

**MINISTRY OF ENVIRONMENT
AND
NATURAL RESOURCES**

**PROCEEDINGS OF THE
NATIONAL WORKSHOP
ON
STRENGTHENING FORESTRY
RESEARCH IN KENYA.**

**November 1-4, 1983
Eldoret, Kenya.**

Sponsored by:
The Government of Kenya
& U.S. Agency for
International Development.

I.

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OF THE
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STRENGTHENING FORESTRY RESEARCH IN KENYA

NOVEMBER 1 - 4, 1983
ELDORET, KENYA

SPONSORED BY THE GOVERNMENT OF KENYA
AND
U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

II.

FOREWORD

During January, 1983 U.S.AID officials met with representatives of the University of Nairobi and the Kenya Department of Forestry to discuss forestry research networking and training needs in Kenya and throughout East Africa. A three-part plan was devised to consider these needs.

As a first step, a short course/workshop was planned. Its specific aims were:

1. to assist Kenya to prepare an effective forest research program emphasizing coordination between government and non-government organizations.
2. to bring regional African Energy Program (AEP) scientists together to participate in the workshop, and to encourage similar activities in their own countries.
3. to encourage expansion of the effort into an East African regional research network for conducting research suited to recognized needs.

As preparation for the workshop began, investigation of Kenya's forestry oriented research activities revealed ongoing programs in a surprising wide range of fields including energy utilization, agroforestry, range restoration, fish and wildlife habitat improvement, soil conservation, watershed management, forest based industrial development and recreation. Many more agencies, both public and private, were involved in the work than anyone had suspected. However, communication and cooperation among these many organizations was not sufficiently developed to permit regional research collaboration without additional preparatory work.

Accordingly, the initial focus was shifted from regional (East African) research program planning and development to national (Kenya) research program planning and development. The idea was that if the Kenya research community could develop and apply techniques for more effective communication and cooperation, these same techniques could be applied first within other East African countries and then, later, among them.

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III.

By late fall, 1983 two workshops had been planned to improve Kenyan research efficiency. This first one, "Strengthening Forestry Research in Kenya" has been designed primarily to:

- 1) bring together for the first time representatives of all forestry oriented organizations in Kenya having a research interest.
- 2) encourage high level of cooperation and collaboration among them.
- 3) work out additional means for increasing research efficiency, both within and among members of the forestry community.

A second workshop, tentatively scheduled for spring, 1984 will stress techniques for setting research priorities and thus will provide the basis for a national plan for forestry research which will harmonize national, regional and institutional goals within Kenya for maximum efficiency.

As is usually the case, a few dedicated individuals carried most of the burden in arranging, organizing and coordinating the inputs to this workshop and carrying it forward to a successful conclusion. Chief among them have been:

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|--------------------|--|
| Dr. J. A. Odera | Chairman of the Workshop Organizing and Coordinating Committee. |
| Dr. F. Owino | Secretary of the Organizing and Coordinating Committee and Rapporteur General of the Workshop. |
| Mr. G. K. Mburathi | Workshop Chairman, in charge of the execution of the entire workshop. |
| Dr. F. J. Wang'ati | Chairman of the Post-Workshop Committee, charged with preparation and publication of these proceedings and with arrangement for implementation of all recommendations of the working groups. |

IV.

Mr. A. H. Chavangi Director of Transportation and Supervisor
of office and clerical and other services
to delegates.

In their work, they have enjoyed support from the Ministry of Environment and Natural Resources, Ministry of Agriculture and many other agencies of government as well as from selected individuals whose names are mentioned elsewhere in these proceedings. The Forest Department, the National Council for Science and Technology and the Permanent Presidential Commission on Soil Conservation and Afforestation contributed special services. The excellent, modern facilities of the Sirikwa Hotel, Eldoret also helped to make the workshop a success. There can be little doubt that if the spirit of cooperative action demonstrated at this workshop can be applied generally within Kenya's research community, East African Forestry Research will soon enter a new era.

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P A R T I

INTRODUCTORY REMARKS

SPEECH BY HON. E. T. MWAMUNGA, MINISTER FOR ENVIRONMENT AND
NATURAL RESOURCES ON THE OCCASION OF OPENING THE WORKSHOP
ON STRENGTHENING FORESTRY RESEARCH IN KENYA

H.E. The Representative of the U.S. Ambassador, Distinguished Guests,
Ladies and Gentlemen,

It gives me great pleasure to be invited to open this important Workshop. The workshop not only deals with issues which are of great importance to the operations, objectives and goals of my Ministry, but it also takes place at a time when I personally have just assumed responsibility as Minister for Environment and Natural Resources. The Workshop, therefore, gives me and my Ministry an Excellent opportunity to discuss with you some of our development aspirations as will affect you as Research Personnel and Users of information obtained from research.

Honourable Guests, Ladies and Gentlemen, I wish to emphasize certain important challenges facing you as a scientific community and us as a Government implementing agency with respect to forestry development. Indeed, our beloved President H. E. Honourable Daniel arap Moi, has on several occasions championed the cause of afforestation and soil conservation to underscore the important role which forests and good land management promise to play in the future conservation and economic development of our Nation.

My Ministry intends to take these challenges seriously, and as a matter of fact, on my way out to Eldoret, we have been viewing (on site) forestry development and I intend to continue to do the same in the future. You all realise how precious the limited national forest base is, and my Ministry intends to be vigilant in its protection for posterity through judicious management. You all realise that the bulk of our Nation is arid and semi-arid, and as our population increase the Nation has no option but to move into the arid areas for the extra production of food. The potential role of trees in taming the harsh environment in these arid and semi-arid areas is well known to you all. I, therefore, wish to stress that you who are gathered here should play an important role in extending the national forest base into this more difficult environment so that in future the harsh environment can be turned into productive land to feed future generations. As foresters, you should therefore feel that, in many ways the extension of

land production base of this Nation rests squarely on your efforts.

Honourable Guests, Ladies and Gentlemen, I wish to make a few comments on the growing importance of forests as a source of energy. We are often reminded that the majority of our rural population rely on fuel wood as the main energy source. In many parts of our country we have reached a sad situation where Wananchi may grow enough food to eat but lack the energy to cook it with. The long cues for kerosene in many parts of the country attest to this! This is another challenge which my Ministry with the cooperation of all you technical people must accept immediately and find solutions to. I have been reliably informed that as foresters, you can come up with energy plantations. My Ministry will give all the support and encouragement for these developments to continue at an even faster rate.

Honourable Guests, Ladies and Gentlemen, I now wish to mention a few things in connection with proper land use. Forests are crucial for ecological stabilization, i.e. water catchment protection, prevention of soil erosion, etc. But the nation must first and foremost feed itself not only now but into the future. The acceptable solution out of this dilemma lies in well designed and integrated land use. I have been informed for example that recent developments like agroforestry systems hold great promises for nations like ours, and it is our intention to support you as technical people in the rapid development of these appropriate systems.

Honourable Guests, Ladies and Gentlemen, having touched briefly on the relevant national development challenges, I now wish to turn specifically to forestry research. I have mentioned a few new areas of forestry research. I am aware that these areas are not only new to us in Kenya, but to other countries elsewhere and it is my great pleasure to observe that you, as a group of research workers, have deemed it necessary to invite other scientists from the United States of America in charting out the most appropriate research strategies towards the solution of the problems I have mentioned before.

In the past, foresters and forest research workers have tended to narrow their spheres of responsibilities and duties in such a manner that some glaring gaps have resulted. For example, you talk about the importance

of forests in water catchment protection and yet relatively little research effort has gone into this area. Research in tree (forest) development in arid areas is not adequately being tackled by you. Sometimes one even gets the impression that the rural farmers are ahead of you in finding out which trees can grow well in combination with his crops. These are the kinds of development which the nation should immediately correct and I wish to assure you that my Ministry will do all it can to assist you as research community in developing not only stronger research programmes along the traditional lines, but also in broadening your scope of research into some of these new areas I have mentioned.

I should like at this juncture, Ladies and Gentlemen, to reiterate the concern and the priority that our beloved President His Excellency Honourable Daniel arap Moi, and his entire Government attach to forestry development in this country. As you all know, the forestry estate in this country is less than 3% of our entire land surface, and even this limited area under forests is decreasing continually because of population and other pressures. It is for this reason that energetic action is required on our part and on the part of our friends to reverse the situation and bring about positive development of our forest estate. The target of planting 200 million seedlings which has been launched by our President is aimed among other things to bring about positive improvement to our forest estate. More recently, during this year's National Tree Planting Day, His Excellency the President launched the idea of a tree farmer. Just like we have maize farmers, we would wish to see Wananchi becoming tree farmers and for this purpose necessary action and incentives would need to be developed to assist Wananchi and the Kenya Government in the exercise. I believe therefore that this seminar could greatly contribute to this. The strengthening of forestry research in Kenya would go along way in assisting us in this country to effectively develop our forest estate. We therefore attach great importance to research and training and therefore highly welcome efforts that you are making to promote this activity. We are looking forward to receiving and studying the recommendations of this Seminar.

Honourable Guests, Ladies and Gentlemen, I wish to thank the United States of America Government for joining hands with us towards the success of this important Workshop. This Workshop in fact, represents the first development assistance from United States of America to my Ministry and we

therefore look at it as a very important first step towards future development co-operation. My Ministry will take keen interest in the recommendations coming from this workshop and will pursue follow-up action with the U.S.A.I.D. and from donor agencies. I also wish to thank the other donor agencies who have come to participate in this Workshop.

Finally, Honourable Guests, Ladies and Gentlemen, it gives me pleasure to convey my Ministry's and my personal encouragement and good wishes for the fruitful discussions you will have during your brief stay in Eldoret.

With these few comments, it is my great honour to declare the Workshop open.

Ministry of Environment and Natural Resources,
P.O. Box 30126,
NAIROBI.

PRESENTATION BY DWIGHT WALKER U.S.A.I.D./KENYA
GIVEN AT THE OPENING EXERCISE FOR THE FORESTRY
RESEARCH WORKSHOP

Over the last several years AID has entered the field of Natural Resource Management and Protection in a number of countries throughout the world. Generally these programmes have given particular emphasis to the forestry area. These programmes are based on the premise that the protection and wise use of natural resources is essential to the well being of all peoples. They are also based in part on the growing world-wide appreciation that the world's natural resources are limited and that their protection and rational use at any point on the globe is of concern to us all.

Kenya has in many ways been a leader in recognizing the important role that natural resources play in the well-being of its people and the contribution that these resources make to people from all over the world. Particularly note-worthy have been Kenya's efforts in the establishment and management of parks and reserves for the protection of unique flora and fauna. In addition, Kenya has traditionally conducted successfully overall natural resources programme including forest production and management.

In spite of the fact that Kenya has avoided many of the mistakes due to over exploitation and misuse of natural resources that have occurred in some countries, the future is not necessarily certain, nor can Kenya necessarily expect to avoid major problems in the future. In my opinion a major effort in natural resources research, education and management will be required to insure the protection and rational exploitation of Kenya's natural resource - forestry obviously will play a major role in the effort.

The Agency for International Development considers a strong balanced research, education and management programme in forestry and related areas important to Kenya's development. Various existing AID programmes contribute to this effort, and the possibility of a specific natural resources programme designed to support Kenya's governmental and private natural resources/forestry effort is being considered.

Existing AID activities in this area include:-

1. Support for the establishment of a forestry unit at Egerton College.
2. A broad-based effort of support to the governmental fuel wood supply programme.
3. A rural enterprise programme to assist rural businesses including those in forestry and allied areas. The programme is designed to encourage individual and group entrepreneurial efforts.
4. Various AID supported research and development programmes that provide basic and applied data useful in the natural resources/forestry area, particularly in the arid and semi-arid areas of the country.
5. Broad based human and physical resources planning project support. These activities include training and technical assistance.

Planned AID projects that will support the natural resources/forestry area are:

1. Agricultural Management - This project, now in the early design stage, will provide management training assistance to the rural sector including natural resources/forestry.

