Gill Shephard spoke on Information networks for increasing utilization of research results. She discussed the various types of research including formal research, project research, monitoring and review and farmers own research. She also discussed the various mechanisms of diffusion of research results - journals, books. On the question of users of research results, she mentioned Government policy makers, donors, field staff, NGO's and academicians.

13. Mr. Thomas Wollersen from Commission of the European Communities spoke on the EEC's Strategy for funding Land use and Forestry Research in Developing Countries. The salient points raised included the following:

- (i) Although public awareness on environmental conservation had increased in recent years, the responsiveness of research organizations to support tropical forestry research programmes had been limited. He suggested that this could be due to the complexity of the tropical forestry research requiring a multidisciplinary approach as well as lack of transparency,
- (ii) The Council and Parliament of the CEC is currently discussing a strategy for the conservation of tropical forests,
- (iii) The "Science and Technology for Development (STD) programme is a research driven programme that support mainly research projects in a variety of scientific fields including land use and forestry research. Projects are generally carried out jointly by research teams from Europe and from developing countries.

#### FINAL SESSION

14. The final session discussed the setting up of forestry research objectives in developing countries as summarized below:

- (i) Assessing strengths and weaknesses
- (ii) Deciding on the scope of the research
  - (a) International
  - (b) National
  - (c) Regional
  - (d) Local

- (iii) Making an inventory of resources for research
- (iv) Setting the time scale for research
- (v) Choosing a research strategy
- (vi) Planning the research programme
- (vii) Monitoring the progress of research

In addition, all the rapporteurs summarized the proceedings of the various sessions. It was agreed that a summary of the workshop proceedings would be sent to SAREC with a chapter on specific recommendations on steps to be taken to promote and improve forestry research in developing countries.

#### Appendix 1

##### List of participants in SAREC 'think tank' on forestry research

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Proposed agenda for SAREC meeting

Wednesday 18 April am:

Planning and execution of research - the basic problems

Chair: Dr. Philip Allard  
 Protagonist: Dr. Caroline Sargent  
 Rapporteur: Simon Rietbergen

Discussion notes:

Dr. Caroline Sargent	Are we looking far enough ahead? Critical issues raised in the background paper.
Prof. John Jeffers	Appropriate institutional structures for formal research
Prof. Bob Johns	Training forestry students for research
Mr. Goldsworthy	ISNAR's experience in reviewing national agricultural research programmes and institutions

Identification and definition of subjects for research:

Chair: Prof. John Jeffers  
 Protagonist: Gerald Leach  
 Rapporteur: Dr. Gill Shepherd

Discussion notes:

Gerald Leach	Identification and definition of woodfuel problems
Dr. Jeff Sayer	Relevance of present forestry ecology research for conservation of biodiversity: institutional implications

Ms. Jo Burgess Gum Arabic in Sudan: research priorities from the government's and the producers' viewpoint

Prof. S.K. Imbamba Research for desertification control

Thursday 19 April am

Application, monitoring and evaluation of research results

Chair: Prof. Bob Johns  
 Protagonist: Dr. Gill Shepherd  
 Rapporteur: Gerald Leach

Discussion notes:

Dr. Gill Shepherd Information networks for increasing utilisation of research results

Dr. Philip Adlard Monitoring and evaluation of forestry research

Dr. Edward Barbier Full economic valuation of natural forest management benefits

Thursday 19 April pm

Recommendations for improving (land use and) forestry research in developing countries

Chair: Dr. Jeff Sayer  
 Rapporteur: Dr. Edward Barbier

Discussion notes:

Further notes to be produced by rapporteurs and other participants as necessary.

Friday 20 April am

Recommended strategies for research donors

Chair: Dr. Caroline Sargent  
 Protagonist: Prof. John Jeffers  
 Rapporteur: Dr. Philip Adlard

Discussion notes:

Thomas Wollersen EEC DG XII's strategy for funding (land use and) forestry research in developing countries

Simon Rietbergen NGO contributions

Discussion notes:



Appendix 3

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UNITED NATIONS  
ECONOMIC COMMISSION FOR AFRICA

CHALLENGES OF FORESTRY RESEARCH FOR DESERTIFICATION  
CONTROL IN AFRICA

Paper for presentation at the SAREC Workshop on  
"Forest and Forest-Related Research in Less Developed  
Countries" Northamptonshire, U.K. 17-20 April 1990

by

Regional Advisor on Drought and Desertification Control

Addis Ababa  
March 1990

## FORMAL RESEARCH AND INSTITUTIONAL ARRANGEMENT

1. In many developing countries of Africa, forestry research is carried out mainly by the Forestry Department or Commission, usually located in the Ministry of Agriculture. In only a few instances is forestry research conducted by universities and other institutions of higher learning. One reason for this drawback has been the fact that the establishment of forestry university departments is a relatively new event in Africa. Even where the faculties of biological sciences and agriculture are strong, one still finds the department of forestry wanting.