2. Agricultural Technology - A planned project that will support various types of rural sector research. Forestry related research should play an important role in this project, particularly the agro-forestry area.

3. A Natural Resources Protection and Management Project - This project which is, at this point, only in a very preliminary planning stage would provide assistance in the areas of natural resources education, protection and management.

In addition AID stands ready to assist, within the limits of our abilities, with appropriate special activities such as seminars, special studies etc.

The agency is encouraged by positive efforts such as this Workshop and looks forward to a continued close relationship with the various units of government and the private sector involved with forestry.

P A R T I I

WORKSHOP RECOMMENDATIONS

P R E F A C E

A central objective of the workshop was to identify the factors reducing research effectiveness in Kenya, and to consider means of ameliorating or eliminating their effects. To do this, four working groups were formed, each having its own chairman and rapporteur, ^{1/} to consider problems and solutions in:

forestry research programme development
forestry research management
application of forestry research results, and
interagency coordination.

In a first session on problem identification, participants were arbitrarily divided into four assemblies of equal size which circulated at half hour intervals from one working group to another. In this way, all participants were able to make input in the identification of problems for each of the four areas considered.

The findings of this first session were aggregated by the Chairmen and rapporteurs in such a way as to develop lists of ten or fewer major problems within each working group. These syntheses were reported at a special plenary session on Problem Identification immediately following the working session.

1/

| <u>Working Group</u> | <u>Chairman</u> | <u>Rapporteur(s)</u> |
|----------------------|------------------|---------------------------------------|
| ‡ 1 | MR. J.D. ONYANGO | MR. H.M. NGIBUINI MR. K.A. BUIGUTT |
| ‡ 2 | DR. T.OLEMBO | DR. W. MATHU |
| ‡ 3 | MR. T.K. NJAGI | MR. E. BURROW MR. A. SPEICH |
| ‡ 4 | MR. D. KAMWETI | MR. J.K. MAVUA |

Conferees were then asked to show their first and second preferences for participation in the working groups, and were divided among the four groups in such a way that most were assigned to their first or second choice of working group.

In two subsequent sessions, they considered alternative solutions to each problem that had been identified; selected from among them those options that seemed to be potentially the most effective, and then hammered out specific recommendations for action that would lead to problem solution.

Their recommendations were drafted and presented at a special plenary session during which all participants had opportunity to call for clarification and/or amendment.

When the workshop had concluded, a post workshop committee reviewed the problem statements and the recommendations that had been endorsed by the entire workshop assembly, and prepared for each a statement of implementation designed to facilitate effective action. Special attention was given to which organization or person was to take responsibility for action, the general nature of that action, and the time schedule for accomplishment.

The problems, the recommendations, and the plans for implementation stemming from them are reproduced on the following pages. The last page of this section outlines the general schedule for accomplishment which is now being monitored by the post workshop committee.

- Problem:
- 1.1 Inadequate mechanisms for formulating national research priorities and for coordinating research development programmes.
 - 1.2 Problems created by personal interests and politically motivated research priorities.
 - 1.3 Conflict between national, donor and user needs.
 - 1.7 Need to know and accept realities in rural areas.
 - 111.1 Lack of proper identification of, and contact with, user or target groups.
 - 1V.4 No comprehensive set of research priorities.

Recommendations:

1-1 Noting that there is an inadequate mechanism for formulating research priorities and for coordination of research and development programs, it is recommended that a mechanism be developed by the Forest Department for consultation among bodies interested and/or involved in forestry research in order to facilitate formulation of research priorities for consideration at the national level by the National Council for Science and Technology, bearing in mind the needs and the knowledge of all clients.

It is further recommended that all future research programmes and projects should be based on the established national priorities.

111-1 All government and non-government organizations involved in forestry research in Kenya should identify and respond to their clients' needs in terms of technical knowledge and related communication contacts; with attention to national priorities ...

IV-4 Each agency carrying out forestry research should set out its own set of priorities for research, and a workshop of these relevant agencies should come up with a master plan or priority list. This workshop should be held within six months.

Implementation:

The committee interprets these several problems and recommendations to mean that collaborative determination of research priorities across the research community will tend to eliminate conflicts of interest, arbitrariness in program development and inappropriate use of scarce resources.

It is also pointed out in the recommendations that deep knowledge and careful study of the needs of user groups is a vital part of the priority determination process.

In line with the recommendations, a plan for a workshop on "Setting Forestry Research Priorities" has been developed for implementation on or before April 1984, and is being brought to the attention of interested donors. It is intended to develop a national priority list, and lays out the procedures by which such priorities are determined. While it builds on priorities already determined within individual agencies, it allows for their revision in the light of national needs and new criteria for decision.

This committee will continue to carry the responsibility for implementation of this workshop as an important early step in clarifying, reconciling and coordinating Kenya forestry research. It will cooperate closely with the Forest Department in developing and seeking support for the proposal.

Problem: 1-4 Need for forward planning, but allowing timely response to emergency situations.

Recommendation:

1-2 Emergency or crisis situations will require research to be conducted (that is) not defined by the established national priorities. The forestry service would be encouraged to negotiate directly with relevant research organizations and sponsors.

Implementation:

The committee recognizes that a list of research priorities, however well formulated, is constantly subject to change; sometimes due to the solution of old problems, other times due to the discovery or creation of new problems, and still other times due to the reordering of priority items.

The Forest Research Advisory Committee is an appropriate body to monitor changes in priority listings. One of its earlier duties will be to develop a system for receiving requests and recommendations for priority changes from clients, from research organizations and from government; assessing the validity and impact of those recommendations through consultation with interested groups and careful measurement of major criteria; and generating appropriate response to such requests in such a way as to preserve the integrity of the long term program while recognizing the occasional need for short term responses to newly recognized emergencies and for reordering of priorities as problems are solved or dwindle in significance.

For timetable see problem 11-2

Problem: 1.5, IV-I

Need for an information bank on current and past research activities.

Recommendations: 1.3, IV-1

It is recommended that the Forestry Research Department now within KARI (FRD, KARI) establish a national data bank (information centre) through which such information will be readily accessible.

Implementation:

The committee recognizes that this large undertaking by the FRD, KARI must be approached in stages and will require the support and input of all Kenya's research-oriented organizations.

A. Current Research: As a first step, FRD-KARI before the end of 1983 will solicit all known forestry oriented research organizations for information on all current research projects and operations. This information will be forwarded through that representative on the Forestry Research Advisory Committee (FRAC) who represents the field closest to each organization's interest. Those organizations that do not feel that their field of interest is adequately represented in the makeup of the FRAC should carry their concern to its secretariat, along with the information requested on current projects and operations. This procedure will meet three purposes: it will provide grounds for FRAC restructuring, if required; it will advise FRAC members on all current forestry-oriented research in Kenya; and it will give FRD, KARI a basic information collection of ongoing research.

By the end of the first quarter of 1984, FRD-KARI will devise a set of standard data sheets, and will fill them out for each organization using the data received. These data

sheets will be circulated to the originating organizations for correction of errors and omissions. The corrected sheets will be returned and together with the more detailed original material will be filed at KARI library in a special collection. Sets of the standard data sheets will be available for the use of the FRAC (as, for example, in discussions with donors and ministries) and will be made available, at cost, at all who request copies.

These files, including detailed data on current projects, thereafter will be updated annually by solicitating through appropriate members of the FRAC.

B. Past Research: The record of past research in Kenya is in fragments in libraries, offices and private collections throughout the country, elsewhere in Africa, and overseas. The job of bringing it together is very large.

As a first step in assessing the dimension and difficulty of the job, the committee recommends that a meeting of all organizational librarians be called during the first quarter of 1984 to describe their collections and how they are handled, and to determine how they might organize to develop a unified catalogue of holdings, encourage inter-agency use of collections, and work out other practical means of pooling resources.

In subsequent meetings, called by the KARI librarian at least semi-annually, other important issues in the strengthening and upgrading of holdings emphasizing past research will be considered for implementation. Included among them might be:

Establishment of closer cooperation with other major forestry libraries in East Africa and overseas.

Establishment of an archives for rare materials.

Establishment of a mechanism (perhaps in cooperation with the University of Nairobi) for translation of foreign language research reports into English.

Establishment of a workable procedure for obtaining, from private offices and collections, materials otherwise unavailable (e.g. by microfilming in situ).

Problem: 1.6 Need for promoting coordination between various forestry institutions and communication among researchers.

Recommendation:

1-4 In order to increase coordination of forestry research between various institutions and communication among researchers to benefit the economic and social welfare of Kenya, it is recommended that a periodic research forum be coordinated by NCST. See also II-3 i.e. that communication forums be established in the form of regular national forestry conference.

Implementation:

The committee suggests that the national Forestry Research Advisory Committee appoint a sub-committee to plan a national forestry research conference or symposium to be held not later than March, 1985. In developing this plan, it is also suggested that the sub-committee consult with the research organizations which are its constituents in the determination of timing, subject matter and theme- seek donor through its relations with the Ministry of Finance and Planning; and otherwise encourage strong national and international input into this important instrument of coordination.

Problem: 1.8 Need for project review and evaluation.

Recommendation:

1.5 It is recognized that project review and evaluation by peers increases research effectiveness and contributions. It is therefore recommended that periodic internal and external review and evaluation of forestry research be viewed as a permanent managerial function of research directors.

Implementation:

The committee considers periodic evaluation of research projects as critical to the effective progress of forestry research in Kenya. While some research organizations may currently employ a review process, many do not. Assuming that national, and organizational research priorities will be established by April 1984, it will be logical for research programmes to be reviewed and revised soon after, (i.e. about mid-year) with national, regional and subject matter priorities in mind.

To implement the process, KARI will distribute early in 1984 guidelines for project review. Ways of applying these guidelines will be left to the discretion of individual research organizations as they pursue them during the last half of 1984.

Techniques and problems of project evaluation will be made a seminar topic at the first annual forestry research symposium tentatively scheduled for early 1985.

The above actions refer primarily to internal, project review. To prepare for internal or external programme review, research directors can refer to a second set of guidelines

to be distributed by KARI in mid-1984. See also paper by DR. GEORGE ARMSTRONG appearing in the proceedings of the USAID Workshop on Strengthening Forestry Research in Kenya.

Problem: 1.9 Need for establishing a permanent local funding base for forestry research to recognize the long term nature of forestry research.

Recommendation:

1.6 It is recommended that an adequate provision be maintained in the national recurrent budget for forestry research which may be supplemented by donor agencies.

Implementation:

(a) The Board of Management of KARI and the Director KARI should be asked to provide a separate subhead for the Forestry Research Department, budgetary estimates should be discussed by programmes and allocated financial resources should be spent on the projects for which they were intended. Accounting procedures should be restructured accordingly, to service the decentralized organizations.

(b) To enable the forestry research programme to have access to donor agencies the parent forest department and the Ministry of Environment and Natural Resources should provide a forum for exposing donor agencies and the Ministry of Planning and Finance of the forestry research priority areas needing such support.

Problem: 1-10 Lack of a forum for promoting direct donor or other private agency support for identified national projects.

IV-7 Difficulties in coordinating different donor agencies.

Recommendations:

1-7 It is recommended that the Ministry responsible for forestry, in cooperation with the Ministry of Finance and Planning organize regular briefings of potential donors in order to solicit support for forestry research.

Implementation:

The committee obtained commitment from the Forest Department that the secretariat of FRAC would be assigned responsibility for maintaining liaison with appropriate representatives of the Ministry of Finance and Planning. The first task would be to work out with them appropriate procedures for conducting regular meetings with donors on forestry-oriented research.

It was felt that representatives of the Forestry Research Advisory Committee should be present at such donor-government discussions:

- 1) to get to know donor representatives personally as a means of strengthening communications between them and the research community.
- 2) to gain insight into broad priority areas (e.g. East African, pan-African, global) recognized by donor agencies and where desirable and feasible to arrange for their insertion among local priorities.
- 3) to discuss with donors differences in Kenya and donor priorities and the reasons for them, as a means of promoting joint understanding and reconciliation and coordination of aims and programs.

- 4) to coordinate with the Ministry of Finance and Planning in research of mutual interest (e.g. forecasting, demand analysis).

It was also felt that donor agencies could be effectively aided in planning or considering support if provided with:

- 1) A complete roster of current forestry-oriented research programmes and activities in Kenya.
- 2) A review of national, regional and agencywide research priorities in Kenya.
- 3) Prospects for change in research programmes and priorities based on forecasts, trend analyses and other forms of prediction.
- 4) A complete roster of donor-supported projects in Kenya.
- 5) Early information on crisis or emergency conditions (drought, disease, etc.) calling for quick research response.

The tentative schedule for implementation was:-

- 1) That procedures for joint meetings be developed within 4 months, including involvement of the Forestry Research Advisory Committee in the proceedings.
- 2) That a major meeting be called within 6 months, at which time several of the rosters and other guides for donors should be available.

Problem: 11-1 Luck of identity for Forestry Research at the national level.

Recommendation:

11-1 A Kenya Forestry Research Institute (KFRI) be established to cater for all national Forestry Research Programmes

and (b) to work closely with other government and non-governmental organizations involved in forestry research.

Implementation:

The committee believes that Forestry Research can and should stand apart from agricultural research and receive separate support in view of its large, unique and increasingly critical contribution to the economy and to the long range future of the country. The committee also believes that progress toward this objective should be made without undue delay, and that the request for separate recognition.

- (a) be carefully considered by the NCST
- (b) strongly supported by accumulated evidence
- (c) wisely aimed so that support from diverse sources can be called upon from the very beginning.
- (d) and vigorously pressed by the Ministry of Environment and Natural Resources, the forest service and the NCST.

To do these things require careful planning and a certain amount of vision plus dedication and drive. Many of the facts and accomplishments needed in support of such a request will be forthcoming as the research community implements the recommendations of this workshop. Many of contacts and associations needed to obtain support in various circles must be sought out and developed simultaneously.

The Committee recommends that a small (e.g. 3 person) committee be established within the Forest service and FRD-KARI and the FD of the University to explore questions such as, but not restricted to, the following:

- 1) what processes and techniques did the existing institutes employ to gain attention, support and identity?
- 2) what talents and special personnel do they require to run their institutes effectively?
- 3) what do they feel are their problems now?
- 4) from what sources do they derive their support and how sure is it?
- 5) what positive steps can be recommended for accomplishment of this objective without undue risk?

It is recommended that the committee report its findings to the forestry research community during the second quarter of 1964.

Problem: 11-2 Lack of coordination of Forestry Research within the country.

Recommendation:

11-2 It is recommended that a National Forestry Research Advisory Committee be established to advise on Forestry research in all institutions. This Committee will be responsible to the Forest Service and will report to the National Council for Science and Technology.

Implementation:

At the time of this writing such a Committee already has been established. Its makeup is as follows:

Chairman:

Secretary:

Members:

One of the first jobs of the Committee will be to outline its several responsibilities and to work out a plan for meeting them. Its statement of purpose and plan of work will be circulated to the research community.

Problem: 11-3 Lack of communication between scientists within research institutions.

Recommendation:

11-3 It is recommended that communication forums be established in the form of:-

- (a) Regular national forestry conference
- (b) Regular seminars and meetings within institutions
- (c) Research newsletter to be published regularly.

from IV.1

- (d) Journals (professional and popular)
- (e) Mass media (e.g. radio, T.V., Newspapers)

Implementation:

For discussion of the need for regular conferences see problem 1-6.

Regular meetings: The committee endorses strongly the need for frequent internal meetings of personnel as a means of keeping abreast of current activities, sharing problems, promoting cooperation and otherwise utilizing the benefits of improved information flow.

How often and in what way to encourage professional meetings internally are local management decisions. Informal discussion groups are sometimes arranged by staff with the approval of the administration. More formal arrangements, such as seminars, normally require administrative action.

Hopefully, the recognition of the vital need for prompt and effective information transfer in the research field will encourage prompt action by all agencies to improve internal inter-communication.

Newsletter: The committee recommends that conservator of Forest Department for extension and information and an appropriate member of FRD, KARI meet before February, 1984 to discuss and plan means whereby a Forestry Research Newsletter may be initiated within the Department and given broad distribution within the research community. It is suggested that they employ the advice and counsel of A. Speich in reviewing options and laying out a plan for accomplishment, and that a first issue be prepared and published, if possible, within the first quarter of 1984.

- Problem: 11-5 Lack of motivation of individual scientists and technicians.
- 11-6 Inadequate managerial skills in research administrations.
- 11-7 Shortage of research staff and absence of critical mass of scientists.

Recommendations: 11 Preamble and 11-5

Noting that motivation of individual scientists and technicians is essential for successful implementation of research programmes and projects:

It is recommended that all research managers and appropriate government institutions should pay particular attention to both institutional and personnel management problems which are likely to affect negatively the morale and motivation and research staff. Special attention is drawn to the absence of an appropriate scheme of service for research staff in public institutions and the low level of operational resources

It is therefore recommended that the following actions be taken.

- (a) Implement the scheme of service for research personnel.
- (b) Improve scientific career development including terms of service and remuneration.
- (c) Give credit in public for work done.
- (d) Provide in-service training and access to professional meetings, especially international meetings, for junior and senior scientists.
- (e) Provide management training opportunities for research officers.
- (f) Adjust basic training of research personnel in accordance with manpower requirements.
- (g) Increase awareness of career opportunities in research, both at schools and universities.
- (h) Orient young and upcoming scientists into research on first appointment.

Implementation:

The committee sees the primary responsibility in this area as lying within the Board of Directors, KARI and suggests that

- (a) what laws, rules and regulations and other types of support are already in place for meeting these recommendations including those affecting personnel in other research areas (such as agriculture, fisheries, planning)
- (b) what needs to be done to take advantage of such opportunities as are disclosed in (a).
- (c) what additional types of support (financial, legislative etc.) will be needed to enhance and improve the present situation, and at what levels of government they should be pursued.
- (d) what kinds of plans or proposals need to be drawn up in order to gain the interest and support of primary decision makers in this area.
- (e) what collegial support is available from research personnel in other fields.

The investigation of these and related questions may be expected to lead to a clear cut view of which of these several recommendations can be met in the shorter run and how to go about it. It will be desirable for the committee to report its findings to the FRAC before the end of the second quarter of 1984.

Problem: 111 1-7

- 1) Lack of proper identification of, and contact with, user or target groups.
- 2) Insufficient understanding of user needs leading to inadequate research results.
- 3) Delays in writing, publishing and extending results of research.
- 4) Inadequate formulation of research information in terms which various groups of users can understand and employ.

- 5) Clients do not know what information is available, who to ask, or what to ask for.
 - 6) Inadequate use of available extension services (e.g. local voluntary institutions, media, and other formal and informal information systems).
 - 7) Lack of trained personnel capable of fulfilling extension functions.
- IV-8 Research information not in usable form (see also 111-4)
- 11-4 Combination of research and extension advisory functions in research institutions affects research (negatively).

Recommendations: III - 1 a, b, c.

1. All government and non-government organizations involved in forestry research in Kenya should identify and respond to their client's needs in terms of technical knowledge and related communication contacts, with attention to national priorities, and

- (a) they should meet under the leadership of the forest department to compare and devise improved means (e.g. organizational structures, advisory services, publications and informal communication channels) for extending information among researchers and users.
- (b) they should select among these means, coordinate their extension functions where feasible and provide for evaluation and monitoring of extension processes.
- (c) they should also meet under the leadership of the Forest Department to investigate, compare and identify means for early training of extension personnel in techniques of information interpretation, communication and dissemination, in order

to rapidly implement coordinated training programmes for extension personnel.

- 1V-8 Technical research results should be translated into a language and form that is readily understandable and usable by different users who may or may not be familiar with technical research jargon. It is recommended that an institution with proper journalistic skills in writing advisory information should be created to take up this task. Such an institution, possibly within KARI, could derive valuable assistance from the Agricultural Information Centre of the Ministry of Agriculture and Livestock Development and/or other donor organizations.

Implementation:

The committee sees these several recommendations as a response to three main points.

- 1) Two-way communication between researchers and clients is insufficient, and yet if further pursued by research personnel will detract from their research.
- 2) An extension service that is highly skilled in communication techniques is needed to serve as a bridge between researchers and clients.
- 3) Extension personnel in the Forest Department, and in some other organizations lack the skills and training and conduct their programs effectively. Furthermore their efforts are uncoordinated.

The recommendations suggest that a working session between and among extension workers in the forestry research field is badly needed and overdue. The committee concurs.

It is suggested that the Conservator in charge of extension and information call such a meeting and engage the collaboration of Mr. Speich before the end of March, 1984. And that in the deliberations of participants be included discussions of at least the following questions.

- 1) How to organize the maximum effectiveness both within and between organizations?
- 2) What are the several responsibilities of an effective extension service and what will be needed to meet them?
- 3) What kinds of training and education are needed by today's extension personnel and how can they be obtained?

It is further suggested that the results of that meeting be conveyed not only to the Forestry Research Advisory Committee and to the Director of the Forestry Department, but also to the research community so that researchers may adjust their procedures to meet new needs.

The working group in closing its recommendations pointed out that their implementation would require substantial strengthening of the forestry extension service. The committee would like to point out that alliances with other extension services (such as agricultural extension) may offer a desirable additional means of achieving forestry extension objectives.

Problem: IV-2 Absence of joint planning and consultation before project development and initiation.

Recommendation:

IV-2 Facilitation of joint planning and consultation before project development and implementation by the Ministry responsible for forestry development in conjunction with the Ministry of Finance and Planning.

Implementation:

The committee suggests that the Forestry Research Advisory Committee is the logical body to receive proposals for new projects and for changes in programme by the various agencies; to assess their merits from several points of view; to suggest collaboration or cooperation when it seems desirable and otherwise steer individual organizations into effective liaison.

The committee further suggests that this process of submitting proposals to the FRAC begin as soon as the latter has clarified its responsibilities and procedures and is ready for prompt action.

Problem: IV-3 Unavailability of a register of research projects and research agencies.

Recommendation:

IV-3 The national council for Science and Technology, with the assistance of all agencies involved in forestry research should compile as soon as possible a register of research projects, programmes, personnel and publications emanating from such projects, and make such register available to all relevant institutions and organizations.

Implementation:

Much of the basic information required to meet this objective will be gathered in the process of forming an information bank (see Problems 1-5 and IV-1). The FRAC will act as a funnel through which this information will flow to KARI. The committee recognizes that the form in which the information is collected and reproduced may be different by reason of the separate purposes of KARI and NSCT. Nevertheless, it recommends

that these two organizations harmonize their efforts so as to avoid duplication and redundancy.

The need for a separate Directory of Forestry Research organizations and personnel is appealing, and this committee suggests that the required information be brought together and published by NCST as soon as possible.

Problem: IV-5 Withholding and clearance of technical information.

Recommendation: IV-5

Delay in communicating information should be minimized by facilitating horizontal exchange of technical information and vertical communication of research policy information.

The P.P.C.S.C.A. through its good offices should take the initiative to minimize the delay(s).

Implementation:

The P.P.C.S.C.A. is ready to assume this responsibility and will be prepared to take the proper actions to facilitate information transfer if and when notified of problem conditions.

Problem: IV-6 Personal differences within and between agencies.

Recommendations: IV-6

Every effort should be made to create good human working relations within and between agencies through regular dialogue and proper selection of personnel. It is the responsibility of every agency to minimize problems arising from personal differences.