2. The type of forestry research carried out is mainly of site provenance trials. In several African countries, site provenance trials of various Eucalyptus species have been carried out. Due to the fuel energy crisis, a number of species of this genus have been planted extensively as they grow readily and mature within a short period in relatively diverse ecological habitats. In addition, the rural industries such as tobacco curing and brick making require large amounts of fuel wood which are obtained from the Eucalyptus plantations. A few countries in Africa have paper mill industries and, therefore, site provenance trials of soft woods such as Pinus sp and Cupressus sp have also received considerable attention. In Kenya, for example, industries and related enterprises are reported to consume 23% of all woodfuel used (Eckholm et al 1984). Although cottage industries exist in many countries of Africa, no substantial field trials have been carried out to cater for these industries.

3. Protection of existing forests may not necessarily constitute research in the true sense of the word. However, utilization of such forests on a sustainable basis may involve some experimentation. A number of African countries are now attempting to conserve and utilize the existing native forests on a sustainable basis. This is evident from the National Conservation Strategies which have been formulated and are being implemented by these countries. Indeed, several African countries have realized that it is no longer practicable for forest rangers to police public woodlands or forests. The conservation of such forests is, to a large extent, being placed in the hands of the local communities.

Some limiting factors on the conduct of research  
in African institutions

4. Quite often scientists and technologists of developing countries have been blamed for not carrying out critical self evaluation of research objectives for the purpose of ranking project proposals. We are told that meetings would be held between the external consultants and the national counterparts and an agreed text of criteria for the assessment of projects

formulated. It is further suggested that the agreed text would be removed or drastically altered by the local scientists before being circulated to the national government and the University community.

5. In Eastern and Southern Africa, there are extremely few scientists holding the MSc or Ph.D degrees in Forestry. As I have pointed out elsewhere, University forestry departments have only recently been established. Consequently, the calibre of the local scientists, to whom self criticism has been described as being "alien" are, to a large extent holders of the first degree or diploma certificate. The directors of forestry departments in several African countries have often confided in me that they are usually embarrassed to attach a diploma or BSc. holder to a visiting scholar or consultant from an international organisation because the two can not just match! Indeed, some of the diploma holders may not have had any formal education; they were probably admitted to the forestry colleges on the basis of their "active" participation, as technicians, in a research programme. I will return to the subject of training of foresters later.

#### Political pressure

6. In Africa, the problem of extended family pervades the family structure deeply. This situation may be likened to the mycelia of a fungal pathogen which ramifies in the cells of the hosts tissue for the purpose of obtaining nourishment. The establishment of a research programme usually requires the hiring of young school drop-outs to assist in simple manipulative skills. If the research is in the general area of natural forest ecology, the sites selected would obviously be located in certain political constituencies. Invariably, the school drop-outs mentioned earlier may be close relatives of the local parliamentarian, who probably wields a formidable political clout. Assume that this project is one of those to be closed because the review team has found its objectives to be inconsistent with the national policies and priorities. Anybody who has lived and worked in an emerging African country already knows the fate of the Director of Forestry and all the research scientists who were involved in this project if it is dropped. It must also be understood that even if a high ranking government official, such as a permanent secretary of the ministry responsible for forestry development and research, was party to the decisions made during the review board meetings, the decision of the political leader would prevail. Therefore, political stability of a country and the political support for a forest research programme is crucial for the success of a research programme.