Implementation:

Personal differences generally arise from inequitable treatment, lack of communication and understanding, and inexperienced management. As the roster of recommendations outlined by the working groups is fulfilled, these types of drawbacks should be ameliorated. The committee can only advise administrators and managers to watch for such differences, and to apply themselves to the task of reducing and eliminating them.

| PROBLEM | END OF 1983 | FIRST QUARTER OF 1984 | SECOND QUARTER OF 1984 | THIRD QUARTER OF 1984 | FOURTH QUARTER OF 1984 | FIRST QUARTER OF 1984 |
|-----------|-------------|--|---|-----------------------|------------------------|--|
| II - 2 | (A) | FORESTRY RESEARCH ADVISORY COMMITTEE IS FORMED (A) AND OUTLINES ITS RESPONSIBILITIES BEFORE END OF FEBRUARY 1984 | | | | |
| II - 3 | (A) | (B) | CONSERVATOR FOR INFORMATION AND EXTENSION MEETS (A) WITH REP. OF FRD/KARI AND A. SPEICH TO PLAN FIRST EDITION OF FORESTRY RESEARCH NEWSLETTER FOR PUBLICATION BY APRIL 1984 (B) | | | |
| II 5-7 | (A) | (B) | NCS: APPEALS TO MINISTRY OF AGRIC (A) FOR REAPPOINTMENT OF KARI BOARD, AND FRD/KARI APPOINTS SMALL INTERNAL COMMITTEE TO REVIEW OPTIONS FOR IN-HOUSE ACTION (B) | | | |
| III 1-7 | (A) | CONSERVATOR FOR INFORMATION AND EXTENSION, IN CONSULTATION WITH A SPEICH, CALLS INTERAGENCY WORKING SESSION OF EXTENSION PERSONNEL TO DISCUSS MEANS OF STRENGTHENING EXTENSION SERVICES BEFORE END 1ST QUARTERS 1984 (A) | | | | |
| IV - 3 | (A) | NCST PREPARES COMPREHENSIVE DIRECTORY OF FOREST RESEARCH ORGANIZATIONS AND PERSONNEL FOR COMPLETION DURING SECOND QUARTER OF 1984 | | | | |
| I.5, IV-I | (A) | FRD/KARI SOLICITS FORESTRY RESEARCH ORGANIZATIONS FOR CURRENT INFO ON ACTIVITIES. DATA IS RETURNED AND FILED AND STANDARD DATA SHEETS COMPLETED BY 2ND QTR 84 (A) | | | | NEXT UPDATE SCHEDULED FOR 1ST QTR 1985 |
| IV - 5 | | PPSCA ACCEPTS CONTINUING RESPONSIBILITY TO FACILITATE INFORMATION TRANSFER REQUEST | | | | |
| IV. 6 | | CONTINUOUS MONITORING BY AGENCY MANAGERS TO REDUCE PERSONAL DIFFERENCE (INTRA AND INTER) | | | | |
| II - I | (A) | FRD/KARI, FOREST SERVICE AND UNIVERSITY ESTABLISH JOINT COMMITTEE TO INVESTIGATE SHIFT TO INDEPENDENT INSTITUTE STATUS (A) AND TO REPORT FINDINGS IN 2ND QTR | | | | |

| PROBLEM | END OF 1983 | FIRST QUARTER OF 1984 | SECOND QUARTER OF 1984 | THIRD QUARTER OF 1984 | FOURTH QUARTER OF 1984 | FIRST QUARTER OF 1985 |
|---------------------------------------|-------------|--|------------------------|---|------------------------|-----------------------|
| 1.10 IV-7 | (A) | MINISTRY RESPONSIBLE FOR FORESTRY AND MINISTRY OF FINANCE AND PLANNING DEVELOP PROCEDURE FOR AND AGREEMENT ON REGULAR MEETINGS WITH DONORS (A) BY MID, FEB 1984 AND SCHEDULE MAJOR MEETING ON OR BEFORE 1ST JULY | | | | |
| 1 - 1-3 1 - 7 III - 1 IV - 4 | (A) | POST WORKSHOP COMMITTEE ORGANIZERS FOR SECOND WORKSHOP "SETTING RESEARCH PRIORITIES" ON OR ABOUT APRIL 1984 | | | | |
| 1 - 8 | (A) | FRD/KARI DISTRIB, TO RESEARCH ORG'S GUIDELINES FOR PROJECT REVIEW (A) | (B) | FRD/KARI DISTRIB, TO RESEARCH ORG'S GUIDELINES FOR PROGRAMME REVIEW (B) | | |
| IV - 2 | | FORESTRY RESEARCH ADVISORY COMMITTEE RECEIVES, ASSESSES AND GUIDES PROPOSALS FOR PROJECT AND PROGRAMME CHANGES ON A CONTINUING BASIS | | | | |
| 1 - 4 | | FORESTRY RESEARCH ADVISORY COMMITTEE RECEIVES, ASSESSES AND RESPONDS TO CHANGES IN RESEARCH PRIORITIES OR ORGANIZATIONS AND AGENCIES | | | | |
| 1 - 6 | | FORESTRY RESEARCH ADVISORY COMMITTEE APPOINTS SUB-COMMITTEE TO PLAN FOR NATIONAL FORESTRY RESEARCH CONCERENCE BY MARCH '85 OR EARLIER | | | | |

P A R T I I I

P O S I T I O N P A P E R S

F O R E W O R D

One of the main purpose of the workshop was to bring together, for the first time, representatives of all organizations in Kenya that were in some way involved in forestry-oriented research.

To find out what they were doing, each organization was asked to prepare a short paper outlining its current research activities, recognized research needs and potential research contributions. These papers, edited to reduce their bulk, are reproduced here.

Some organizations could not send a representative. They were asked, after the workshop, to prepare for the proceedings. Those papers also are included in this section. Other organizations, regrettably, may have been overlooked. This is not surprising because interagency communication has heretofore been limited, and because forestry enters into many fields in unexpected ways. Our apologies to those who are involved in forestry research and were not asked to participate in this first conference. If you write to:

Dr. F. Owino, Secretary
National Workshop on Strengthening
Forestry Research in Kenya,
University of Nairobi
P. O. Box 30197
Nairobi

he will see that you are properly advised on future developments in the field.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS

at

B.A.T. KENYA LIMITED

by

Mr. G.W. Gaitho 1/

Tobacco growing in Kenya was started by B.A.T. Company in Eastern and Central Provinces in the late 1930s, and was introduced in Nyanza and Western Provinces in 1974 as a crop for small scale growers.

Methods of curing tobacco

Three types of tobacco are grown by B.A.T. (Kenya) farmers, namely flue cured, fire-cured and burley. The main differences, other than variety differences, are the ways in which the tobacco is cured (dried).

Flue-cured tobacco is traditionally cured by passing heat through a system of flue pipes, laid in a curing barn, which in turn heat the air around them. In Kenya, the heat required to cure this type of tobacco is obtained from fuelwood.

Fire-cured tobacco is cured by suspending the leaf above a smoky fire, lighted in pits located inside a barn. Fuelwood is also used to carry out the curing.

Burley tobacco is air cured and has no requirements for fuelwood.

Tree Planting Programmes

When B.A.T. (K) Ltd. embarked on a tobacco expansion programme in the early 70s, the areas were selected on the basis of suitability of tobacco growing and availability of

1/ Forest Specialist B.A.T.

indigenous trees. At first the farmer got his fuelwood from his or his neighbour's land. Very soon B.A.T. Kenya realised that this source was not going to last forever, and therefore saw the need to create an alternative source. Each tobacco growing area then started its own tree nurseries from which tree seedlings were given to farmers at highly subsidised cost. The tobacco farmers were required to raise at least 3,000 trees each. The Company has nine tree nurseries which are located within tobacco growing areas. Annual nursery production averages nine million seedlings. Farmers have also been encouraged to establish their own small-scale tree nurseries for their planting. The Company has also leased County Council land, mainly on hill slopes, for afforestation.

Also in conjunction with the local administration, B.A.T. continues to plant trees on public places (e.g. schools, market places). In September 1982, B.A.T. Kenya sponsored a joint workshop with ICRAF in Nairobi entitled "Agroforestry Systems for Small Scale Farmers". As a result of findings of this workshop, the Company has diversified into several tree species with multi-purpose use (e.g. fuelwood, fodder and soil improvement).

In May this year, the Company decided to sponsor a comprehensive appraisal of its afforestation programme in tobacco growing areas. The Department of Forestry of the University of Nairobi was requested to carry out the exercise.

Our research and training centre at Malakisi continues to conduct research on energy conservation through advanced barn and furnace designs.

Research Needs

1. Species selection

Rainfall in tobacco growing areas ranges from 550 mm to 900 mm in Eastern Kenya and approximately 1200 mm in

Western Kenya. Soils are variable. The suitability of different tree species in these areas needs further investigation. Fast growing tree species with ability to coppice, of high calorific value, and not susceptible to termites are sought.

2. Termite control

Termite damage to trees, especially Eucalyptus, is prevalent in the dry eastern and central parts of the country. Use of Aldrin and its derivatives to control termite attack is not allowed by the Company. Other controls are needed.

3. Agroforestry

Further research is required in the area of agroforestry. Research on planting designs is particularly desirable, as the available land for crop production is getting smaller and smaller.

4. Energy Conservation

Although we have researched several furnace and barn designs, further research will be required if we are to reduce consumption of fuelwood used for curing tobacco.

5. Other Sources of energy

To reduce the amount of wood cut, other sources of fuel should be sought (e.g. use of agricultural wastes such as cotton stalks, charcoal wastes and grass).

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS OF CARE-KANYA

by
Mrs. Louise Buck 1/

Research Needs

CARE-Kenya is currently preparing to launch its Agro-forestry Extension Project in Nyanza Province. The project's aim is to support and promote tree development initiatives by farmers and community groups in order to effect household level adoption of appropriate agroforestry techniques. CARE's agroforestry extension team will cooperate with the Kenya Forest Department, District and local representatives of other concerned ministries and with various regionally operative non-government development organizations to:

- 1) identify locally-specific agroforestry needs (i.e., farming system production problems addressable through agroforestry).
- 2) generate and evaluate appropriate agroforestry designs.
- 3) effect implementation/adoption of the techniques, initially on a trial basis.
- 4) monitor performance under alternative management regimes.
- 5) evaluate developments, modify designs and broadly extend the most promising options.

CARE's perspective on forestry research needs, thus, is shaped by this project's technical information requirements.

From CARE's point of view, research topics in need of early attention include:

- 1) Selection of indigenous, fast growing, nitrogen-fixing species adapted to agroclimatic and soil zones within the region.
- 2) Optimum propagation and establishment methods, as well as management techniques for indigenous, leguminous, woody species to provide maximum user access to the soil-improving nitrogen.
- 3) Selection of indigenous, fast growing, multi-purpose firewood-producing species adapted to the area, as above.
- 4) Development of optimum spacing and management strategies for securing maximum on-farm wood production, with minimum crop competition, from indigenous, multi-purpose, locally adaptable fuelwood-producing species.
- 5) Adaptation and growth performance in respective A-C areas for the most promising among the popular exotic, fast-growing, multi-purpose agroforestry species.
- 6) Documentation of seeding cycles for indigenous, agroforestry suited species on basis of A-C zones or another appropriate geographical classification system.

As the agroforestry project becomes operational at field level, the list will become translatable into more specific research objectives.

Potential Research Role

CARE-Kenya is involved already in supporting research related to the last mentioned topic above. In direct collabo-

ration with KENGO and Mennonite Central Committee (MCC), and in association with the Kenya Forest Department and KARI, CARE is committed to the development of a Kenya Seed Directory Handbook. CARE provides a full-time researcher for this effort, whose aim is to identify the locations of potential seed sources for up to 100 promising agroforestry-suited species in Kenya. The first edition of the Handbook is intended to serve as the base for a nation-wide tree seed information exchange for the benefit of rural tree development initiatives. A specific aspect thereof should be documentation of seeding cycles, nation-wide, for species entered in the Directory. Subsequent volumes of the Handbook will expand the list of species included, identified sources, and seeding habits.

Over the next three years, CARE, through its Agroforestry Extension Project, intends to assist directly in the establishment of over 60 small scale, locally-operated agroforestry tree nurseries. Associated with each of these will be "trial demonstration" farmers who will receive advice directly and indirectly from CARE's extension team on the establishment of appropriate or "best bet" agroforestry systems. As part of the project, these trials will be monitored by local participants, by the extension team and by independent evaluators. The project offers substantial potential for addressing most of the research topics enumerated above, at least on a limited basis.

CARE-Kenya's agroforestry project is not primarily a research project. However, it includes potentially important research dimensions. So that these may be most profitably exploited by the Kenya forestry research community, it is suggested that early and consistent co-ordination between CARE and appropriate research agencies be effected. Clearly, the present workshop is a timely opportunity in this regard.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS

OF THE

EAST POKOT AGRICULTURAL PROJECT
KOSITEI CATHOLIC MISSION

by

Mr. Michael Long

General Introduction to the Area

East Pokot is situated in the northern end of Baringo District in Rift Valley Province. Rainfall varies throughout the area, but the average is between 500 - 600 mm. Vegetation consists for the most part of Acacia thickets and scrub brush, such as Acacia brevispica, mellifera, reficiciens and senegal.

There are also some taller woody species which include tortilis, eliator, Terminalia spinosa, Tamarindus indica, Balanites aegyptiaca, brownii.

The area is inhabited by the Pokot. These are a pastoral people whose livestock consists of cattle, camels, goats, sheep and donkeys.

The Pokot have a very good knowledge of their trees and shrubs. These they put to a variety of uses from house building to feeding livestock and herbal medicine.

Project Involvement in Trees in East Pokot

In 1978, Kositei Tree Nursery was started with about 1,000 seedlings of nine different species. This number has

increased gradually to its present level of about 15,000 seedlings, consisting of about forty different species tried to date including both indigenous and exotic species and provenances. The trees were selected in the hope that they would serve one or more useful purposes when mature such as animal forage, fuel, fruit and building timber. Tree seed sources have included the National Christian Council of Kenya, Katumani Dryland Research Stations, Baobab Farms (Mombasa), Ben Gurion University of Neger, Israel and Dr. K.M. Ibrahim, F.A.O., Kitale. Seed from indigenous trees was collected locally.

At the nursery, all seed is planted in black perforated polythene bags. A mixture of soil and sand is used at a rate of 4:1. No fertilizer is used. All seed is direct seed in the bags, but seed pre-treatment varies.

Seed pre-treatment methods used by the Project include hot water scarification, concentrated sulphuric acid and physical scarification (using nail clippers).

Of these methods, the breaking of the seed coat with nail clippers has proved to be the most successful. This has given 70% germination, which tends to be even and quick.

A number of varieties do not require pre-treatment. Shade is provided for the young seedlings. This shade is gradually removed to harden them off prior to planting out. The planting methods used by the project are designed to help seedlings get established and to help young trees overcome long dry spells. Tree planting holes are prepared well in advance of the rains, January to February. Holes are 60 x 60 cm. A bund 25 cm. Long and 25 cm. high is placed at the lower side of the hole to prevent run-off. Seedlings are planted after the second or third shower of rain. By then, the earlier rainfall will have soaked into the soil, where it can be absorbed by the young seedlings. Subsequent rainfall is also impounded in the tree micro catchment. Tree planting in project plots is at a spacing of 6 m x 4m.

Of the total number of trees planted in the area by the project and by private individuals, the survival rate is estimated at about 30 per cent.

In 1980, 120 fruit trees were sold locally for out-planting by residents. These included oranges, mangoes, and pawpaw. People were advised to water them. Over the last several years, people have taken trees mainly for planting around their homes. The most popular ones are: Cassia siamea, Azadirachta indica, Eucalyptus camaldulensis and Leucaena leucocephala. Trees also showing promise for the area are: Cassia Sturtii, Prosopis chilensis, lalousericea, tortilis, aegyptiaca, atriples nimularia.

In 1983, over 12,000 trees were planted by the people. Also, a forage block was planted by the project. It consists of four varieties. Chilensis, aegyptiacea, sturtii and albisia amara.

In all, 1,740 trees were planted, at a spacing of 4m x 4m. It is hoped that, after three to four years, this block will provide dry season forage for animals.

Agroforestry involves the crops demonstration garden in which four varieties of forage trees have been planted: leucocephala, chilensis, juliflora F2, and Sturtii. These trees have been planted along the terraces constructed to impound run-off. So far, only the leucaena planted in 1980 and 1981 was cut in February to a height of 45 cm. But it has since re-grown to a height of about 2.5 metres.

Also, two gardens have been fenced using live fencing. One has been planted with Euphorbia tiracali, which was quick to establish itself. The other garden was planted with a combination of Ziziphus mauritiana, ziziphus mucronata, and acacia mellifera

Ziziphus mauritiana had a mortality rate of about 40 per cent while the other two performed a bit better, with about 25 per cent mortality.

This year, tree nurseries were started in six primary schools in the area. Each school was supplied with 600 plastic bags and four varieties of tree seed. All the work was carried out by the children. At present, these schools have a total of about 2,000 seedlings for planting around their schools and homes.

Forestry Research Needs

Forage Trees:

The forage block, planted by the project this year aroused a lot of interest locally. It is something that has a lot to offer in an area such as Pokot.

More information on the feeding value of various fodder trees would be very useful. With such information, a forage block could be planted with a combination of trees which would produce a maximum amount of feed as well as a balanced diet for livestock, assuming that a variety of forage trees will grow in the area.

Seed Bank.

It would be useful to set up a seed bank where people could buy or sell suitable seed. Such a centre would provide information on the various seed types in stock. This information would include a summary of experience with particular trees and shrubs, outlining successes and failures.

Local Medicine

The Pokot have their own forest remedy for just about

every ailment. Patients are given medicine containing either the bark, roots, fruit or leaves of selected trees depending on the complaint.

This practice may or may not be very helpful. More information on the actual medicinal constituents of these trees/shrubs would help to clarify the ones that are useful and the ones that are not.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS
of the
EMBU MERU ISIOLO FORESTRY PROJECT

by
Mr. Gordon Armstrong 1/

1. General Description of the Project

The Embu Meru Isiolo Forestry Project aims to improve the services of the Rural Afforestation Extension Scheme of the Forest Department in the three districts. Emphasis is given to the arid and semi-arid area. Assistance is being given by the British Government (ODA) to improve and expand existing extension nurseries and to construct a total of seven new nurseries. Extension services are to be improved by giving lectures and general advice to chiefs, farmers, women groups, etc., and by training a group of nursery extension workers who will follow up seedlings sold from the nurseries. The project is also aiding the demarcation and protection of the many hilltop Forest Reserves, and small fuelwood plantations are being established within some of the reserves.

The project has been operational for one year and continuation for a further two years is currently agreed between the two governments. The total budget of the project is over K£500,000. Good progress has been made on the physical side of the project. Five of the new nurseries are already in production, and much of the proposed reserve protection and planting has been done. Attention is now being focused on the training and extension side.

2. Research Component

The project concentrates on arid and semi-arid areas of the three districts. These areas are where the most serious problems of deforestation, overgrazing and soil erosion occur, and

1/ Silviculturist

where the Forest Department has done little work in the past. When the project was being set up it was recognized that the Forest Department lacked knowledge and experience in dry land afforestation. A research component was therefore included in the project to investigate suitable species and silvicultural techniques. To carry out this work, ODA provided a silviculturist (Mr. G. Armstrong), and a silvicultural assistant (Mr. J. Lugadiru) was transferred from K.A.R.I.

3. Current Research Activities

The research work has concentrated so far on species trials on various sites with E.M.I. A wide range of both exotic and native species is being tested. The main aim is to identify species which can survive and grow in these conditions and which can provide fuelwood, poles, fodder, shade or assist in soil conservation. They should be suitable for planting by farmers, schools, community groups and other non-professional people. Species raised so far include 21 species of Acacia, (including six natives), 40 species of Eucalyptus (including 10 provenances each of E. camaldulensis, E. microtheca and E. tereticornis), 10 varieties of Leucaena, four species of Prosopis, seven species of Casuarina and a number of other species in the genera Albizzia, Atriplex, Azedarachta, cassia, Melia, Parkinsonia, Schinus, Tamarindus, Terminalia and Ziziphus. The trial sites range in altitude from 2,000 ft ASL (Marimanti Meru) to 5,000 ft. (Kuani, Meru). There is a corresponding range in mean annual rainfall from approximately 450 mm to approximately 1,000 mm. Rainfall at all sites is extremely irregular and unreliable. Soil types covered include deep sandy soil (Gangara, Embu) - deep red loam (Kuani, Meru) eroded, indurated red soil (Marimanti, Meru and Isiolo). Some of the trials are also designed to compare different methods of site preparation such as pitting with microcatchments, pitting without microcatchments, pitting with terraces and deep cultivation by bull dozer. Two trials have already been planted out, and a further five are to be planted out this month during the rains.

Also to be planted out this season is a series of five trials designed to test the survival of seedlings raised in different sized tubes.

Investigations of indigenous species are also being carried out. Seed of 20 species have been collected, and some of these have been raised for inclusion in the trials. A few native species (e.g. *Melia volkensii*, *Terminalia brownii*, *Terminalia spinosa*) have proved difficult to raise in the nurseries, and further investigations on these are being carried out on our behalf by Dr. D. Taylor of the Botany Department of the University of Nairobi.

4. Future Studies

In the future, it is hoped to give more attention to nursery factors such as soil, watering regimes, shade, hardening off, etc. This work should culminate in the production of a nursery manual giving recommended techniques for dry zone nurseries. Species and establishment trials will be measured and evaluated, and it is planned to set out 'farm' demonstration plots of the more promising species. (A limited number of such plots will be planted out this season by the E.M.I. Soil and Water Conservation Project).

A further species trial is to be planted at one of the irrigation schemes in Isiolo district, and it is hoped to test a few 'new' high productive species at a high rainfall site in upper Embu.

Investigations will continue on the uses and silviculture of native species, and it is hoped to improve the collection, storage and dissemination of seed within the project area.

5. Collaboration with other Agencies

Other agencies have recently started on similar work in similar areas, e.g. Kerio Valley Development Project, the NORAD project in Turkana, the FAO project in Baringo, the Mazingira Institute and KARI, and we look forward to exchanging ideas, and sharing problems and results with those organisations. We feel that it would of great value if a formal forum could be set up to encourage collaboration between agencies rather than the 'ad hoc' contacts which have taken place so far.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS

of

KENYA FOREST INVENTORY, FORESTRY DEPARTMENT

by

Mr. Paul Wachiori 1/

Introduction

The section was started in 1963 with Canadian financial and personnel aid through the Kenya government. After working for a period of about six years, the Canadian foresters handed over the office to their Kenyan counterparts in 1969.

The central objective has been, and continues to be, to maintain continuous inventories in all forested areas for better management of our forest resources.

Activities

1) Indigenous Forest Inventory

We carry out the inventory in all gazetted forests in Kenya to determine the quantity and quality, by volumes, of the indigenous species. Maps 1: 25,000 scale and reports have been produced.

2) Mangrove Forest Inventory

The inventory also has been carried out in the Coast (i.e. Lamu Mangroves) to determine the quantity and quality of the poles by their cutting classes. Maps and reports have been produced.

1/ Officer in Charge Inventory Section

3) Plantations Inventory

A) Management Inventory

Plantations which are 10 years and older are inventoried to form the basis for management plans in the most active areas.

B) Sale Cruise Inventory

- i. From 1978, the Forest Department started selling standing volume to the Panafrikan Paper Mills (E.A.) Ltd. for the three major species, i.e. Cypress, Pinus patula and Pinus radiata. Volumes to be sold are assessed by the section.
- ii. The stumpage appraisal has now been started which will cover all sawmillers utilizing cypress and pine species.

C) Permanent Sample Plots

A permanent sample plots programme was started in 1956 for growth and yield studies of exotic species in different climatic zones.

Data Analysis

We used to analyse our data by ordinary calculators. Some of the data were sent to Canada for computation. At present, we analyse data through the Kenya Government Treasury Computer except for the Permanent Sample Plots data which are analysed at Oxford.