7. On pages 14 and 15 of the main working document, the findings of Bengston (1986) on forestry research capacity and constraints in developing countries have been listed. The list consists of 24 factors arranged in a descending order, from the factor with greatest impact to the one with least impact. I must however, point out that in order to assemble useful and meaningful research data, certain essential conditions must prevail. In my view, the first ten factors listed on page 14 appear to be the most critical ones, the absence of any one of which would strangle any research effort. I am pleased to note that the factor "improved political support...", which I have discussed in the previous paragraph, ranks high in this list. However, in developing countries of Africa, the problem of foreign exchange, which is listed as no. 17 by Bengston (1986), has become a critical factor. Research can be stifled simply because of unavailability of foreign exchange for a purchase order to the tune of US \$ 100.00. To circumvent this problem, I have often advised donor agencies to deposit a certain amount of the grant in a foreign bank for this specific activity. However, if the project is fully funded by local funds, it is unlikely that it would make progress even if the first ten critical factors listed by Bengston (1986) are provided.

8. I have previously identified the non-availability of properly trained forestry scientists in some African countries as a key factor hampering research in this field. Indeed, some of the existing national forestry policies and priorities have been drawn by consultants with "full participation of the indigenous people". Formulation of research programmes based on the non-indigenous forestry policies are likely to falter for obvious reasons, for example:

- (i) inability to carry out mimicked foreign research programmes,
- (ii) inavailability of literature, equipment and other essential resources,
- (iii) non-involvement of users of the research findings in the formulation of such research programmes.

Hamilton (1984) has a sombre view about research potential of the Ugandan foresters. He argues that foresters in that country are "intellectually isolated from their forest colleagues elsewhere, and that their professionalism is under constant threat of erosion from the pulls of other commitments." This could be said of any African country. Hamilton further believes that in order to restore and strengthen their professional attitudes there is need for a strong backing from external scientific and technical communities. He also maintains that this kind of aid, which will be needed for many years to come, will hopefully help to restore an atmosphere of confidence, as well as enabling them to think about forestry in other parts of the world.

9. In some African institutions one finds forestry experts who have been well trained in the West but have little insight into the problems confronting the forestry sector in the tropics. They probably obtained their higher qualifications by conducting research in a boreal or temperate forest so that certain pest incidence characteristic of humid tropical forests are unfamiliar to these scientists. Moreover, the species diversity and the ecology of the native tropical forest is markedly different from the monoculture or pure coniferous stand in which they may have worked.

#### FORESTRY RESEARCH PRIORITIES

10. Forest research is not "sexy" enough a subject for young people. It does not excite individual scientists nor does it excite Governments. Consequently, little research is being carried out in forestry in many African countries. I have already alluded to species trials in various ecological habitats as the major component of research which under-way. The lack of trained botanists, ecologists, soil scientists, breeders, geographers and foresters makes it impossible to mount an integrated forest research programme. If such scientists were available and could work as a team the following research areas could readily be tackled:

- (i) natural forest ecology and management;
- (ii) ecosystem conservation and maintenance of species diversity;
- (iii) tree selection, improvement and establishment;
- (iv) watershed management.

#### Forestry in Land Use

11. Agroforestry research has recently gained momentum in many of the African countries. This is an ancient method of raising crops through inter-cropping with trees. For many years our ancestors experimented on agroforestry, and have some idea about those native tree species which do not provide too much shade to their crop plants. It is unfortunate that our scientists are not making full use of this wealth of knowledge.

12. Research in agro-forestry, including aspects of selection and improvement of multipurpose tree species for various ecological habitats should, therefore, be intensified. This should include selection of appropriate leguminous tree species for the semi-arid and saline environments especially since most of the Sudano-Sahelian countries experience these extremes. This type of, research is consistent with the traditional farming practices and is likely to succeed. In fact, I am informed that intercropping reduces pest incidences. Care must, however, be taken to ensure that local leguminous species are used instead of the imported ones. I recently visited an African country where

Central American tree species of the genera Prosopis, Albizia, Leucaena, Azadirachta, Cassia and Parkinsonia had been imported for trials. I also saw experiments where maize was being intercropped with Eucalyptus!

### Fuelwood and Energy

#### The myth about social (communal) forestry.

13. According to Eckholm (1984) communal forestry programmes involve growing trees on public or communal land as apposed to private land. The author cites China, South Korea and Ethiopia as countries where communal forestry has been undertaken on a massive scale. The benefits of such a programme include the participation of the landless people in forestry activities which would otherwise be reserved for the landowners. Grainger (1982) points out that for most countries, village based schemes will prove to be a practical option.

14. It will be recalled that during the 1960s the Tanzanian government planned that every village would start a village woodlot to supply woodfuel to the villagers. This attempt failed miserably. In the Sahel countries attempts to promote community forestry after the 1968-73 drought also failed.