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FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS
KENYA FORESTRY COLLEGE, LONDIANI and
EGERTON COLLEGE, NJORO

by

E.A. Ochieng, G. Carlton, W.N. Akinga 1/

Forestry research in any country is vital if maximum land productivity is to be attained to match the ever growing population. While some of the factors of production remain constant, e.g. land, there is every opportunity to improve on yield and quality of a forest crop. To achieve such improvement, there is need to have all the supporting machinery which includes person transport and finance availability. The two colleges have the first two inputs but lack finance.

The two institutions of learning have highly trained teaching staff, and a large number of competent pre-service and in-service diploma students who can be used to supplement forest research in the following fields:

Surveys

- (a) For rural afforestation schemes to be successful, there is need for research in areas with poor tree cover to determine what tree species can be effectively grown. The tree species chosen for a particular area should be able to meet the demands of the local people. There should be mutual understanding and respect between the local villagers and forestry staff if there is to be agreement on the selection of suitable tree species.
- (b) Rural tree planting has been going on for over ten years, but little progress has been achieved on the ground in some districts. This has been due to:
 - (i) Lack of suitable species.
 - (ii) Poor planting techniques.
 - (iii) Planting during unfavourable climatic conditions.
 - (iv) Poor protective measures taken by the local people, etc.

1/ Principal, Londiani; Head of Forestry Department, Njoro and Deputy Principal, Londiani respectively.

There is need to carry out surveys to determine where failure lies and to take corrective measures. Even if we continue raising a sufficient number of seedlings, without monitoring and evaluating what has been planted in the past there is no hope of improving much on the survival of seedlings.

- (c) Demand for forest products such as charcoal, poles and fuelwood is ever rising. There is need for foresters to continuously assess this demand so that the local people can be advised on how best to utilise these forest products without much extra expense. Some surveys have been carried out on fuelwood consumption but not on the supply side.

Sawdust is abundant in many areas. Its utilization as a source of energy for rural households needs to be looked into very seriously.

We believe that the students at both Egerton and Londiani can competently carry out surveys in these areas during their 2-month annual vacations. Most of them have been exposed to statistical techniques for collecting such data. Therefore, with the cooperation of the research section and the field staff, they would, unlike field staff, collect reliable information knowing that such research programmes form part of their academic grading.

Silvicultural Research and Seed Production

Londiani Forestry College has a 4,000 hectare training block. Egerton College is using Terer forest block which is just as large as the Londiani block. Kenya Forestry College could be utilized in silviculturally related research as a number of silvicultural trial plots have been established there since the 1950's. Egerton College could be used to supplement silvicultural and agro-forestry related research. The staff and students of these two institutions would provide the human source required for such research. Support would be needed for transport and stores.

Both institutions are capable of carrying out studies on local collection of seeds for rural nurseries, e.g. where seeds of certain tree species have to pass through the alimentary canal of a goat, we could carry out studies to devise a similar, quicker external treatment of the seeds.

Wood Utilization

Our forest resource is really becoming scarce due to high demand from the ever increasing population. Better utilisation of this resource is of paramount importance to the nation, sawmiller and consumer. Studies on sawmilling industry are therefore essential.

Both Egerton and Londiani Colleges are near very large sawmills, i.e. Amalgamated at Nessuit, and Sorget at Londiani. The staff and students of these institutions could supplement the work of the utilisation section by conducting research on the following:

- (a) How to improve timber recovery.
- (b) Better use of sawmill waste.
- (c) Seasoning defects and how they can be overcome or corrected.
- (d) Advice on best sawmill layout for small sawmillers, reducing logging costs, organisation of cutting crews, and maintenance of sawmill equipment and their protection.

Several diploma students have already carried out studies on timber recovery, logging costs and timber seasoning of various species in some sawmills within Londiani as part of their academic grading. Some of these studies are really valuable.

Watershed Management and Soil Conservation

Most of the rivers flowing from the forest are becoming siltier.

There is need to establish the extent to which present logging, or road murrum excavations, clear felling of indigenous forests, overgrazing and other production techniques have contributed to this situation. Since the two institutions are situated near the major catchments for most of Kenya's rivers, these problems could be monitored by the staff and students.

Similarly, the effect of changing vegetative cover from indigenous to exotic should be under continuous study. The two institutions could assist in monitoring these aspects.

Work Study or Operational Research and Agro-Forestry

In most of our forest operations it is accepted that labour productivity is going down, although the reverse is expected. Studies need to be carried out to find out where the snag lies. Studies on economics, tool maintenance, social-economic status, walking distances to places of work, overall forestry supervision, etc. are urgently needed.

Also, the subject of agro-forestry is discussed frequently but much on-the-ground research is still needed. Studies on the effect of espacement of trees on distribution and quality of animal fodder, or on the yield of various food crops, need special attention as there are some areas in the country where pure tree planting cannot be practiced. There is need to carry out studies on the effect of certain fodder tree species on livestock as far as meat production is concerned.

We suggest that the following areas need special attention:

- (i) Study of small sawmills around Elburgon, Nessuit, Londiani, Maji Mazuri and Bahati forests.
- (ii) Water catchment and soil conservation around Maus and Tinderets and Mt. Elgon forests.
- (iii) Rural tree planting in marginal areas and settlement schemes.
- (iv) Agro-forestry practices in Kenya highlands and marginal areas.
- (v) Work study methods in selected forest areas throughout the country. Silvicultural research also is urgently needed as new forest product industries require different qualities and quantities of similar wood species, e.g. plywood vs. pulp and paper use of pines.

Conclusion

The two institutions can competently be used in forestry research provided funds for transport and stores can be made available.

We are convinced that if our young officers were exposed to the principles of research, and an interest created in them for investigation, they would serve the department well when they went into the field. There has been limited meaningful participation of our students in research activities. The reason is probably because our Colleges have not always been regarded as research institutions. If the lecturers are given assignments to investigate pertinent forestry problems, they will undoubtedly interest their students to be involved in similar investigations.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS IN FOREST ENTOMOLOGY

at

KARI

by

T.C. Aloo 1/

Forest Entomology is the study of insect damage to forests and forest products.

Numerous problems beset the trees before they reach maturity. These range from nursery pests (mainly scale insects, defoliators and cutworms) to pests of transplants (mainly termites) to defoliators which feed on almost all stages of the growing tree. There are also pests of the growing wood and those of wood in use, for example beetles and termites.

The Entomology section over the years has been involved in forest insect surveys and identification. Biological studies on life histories and ecology of various pests have also been undertaken in order to yield information on mortality factors to enable the Entomologist to base recommendations for control on sound scientific findings.

The present cultural and silvicultural practices in cypress plantations to control Oemida gahani were based on such studies. The biology and ecology of the woolly aphid, an introduced pest, has been well studied. Life history studies of a number of defoliators and elucidation of their natural enemies, e.g. predators, parasites and disease organisms, has been covered.

1/ Forest Entomologist

Our survey efforts have resulted in a well stocked museum of forest insect pests and an accumulation of information on those pests. Such information should be invaluable to anyone trying to produce a Kenyan Forest Pest hand book, which I think is long overdue.

The Forest Entomologist also gives advisory services to the general public and the foresters in the field. This has often involved direct supervision of spraying operations and other control measures.

Current Research Problems

The biggest insect problem that faces the Kenyan forest is that of termites. This has become more acute because of the present expansion of plantations and agroforestry into the arid and semi-arid regions. The problem is serious, as the available insecticides for the control of termites are environmentally objectionable. The solution to this problem lies in the setting up of a research team to work on various aspects of termite ecology and the part they play in the tropical forest ecosystem, besides finding methods of control which would be free of dangerous chemicals. It is a pity that the only centre in Africa (International Centre of Insect Physiology and Ecology (ICIPE)), which was conducting research on termites had to terminate its programme due to lack of funds.

There is a constant threat from introduced pests as evidenced by the successful establishment of the Pine woolly aphid on our pines. Recently, the Australian Ctenarytaina eucalypti, though not a serious pest, was found firmly established on our Eucalyptus. We are studying controls for termites and woolly aphid, but if the department is to intercept such pests before they cause much damage, it will need the services of a taxonomist to be in charge of forest insect surveys and identification services. Such a person would also carry out damage

appraisals. This is important because, as resources are very limiting, control measures should only be undertaken after such appraisals.

In arid and semi-arid regions, besides termites, there are problems of scale insects and aphids. The study of bark beetles and wood borers though actively pursued in the past has been temporarily halted due to lack of expertise in this specialised field.

Zoology

Non-entomological pests include rodents, monkeys, elephants and buffaloes. It would be useful to find out why certain species of trees are more favoured by these pests than others, and also to develop economic methods of control. For example, is the digging of moats the most economical way of keeping big game away from plantations? On the other side of the coin, what is the effect of exotic plantations on the species diversity of some of our small mammals and insects? The department needs a zoologist or, alternatively, a stronger cooperative working relationship with specialists in the Ministry of Wildlife and Tourism.

Advisory Services

Most of the advisory services rendered this year have been to people with ornamentals. This is understandable since a man with one or two trees loses everything if his tree dies. Kenyans are beginning to value their trees highly. Recently, someone travelled all the way from Siaya to consult us on pest problems.

Under this category of ornamentals should be placed our nationally valuable ceremonial trees. This year we have been busy treating the "Uhuru tree" planted by Mzee Kenyatta at Independence in 1963. The trees planted by other dignitaries

and by His Excellency President Daniel Arap Moi both at Uhuru Gardens and Ngong Hills also need constant surveillance and treatment against insect pests.

We have, in the past, been called to treat ceremonial trees in Muranga planted by the late President, and trees planted in 1952 by the Queen and her husband Prince Phillip. The people looking after such trees attach great sentimental value to them. One has to deal with them very diplomatically especially where the pests don't warrant much attention.

This therefore calls for a setting up of separate advisory services unit which should be manned by people versed in ornamental Entomology, chemical control and public relations. In fact such a unit could be interdisciplinary.

Constraints

The biggest constraint the division faces is lack of trained manpower in the necessary field. The staff position at present is one Forest Entomologist with a B.Sc and M.Sc. and one B.Sc holder away on studies which will lead to an M.Sc. The advisory services provided by the department in chemical insect control, would be greatly improved by appointment of a trained toxicologist in charge of a team of technicians well versed in the handling of pesticides. The funds provided are usually not sufficient to cover such services as well as research. There is also greater need to provide continuing education to both technicians and researchers in the various research methods so that they acquire new skills. This should be in form of short courses or short attachments to different laboratories.

Co-operation with Other Institutions

If research in all these aspects is to be conducted adequately, strong links with well established research bodies

in different parts of the world is desirable. Such co-operation should provide forums for information exchange, experience sharing and interchange of scientists. It should also provide collaboration in research. Among the institutions which could help in this respect are:

1. Centre for Overseas Pest Research
2. International Centre of Insect Physiology and Ecology.
3. University of Nairobi Department of Forestry.
4. University of Nairobi Zoology Department
5. Forest Pest Management Institute, Ontario Canada.
6. Institute of Forest Research and Protection, Australia.
7. Kenya Rangeland Ecological Monitoring Unit.
8. Commonwealth Forestry Institute, University of Oxford.
9. International Centre in Research in Agroforestry (ICRAF), Nairobi.
10. Bee Research Section, Ministry of Agriculture and Livestock Development.

The list is not exhaustive. There is also a need for stronger inter-departmental communication, both horizontally and vertically.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS
IN FOREST ECOLOGY

AT

K.A.R.I.

by

B.N. Kigomo 1/

The Forestry Ecology and Soils section is mainly involved in research investigations relating to management of natural forests. It also takes strong research interest in appraisals of forest nature reserves and protection of endangered, rare or dwindling tree and shrub species as outlined below:-

1. Silvicultural and ecological studies in Moist Montane Forests and Sub-Humid Lowland Forests. This includes problems relating to:-
 - (i) Performance of trees of economic and ecological importance in in-situ (inviolable) Tropical High Forest (THF) and Dry Equatorial Tropical Forests (DETf) - (Life history studies).
 - (ii) Investigations of natural regeneration in closed forests - to improve regeneration in natural and plantation forests, e.g. Cedar, Vitex, Olea.
 - (iii) Enrichment trials - line, under and shelterwood planting in THF - initial pilot trials in Kakamega and South Nandi forests. Further enrichment trials in these two forests have been proposed.
 - (iv) The management and performance of trees in treated THF - through temporary and permanent sample plots.
 - (v) Endangered species (data and protection) - relation of the species to the habitat and to the community, e.g. Vepris glandulosa (Syn. Tecleopsis glandulosa)

1/ Forest Ecologist

in Muguga Nature Reserve.