15. Unless there is an exceptionally strong feeling of local identity such as that offered by some churches or schools, promotion of village woodlots is likely to fail. Moreover, villagers are always suspicious of any financial dealings undertaken on their behalf because some village members may abscond with the profits from the sales of the firewood and poles. I must also emphasize the point that unlike agroforestry, mass forestry was not practiced by our ancestors. The pre-colonial African farmer, being aware of the fragility of his soil, included agroforestry, and land fallowing in his agriculture. In my opinion, the only way mass forestry or village woodlots can succeed is if they are owned by the local administration such as the locational, village or ward council. Greater emphasis on the expansion of local forestry should, therefore, be carried out through the promotion of tree planting by private citizens rather than mass forestry.

### MANAGEMENT OF FORESTS IN SOME AFRICAN COUNTRIES

16. I have previously pointed out that forestry research in many of the African countries is just beginning to take root. This does not mean that African countries have been doing nothing about their forests. The following is, therefore, a summary of forestry activities in selected four African countries (Imbamba, 1989).

### Zambia

17. The national body which is charged with the responsibility of carrying out forestry research (or tree improvement research, as it is known in Zambia) is the National Council for Scientific Research (NCSR). The NCSR also conducts research in water resources, livestock development and industrial processes. The NCSR is a statutory body and is based in the Ministry of Higher Education, Science and Technology. It was established in 1967.

18. The Tree Improvement Research (TIR) programme is located at Riverside, Kitwe. The objective of the (TIR) is to identify forest trees, shrubs and herbs which have a potential as sources of food, medicine and industrial materials. Once the trees have been identified, other studies such as breeding, physiology and silviculture are then undertaken.

19. Establishment of trial plots to test nutrient status in various ecological habitats and the performance of specific plant species has also been carried out in some parts of the country. In addition, different propagation techniques have been tried. Finally, studies on ecological distribution and natural variations in plant species have been carried out to identify factors contributing to species survival in their natural habitats.

20. The other forestry programme activities which are outlined in the National Conservation Strategy include, establishment of farm and community forests, mapping out inventories and the rational utilization of existing forests, improvement of fuelwood efficiency, the formulation of legislations and the maintenance of biological diversity.

### Mozambique

21. The Forest Research Centre which is located in the Ministry of Agriculture has for the past seven years conducted research on species trials. By 1989 approximately 30 tree species had been tried mainly in the Maputo Province due to civil war in the other provinces.

22. The main field trial site is at Michafutene in Marracuene District (Maputo Province), which receives about 700mm rainfall per annum. At this field station, several Eucalyptus species have been tried including *E. camaldulensis* and *E. grandis*. Some of the variables being tested include land preparation (tractor ploughing and hand weeding) as well as fertilizer application. The total area which has been planted with Eucalyptus species is about 2000 ha (appr. 4 million trees). Some of the Eucalypts are over 6 years old.

23. In more recent years experiments have centred on trials of leguminous tree species, mainly Albizia lebbeck, leuceana leucocephala, Casuarina equisetifolia, Azadirachta indica, Cassia siamea and Prosopis juliflora.

24. The other research activities by the Forest Research Centre have included seed collection, nursery management and the general aspects of silviculture. The University Department of Forestry is currently not involved in serious research activities mainly because of the war. As soon as the war situation improves, the department plans to carry out research in the following areas:

- (i) agroforestry
- (ii) inventory of native forests and
- (iii) wood properties of native species.

25. On the question of deforestation, rough estimates suggest that the country possesses about 19 million ha of forests and that deforestation is proceeding at the rate of 100,000 ha per year. In 1986, it was estimated that about 150 trucks (each weighing 8 tons) come to Maputo each day loaded with fuelwood.

#### Somalia

26. The National Range Agency (NRA) is an autonomous body under the ministry of Livestock, Forestry and Range. It was established in 1976 and is mandated with range management programmes as well as forestry, wildlife and water resources. The objectives of the agency include, inter alia, the utilization of rangelands on a sustainable basis, establishment of tree planting programme, sustainable utilization of natural woodlands and rehabilitation of denuded range and forested lands, training and research and monitoring of environmental changes. The department of forestry is one of the departments within the NRA.

27. Available information indicates that 95% of the total population of Somalia is dependent on firewood for fuel energy. Urban residents have a preference for charcoal, while rural dwellers rely on firewood. The kinds of activities the Department of Forestry has undertaken include selection of tree species for various ecological habitats as well as the expansion of seedling production. By 1988, 22 nurseries had been established all over the Republic.

28. The Faculty of Agriculture at the National University of Somalia has undergraduate programmes in Agriculture and Botany and Range Science. It does not grant MSc nor Ph.D degrees. The departments have continued to experience an acute shortage of staff. Little research is being carried out by academic staff because of scarcity of funds.



29. The major environmental threat to the development of many sectors of the economy is encroachment of sand dunes on rangelands as well as public utilities. The Government, with the assistance of international organizations, is forging a head with sand dune stabilization. Biological stabilization include the use of species of the following genera: Casuarina, Prosopis, Eucalyptus, Acacia, Tamarix and Cordia.

#### Mauritania

30. In Mauritania, sand dune movements pose the greatest threat to all forms of life and development efforts. Sand dunes are not only a health hazard but quite often obstruct sewage systems in urban centres, highways and other similar facilities. Any afforestation programmes have, therefore, to be planned with this in mind.

31. The University of Mauritania awards degrees mainly in the humanities (literature, law and economics). However, the University does not grant degrees in basic and applied sciences such as medicine, agriculture, veterinary medicine and mathematics. The national school for training in forestry, agriculture and animal husbandry is at KAEDI. Two levels of professionals, C and B are trained and that the courses last for a period of three years. The minimum entry requirements into cycles B and C are the completion of two and five years of secondary education respectively. Course programme A has not been instituted in the country so that graduates from course B normally proceed to foreign countries for further advanced studies.

32. The first forest officer in the country was appointed about 1940. The responsibility of the forest officers during the early years was to survey the needs of forest services in the country. Sand dune fixation was intimately associated with forestry. Today, there are at least 2-3 forest officers in ten out of the twelve provinces.

Forestry services have doubled since 1982. In 1982 there were only four nurseries in the whole country while in 1986 there were 56 nurseries.

33. The main tree species used for sand dune fixation is Prosopis juliflora, which was introduced in the country in the 1930's. Forestry research in the country is quite low. However, species trials have been carried out. For example, productivity studies have revealed that P. juliflora yields 5m<sup>3</sup>/ha/y of biomass. Balanites aegyptica has also shown good results. Other tree species which have been studied include Acacia senegal, A. tortolis, Parkinsonia aculata, Calligonum sp and Leptadenia payrotechnica.

## TRAINING

34. The author of the working document has provided a comprehensive account of the problems associated with training of forestry research scientists in developing countries. I am in agreement with most of the views he has expressed. However, I wish to comment briefly on some of the points raised by the author.

1. Short term training course (STTC)

35. Most of the donor agencies prefer to provide aid for STTC lasting from 3 weeks to 6 months. (The most common STTC are usually of 3-6 weeks duration). A majority of courses are conducted in developing countries, however, most of the teaching staff come from developed countries. In my view, the primary objective of a short-term training course should be to update the participants' knowledge in new and relevant research techniques and biotechnologies. I have for many years conducted STTC for various international organizations, and the following discussion pertains to some of the problems that may arise.

(a) Preparedness of the participants for STTC

36. Despite a rigorous scrutiny of applications for the STTC, the course organiser is likely to discover names of a few candidates who are well qualified on paper but have not been involved in forestry research for many years. In addition, for the sake of geographical distribution, organisers of STTC are forced to waive the selection procedures in order to admit into the course a civil servant, who may not have been involved in research. Such an individual ends up being interested in shopping rather than the training course itself. In other instances, the participants may not be qualified and ready for a rigorous course which extends in the late hours of the night. In fact, they may not be able to absorb most of the materials being presented.

(b) Local vs external lectures

37. There are occasions when the donors insist on external lecturers without paying due regard to the local ones. In other instances, the local lectures receive low remuneration in contrast to their expatriate counterparts. This creates ill-feeling amongst the lecturers.

(c) Theoretical vs practical considerations

38. In a number of cases, the course duration is normally too short for a rigorous practical treatment of the subject. Consequently, the STTC ends up concentrating on theories with one or two practical demonstrations.

(d) Follow-ups

39. One of the reasons why many short term training programmes do not yield the expected results is simply that many of the trained personnel end up carrying out duties which bear no relevance to the completed STTC. It is always useful to carry out a follow-up of the activities of the previously trained participants before duplicating the STTC in other regions.