(vi) Appraisal of Forest Nature reserves - islands or isolated patches of trees and shrub communities that may be unique survivors. Community interpretation in terms of species composition and diversity through phytosociological studies, e.g. Muguga Nature Reserve.

(vii) Taxonomic studies of selected tree and shrub species.

2. Silvicultural and growth research on selected indigenous commercial species.

- A follow up of 1 (i) above. Ongoing studies on profitable recruitment of species such as Cedar Mutere, Meru Oak, Podo and Camphor, in plantations, exist in sample and permanent sample plots.

3. Research on management of Bamboo, Arundinaria alpina and introduction of exotic bamboo and rattan palm species. This new project has been triggered by the need to manage the few remaining stands in perpetuity, by a current shortage of handcraft raw materials and by the need to bring bamboos and canes, with their multipurpose uses, as near as possible to the semi-arid and coastal populations.

Investigations will aim at determining satisfactory and profitable methods of felling bamboo culms and subsequent regeneration and treatment after felling; testing performance of exotic bamboo and rattan palm species on wet and semi-arid eco-zones of the country; selecting those which show greatest potential for local cultivation; and experimentally determining the best nursery and field planting methods in different eco-zones.

4. Study on the ecology and feasible silvicultural management of mangrove forests

A new project in proposal status. This rapidly dwindling commercial mangrove situation is well known to most practicing foresters, and especially to our inventory officers at Karura. The objective is to study regeneration and development of Kenya coastal mangrove forests in pursuit of a proper management system.

The project intends to look into problems relating to:

- current distribution where undefined;
- modes of regeneration and succession in the mangrove ecosystem;
- inundation frequency, soils and water properties at varying mangrove zones;
- growth potentials, through growth and yield plots (PSP), in an attempt to achieve a feasible expansion, where possible, of the mangrove crops on the Coast of Kenya.

FOREST PATHOLOGY IN KENYA

by

L. M. Mwangi

INTRODUCTION:

Forest Pathology deals with the research investigation, diagnosis and eventual treatment of forest trees diseases. The objective is to carry out experimental work in identifying the causative agents of the diseases affecting our trees in all stages, from the nursery to the plantation stage. The causes of such diseases could be pathogenic i.e. involve fungi, bacteria or viruses or could result from non-pathogenic (environmental) factors. Both these causes are important in any diagnosis of disease problems associated with forests.

The Forest Pathology Division's aims and objectives are geared towards a wider knowledge of the disease problems in Kenya through research investigations, diagnosis, control and subsequent forest protection against diseases. This will go along to protect and conserve healthy forest trees for future exploitation. The division also carries out surveys of forest diseases and offers advisory services on disease problems and implementation of control measures to curb the spread of dangerous diseases.

RESEARCH ACTIVITIES:

Timber Decay

This experiment involves testing of five commonly used Eucalyptus timber for natural resistance to decay. Assessment are made on the degree of fungal attack since the fungi play a greater role in wood decay. The results of this experiment should give a reflection of the natural durability of timber. There now exists a danger of fungal attack on converted timber. It is believed that resistance to fungal attack and eventual decay of timber may differ from species to species.

Mycorrhiza Research

Research on mycorrhiza is aimed at development of viable ectomycorrhiza in nodule for subsequent inoculations into Pinus species e.g. P. caribaea for forest establishment in the semi arid and lowland coastal areas. Establishment of Pinus species has been hindered by the adverse condition in these areas. It is believed that with proper ectomycorrhiza associates in symbiosis the pines can be grown successively in these areas. Experiments are being made to raise the inocula under conditions exist that in such areas for subsequent inoculation trials.

Resinosis of Pinus radiata:

Investigations into the problems of resinosis in P. radiata plantations have been initiated. The problem of resin exudation in these species have been thought to be as a result of several causes. One of them is of fungal origin suspected to be Diplodia sp. but it's not certain of it's causative role and possible mechanism. It is hoped that this series of experiments will provide the answer and enlighten on the control measures to be adopted.

Disease of Grevillea Robusta:

This is a newly recorded disease whose symptoms are resin exudation from the tree sap-wood followed by death after six months. The cause is being investigated. G. robusta has become an important species not only for fuel and timber but also for agroforestry practices. Canker, and Diplodia die-back continue to plague our already established forest plantations. Effective control measures and/or resistance trials should be implemented to curb their spread. Surveys are essential to identify existing and check introduction of exotic disease into our plantations.

Advisory Services:

These have been centred on cases of disease problems reported from the field stations. It have involved diagnosis of both nursery and plantation diseases in forest stations around the country. Several specimens also come to the farmers in the country side with the more increasing

planting of trees in individual farms. Relevant information and advice is relayed back to those concerned.

Co-operation in forestry research:

Co-operation between research institutions is needed both internationally and regionally for proper dissemination of information, collaboration and coordination of research activities. Liaison with already established research centres should be encouraged to deal with disease problems and research. If all the forums for cooperation and coordination in research are exploited, then research problems could be talked and problems solved for a better future of forestry.

FOREST PRODUCTS RESEARCH

by

F. M. Nganga 1/

Involvement of the Forest Department in forest products as part of overall forestry research is as old as the department itself. Nearly thirty years ago the department established a post of a Utilization Officer to deal with matters relating to forest products, including research. Over the years, as the department expanded, the duties of the Utilization Officer narrowed down more and more to research. By the 1970's a decision was made to develop a research laboratory at Karura. For a period of seven years preceding 1981, slow development of a laboratory did take place.

Important activities of the division include:

1. Sample Collection of Kenya Grown Timbers: For more than a decade a collection of various timbers has been built up. The aim is partly to establish a reserve of representative samples at hand for each type of timber and partly to accumulate technical data about each timber from both field and laboratory measurements. Records are kept for each tree from which logs are sampled. Subsequently observation and measurements are made on the timber:
 - (i) during initial conversion, i.e. logging, sawmilling and air seasoning.
 - (ii) in respect to wood characteristics, namely moisture content including moisture meter corrections, density, shrinkage intersection points, and basic strength of small clear specimens.

At the end of seasoning observations some of the timber is made into educational specimens, some is selected for specific tests, while still some other is put aside as reserve for future studies.

1/ Head of Forest Products Division

The collection so far is made up of over ninety species, both indigenous and exotic, but most of the species are represented in the collection by less than five trees.

2. Wood Microstructure and Physiology:

This is deemed to be extremely important in providing a practical understanding of the potentials of Kenyan grown wood. Although most of the essential facilities have been installed, the work has not taken off due to lack of laboratory technical staff. Besides purely anatomical microscopy the urgency of undertaking certain physiological studies such as, stem cracking of cypress has been recognized.

3. Plantation Softwood Seasoning:

Although there has been a long break since any work was done on seasoning improvement, it is recognized that seasoning defects are serious in both cypress and pine but particularly so in the latter. Our biggest constraint is that we are limited to drying timber in ordinary air as we do not have any serviceable kilns with which to try techniques such as solar or high temperature kiln drying.

4. Structural Timber Strength:

The basic equipment available is capable of most standard strength tests. However auxiliary attachments are limited to only a few tests. The work also suffers from unavailability of full time technicians. Consequently only four tests on the standard small clear specimens have been successfully developed. The four tests allow calculations of modulus of rupture, young's modulus of elasticity, crushing strength, shear strength, and Janka hardness. Based on adequate sample the results would serve broad strength grouping.

Testing of commercial sizes of timber is highly desirable to enable determination of reliable strength values according to structural grades and particular components, such as utility poles.

5. Durability and Preservation Treatments:

Work has been going on in this field for some years, first on dip-diffusion of sawn timber and later on preservation of fence posts. Good facilities have been installed but only for use with aqueous preservative solutions.

Treatment of fence posts has included sap-replacement, pressure impregnation with CCA salts, and pressure impregnation with creosote-oil solutions. In the trials eight wood species have been used. The work has lately stalled partly because of unavailability of the necessary analytical facilities and partly because of shortage of money for purchase of treatment materials.

The studies need to be extended to more wood species and to a wider range of preservatives. Besides preservation analyses, it is envisaged to set up field exposure sites for long term durability observation when the requisite continuity can be reasonably expected.

6. Extractives:

While intent has existed all along for studies on wood extractives, hardly any work has been initiated. Lately attention has been on tannins and gum arabic but the studies require chemical expertise which has yet to be found.

7. Wood Pulp and Paper:

In the past pulping trials have been carried out with the help of overseas laboratories basically to find suitability of trees proposed for cultivation as pulpwood. The results pointed to the need for further studies on the pulpwoods already in use with regard to site and plantation age effects.

Laboratory pulping facilities are totally lacking even if the manpower is available.

8. Fuelwood and Charcoal:

Work was recently initiated to measure various wood properties determining fuel values of both the raw fuelwood and the charcoal derived there from. One important aim is to assess suitability or otherwise of the local technology used for charcoal.

9. Miscellaneous Commercial Wood Manufactures:

This type of work is undertaken as the need arises. Usually it all starts with a request by an existing or a prospective manufacturer of one kind or another wood product, e.g. plywood, matches, sleepers etc. Our research role generally consists of suggesting candidate types of wood worth trying and providing sample materials for trial. Actual trials usually have of necessity been carried out by the interested manufacturer.

10. Round Wood Sale Measurement Systems:

Historically our service has been relied on by the Forest Department in setting measurement procedures for timber sale purposes. The service is continuous in that odd problems crop up now and then in different tree stands. In most cases nowadays the work is meant to qualify defective timber to serve as a basis for adjustment of the chargeable royalty.

11. National Standardisation:

For the period of one decade the Kenya Bureau of Standards has been in existence our division has been the leading contributor to standards relating to timber. Our contribution has consisted of not only participating at the technical committees but also background consultations which sometimes have included actual writing of the preliminary draft standards.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS
IN SEED PROCUREMENT AT FRD/KARI

by
B.N. CHIKAMAI 1/

General Information on Seed Procurement

The process of seed procurement is a joint commitment between the Forest Department in the Ministry of Environment and Natural Resources (MENR) and Forestry Research Department in K.A.R.I. In the latter, the division of Environment and Silviculture is charged with the responsibility.

The process consists of seed procurement of both exotic and indigenous species.

Seed procurement of exotic species

The most important exotic softwood species are Cupressus lusitanica and Pinus patula. Seeds for these species are mainly from seed stands and orchards which have been established in selected areas where they are mainly grown. Examples are Muguga, Elburgon and Londiani. In these areas, the flowering period for lusitanica is between December - February each year. Seeds are ready for collection from May - July the following year. Patula, on the other hand, flowers between March and May, and seeds are ready for collection from August of the following year to February of the subsequent year.

Collection is done under supervision of staff from Muguga, though in some cases foresters from the Forest Department are instructed by the Silviculturist to assist. Seeds for general plantation establishment are collected from all trees bearing them in the orchard, and this type of

1/ ASSISTANT RESEARCH OFFICER, K.A.R.I.

collection is called general collection. If a particular character is of interest, then collections are made from trees with that character. This type is called super-select. In general, during good seed years, about a bag of pine cones can be collected from one tree. After extraction and cleaning this gives about 500-900 gms of pure seed. For cypress half a bag is collected per tree and about 10-13 kgs. are obtained.

Besides exotic softwoods are the hardwood species represented by Eucalypts. Seed trees within the stands are selected from which collection is made. The type of collection is general, and is mostly done by foresters in the field. For instance, most of our seeds for E. saligna are from foresters in Nakuru, Kericho, Kiambu and Nyeri districts.