2. Long-term training programmes

40. These programmes involve the pursuit of a masters or doctorate degree. As pointed out elsewhere, the poor research performance in many of the African countries may be ascribed in part to the inavailability of a critical mass of well trained research scientists. At the undergraduate level students are presented with an overview of the subject matter without paying particular attention to the various career opportunities available in the country or sub-region. A course in management of forest research during the final year at the undergraduate level, as suggested in the main working paper, would be inappropriate because it would mean mounting courses for other careers. A course in forestry research methods would be more appropriate in that it would equip the students with the knowledge of laying out experiments, collecting and analyzing data. This is particularly important in developing countries because such graduates are expected to perform various tasks including being in-charge of forest stations as well as conducting research. At the masters level, it is expected that students would be able to carry out research under the guidance of their supervisors and write a thesis. The Ph.D programme involves mainly research towards the desertation.

41. As pointed out elsewhere forestry is not a popular subject, nor is biology, soil science or agronomy. The popular subjects in many Universities are the professional disciplines such as medicine, dentistry, veterinary medicine, engineering, architecture, etc. Because of the high competition for places in these professional faculties, only the best students are selected. It is my view, however, that those unpopular subjects can be made popular by the lecturers themselves. One way of making a subject popular is to carry out research. I found that students tended to like a course if research was being carried out in that subject. Unless members of the University staff are

undertaking their own research, it is obviously impossible for them to direct or supervise research of the undergraduate or postgraduate students.

42. The assertion by the author of the working paper that students must complete their research projects at the project site because failure to do so may result in non-completion of the research is only partly true. It really depends on the nature of the research being carried out. The project site may not be sufficiently equipped for sample or data analyses, which can only be carried out satisfactorily at the home institution. It is also important to guard against staff members being over-zealous about students' project because this sometimes ends up in the lecturer, rather than the student, doing all the research and the write-up!

43. The suggestion that staff should be trained before being assigned to a project is again not practicable. No donor agency would be prepared to spend funds to train individuals in advance who may probably not join the project. Moreover, when a researcher is negotiating for funds with the donor for a project, he cannot be sure the extent to which the project will be funded in order to initiate the training of relevant staff in advance.

44. On the question of text-books, it is true that some of those produced in industrialized countries are usually irrelevant and inappropriate. It should be possible for the local foresters to be commissioned to write text books instead of assembling selected chapters from various books and reproducing them in large numbers for use in developing countries. The inavailability of journals stifles research. This is an area where donors should endeavour to assist.

#### Retrieval of research data

45. In some African countries, forestry research has been going on since colonial times. However, the results of these investigations have not been incorporated into national development programmes. It is said that because of the civil service bureaucracy, some well researched technologies are simply gathering dust on shelves. It is essential that these technologies be retrieved and imparted to the farmer or the forest extension worker. Furthermore, it is also essential to promote a meaningful tripartite relationship involving the farmer, the scientist/technologist and the extension worker. In this way the scientific knowledge will readily diffuse to the farmer.

Mycorrhizal and Rhizobium Studies

46. Plants require moisture for germination and growth. Arid plants grow more slowly because of a number of limiting factors including the scarcity of moisture. Afforestation of semi-arid environments is, therefore, more difficult than afforestation of the humid moist environments.

Two years ago, the National Museum of Kenya, University of Nairobi and the Institute of Tropical Ecology in Scotland embarked on studies on the growth of native tree species in the semi-arid regions of the country. Two sites (Marimanti in Meru District and Ole-Ogasale in Narok District) were selected. Annual rainfall is 300-400 mm. Two techniques have been used to enhance the growth of the seedlings, namely the use of mycorrhizal and rhizobia for the nitrogen fixing trees. Initially native mycorrhizal and rhizobium strains were collected from the two sites and cultured in the laboratory. The mycorrhiza were added to the potted seedlings. In the case of nitrogen fixing legumes, the seeds were pretreated with the appropriate inoculant before planting. The reports clearly show that these treatment markedly enhanced the growth of the seedlings which have now been transferred to the field.

The next stage in this research is to prepare plantlets using the tissue culture technique in order to produce rapidly the plantlets for the project. This mainly due to the fact that getting forest tree seeds to germinate can sometimes be vexing.

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