Most of the seeds obtained are brought to the silviculturist at Muguga properly labelled. Here they are dried in the drying beds to enable easy extraction. Clean seeds are obtained after screening. Cypress and pine seeds are stored in a cold room at 3°C, while seeds for Eucalyptus spp. are stored in cold polythene bags. On the whole, the seeds of these species do not require special pre-treatments.

Seed Procurement of Indigenous Species

In the past, little was done in this field, though it has received a lot of attention recently. Annual collection is carried out by foresters whenever the species occur in their areas. Extraction procedures vary from species to species. For some, like Terminalia brownii, no extraction is required. For others, like Tamarindus indica, the seeds need to be squeezed from pods before they are stored. Storage is in a cold room at temperatures of 3°C.

Most of these species have germination problems, and hence require pre-treatment. The type of pre-treatment depends

on the nature of dormancy. Prosopis juliflora seeds, for example, give high germination percentage following nipping. Others like Cassia siamea require no pre-treatment. Once the germination percentage has been established and seeds are known to be viable, they are then packed and made ready for dispatch to DFOs via the Forest Department headquarters. Some are sold directly to interested people and organizations.

Problems in Seed Collection and Supply

Most of the seed bearing trees are high, and collection requires the use of up-to-date ladders with proper locks. The types of ladders available are not adequate to serve the purpose, thus limiting collection to a restricted height. This is particularly so for some of the indigenous species that are not easy to climb.

Most of the collection is in the bush, which requires proper protection against snakes and falling branches. This limits the area where seed collection is done.

With the current stress on establishment of chief's nurseries and expanding rural afforestation programmes, demand for seeds has increased tremendously. Even the seed supply of Cupressus lusitanica, P. patula and P. caribaea has become inadequate. Worse still, the seed procurement program for species considered for use in agroforestry or for plantations in semi-arid regions is completely inadequate.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS OF THE
SILVICULTURE DIVISION FRD/KARI

by

C.K. KIRIINYA 1/

The Division of Environment and Silviculture of K.A.R.I. deals mainly with silvicultural techniques for improvement of tree productivity in quality and quantity. In the past, silvicultural research and forest development have been mainly confined to forests in the high potential areas. As a result, very little information is available on suitable species and techniques of planting in the low altitude, arid areas - and only very limited development has occurred, mainly tree planting in and around population centres under the auspices of the Rural Afforestation Extension Scheme. The National Development Plan for 1979-83 includes an arid and semi-arid forestry programme as a priority item, but to date little has been accomplished, mainly due to lack of research information.

The need for Research

For successful promotion of large scale afforestation projects, there is need for carefully planned and well directed research, first of all to guide the selection of objectives and the formulation of policies, and then to support planning and the implementation of plans.

Species and Provenance Research

The objective of this research is to select those species and provenances which are more productive and best

1/ RESEARCH OFFICER, F.R.D./K.A.R.I.

suited to various ecological zones of the country. Species and provenance trials provide some of the basic information on which policies concerning afforestation are made, and there are obvious advantages if such trials can be initiated well in advance of the time when important investment decisions have to be taken. While considerable progress has been made in the assessment of sites for planting by evaluation of geographic, climatic and edaphic factors, there are still serious limitations to the practical application of such techniques to select the species and provenances that are most suitable for a particular condition. There is no substitute, at present, for adequate species and provenance trials on typical sites as a base for large scale afforestation.

Currently there are two major plantation species (Cupressus lusitanica, Pinus patula) for the softwood planting programme, and this number is inadequate for long term health of the forest. For purpose of diversification it is important that species and provenance research is undertaken.

Regeneration (Establishment) Methods -

The objective is to investigate various methods of site preparation, planting and weed control which are cheap, environmentally acceptable and which provide successful establishment of the plantations.

Espacement, Thinning and Pruning Research -

The objective is to determine the optimum spacing, thinning and pruning regimes which are necessary to grow final crops of high quality.

Growth Studies -

The establishment of sample plots and permanent sample plots is to provide data on growth and yield on full rotation

for indigenous and exotic species (and provenances) which have shown promise during the species and provenance research phase. The information obtained is also useful in deciding silvicultural treatment of each species, once it is chosen for reforestation programmes.

Arid and Semi-Arid Lands Research-

The objective of this type of research is to select species (mostly multipurpose) which are most suited to drylands, and to develop suitable techniques for establishing (raising seedlings, planting and tending) them. Forest Research Stations have been built at Hola, Kibwezi and Ramogi to cater for this need.

International Co-operation in Forestry Research

The factors that must be taken into account in the promotion of large scale plantings are similar in most countries. If different countries and organizations took a similar approach to planning for afforestation, it could reduce both the cost and the length of time required to obtain essential, basic, technical information. In particular, the standardization of procedures for experimental work would facilitate international co-operation and the exchange of information to promote research on afforestation.

Species and provenance trials are an aspect of research in which international or inter-organizational agreement and collaboration are of vital importance to all participants. Formal international projects attract more interest and resources when based on a well argued case with clear objectives.

Appendix I gives a summary of some of the registered experiments, indicating the purpose, location and the date of planting.

(i)
APPENDIX I
FOREST PLANTATIONS MANAGEMENT

| Registered Experimental No. | Year of Establishment | Location | Objectives | Species | Remarks |
|-----------------------------|-----------------------|--------------------------|-------------------|---|---|
| 56 | 1951 | Molo 8A | Pruning | <i>C. lusitanica</i> | Needs clear felling and final measurements taken. |
| 63 | 1951 | Londiani Mt. Blacket 8L | Pruning | <i>C. lusitanica</i> | In 1984 DBH all tree, clearfell, volume and mill tests. |
| 105 | 1954 | Elburgon Kitiro 3K | Thinning | <i>C. lusitanica</i> | It has been felled. |
| 217 | 1960 | Molo 5E | Thinning trial | <i>C. lusitanica</i> | - do - |
| 236 | 1958 | Kinale 7C | Thinning trial | <i>Pinus patula</i> | Now seed stand |
| 246 | 1941/52 | Elburgon | Thinning trial | <i>Pinus patula</i> | Ready for clear felling and consequently the final report to be written. |
| 257 | 1966/67 | Londiani, Turbo, Kimakia | Constant stocking | <i>Pinus patula</i> <i>C. lusitanica</i> <i>C. japonica</i> | These will have a life of 40 years minimum i.e. 2006/2007 |
| 268 | 1966 | Elburgon Daraja 2C | Constant stocking | <i>P. patula</i> | - do - |
| 318 | 1971 | Gede & Jilore | Species trials | Many | <i>G. arborea</i> , <i>Terminalia superba</i> and <i>G. jacquini</i> have proved to have superior performance in relation to others |

(ii)

| | | | | | |
|-----|------|---------------------|---------------------------------------|---------------------------|--|
| 355 | 1974 | Gede | Constant stocking | Mixed species | Still young for any appreciable difference to be noticed |
| 303 | 1970 | Londiani Masaita 6C | Species trial | Eucalypts | Euc. rognana, Euc. decaisneana and Euc. fatigata are doing exceptionally well among the group of (7) |
| 365 | | Turbo | Species and provenance trial | Pines and Eucalypts | The Eucalypts are doing alright as compared to pines but the expt. should continue to select best provenances. |
| 366 | | Turbo | Species and provenance trials | Pines and Eucalypts | - do - |
| 367 | 1974 | Turbo | Species trials and establishment | Eucalypts | So far, Euc. saligna is the best followed by Euc. camaldulensis while Euc. maculata does the poorest among the trees |
| 368 | 1974 | Turbo | Species trials on ridges of flei soil | Pines and Eucalypts | Though <u>P. patula</u> and <u>radiata</u> have completely failed <u>P. oocarpa</u> is the overall best. |
| 370 | 1975 | Turbo | Species trials on shallow soils | P. radiata and Eucalyptus | Euc. grandis tops while P. radiata is last both in survival and also fit. |
| 371 | 1975 | Turbo | Species and provenance trials | Eucalypts | Eucalyptus saligna (Turbo) E. robusta (Kitale) and E. grandis (Muguga) have shown recommendable performance |
| 369 | | Turbo | Species trials on escarpment soils | Eucalypts | |

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS
IN TREE BREEDING AT K. A. R. I.

by
E.M. Chagala

Forest tree improvement work was started in Kenya in 1936, with the establishment of registered seed areas. By the 1950's, open pollinated progeny trials had begun, but by 1960 it was realized that more intensive tree improvement work should be started. In 1963, therefore, tree breeding work was started at East African Agricultural and Forest Research Organization (now Kenya Agricultural Research Institute). The aim of this programme was the establishment of clonal seed orchards through plus tree selection. This programme aimed mainly at three exotic high land species Pinus patula, Cupressus lusitanica, and Pinus radiata. In the lowlands, seed improvement work was carried out on a small scale after 1968, and was accelerated in 1974 with the aim of development and improvement of local seed sources of Pinus occirpa, Pinus caribaea and Pinus kesiya.

OUTLINE OF TREE IMPROVEMENT WORK:

To achieve high yields in plantations through genetically improved seeds, five projects have been set up. These are:-

1. Phenological studies of species of cypress and pines.

This project has dealt only with P. patula, P. radiata and C. lusitanica.

2. Seed orchard techniques and production - This has also dealt with P. Patula, P. radiata and C. lusitanica and also with P. caribaea.
-

3. Selection and testing of parent trees - since the success of clonal seed orchards depends on the genetic quality of the parent trees, this is a very important project involving the selection of plus trees. Gains of up to 30% may be achieved.
4. Wood properties comparisons - Since plus trees are selected for fast growth and high yield, the project is to test whether these physical qualities can affect the timber quality. This project also only deals with the four species above, and to a small extent with P. oocarpa.
5. Studies of the inheritance of desirable traits in cypress and pines.

FUTURE WORK IN TREE BREEDING:

It is clear from the above that research work in tree breeding has concentrated mainly on four exotic species. Indigenous species have been neglected. At the moment, plantations of exotic species are dominated by Cupressus lusitanica and Pinus patula. Plantations of Pinus radiata have been reduced due to its susceptibility to diseases. Tree breeding programmes in the future will be broader than operational programmes, in addition to including indigenous species. Below is an outline of the future breeding programme:

1. More breeding work on indigenous species, since the only attempt at tree improvement has been establishment of seed stands.
2. Cupressus lusitanica - include more plus trees in the second generation selection for seed orchards, in order to broaden the genetic base.
3. Pinus patula - This is also in its second generation, and more seed orchards will be established to be able to meet the demand.
4. P. Radiata - This species is susceptible to several diseases. Breeding work will concentrate on disease resistance.
5. P. oocarpa - This species has been neglected in preference to P. caribaea but it has comparable growth rates, superior form and does not suffer from as much foxtailing

and sinuosity as P. caribaea. It also withstands more prolonged and severe dry seasons than P. caribaea. Research on this species will be intensified through establishment of seed orchards.

6. P. kesiya - Provenances grown in Kenya have not been very successful. Improved material from Zambia will be imported for further testing. This species performs better than the others on drier sites.
7. Eucalyptus - No breeding work has been done on these, but improved material from other countries will be introduced to Kenya for a more intensive breeding programme.
8. P. caribaea - more seed orchards will be established.
9. Tree bank - a second tree bank will be established.
10. P. pseudostrobus - a breeding programme will be initiated.
11. Test seed orchard seed against present seed stands to test the hypothesis that our seed orchards are producing genetically improved seed.
12. Start breeding work on agroforestry species, especially in arid and semi-arid areas.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS

KENYA ENERGY NON-GOVERNMENTAL ORGANISATIONS (KENGO)

by
Mr. Arsen Mbonye

Deforestation is now a disturbing problem of global concern. Natural forest cover in many parts of the world has disappeared, mainly because of inappropriate land management practices such as shifting cultivation, overgrazing and excessive exploitation of the forest resource base. The destruction of the vegetative cover always results in the decline of the productivity and carrying capacity of the land.

The disturbance of the ecological balance leads to a chain of events with a negative compound effect. Some of the most adverse ones are:

- (a) Erosion due to wind and surface run off;
- (b) Lowering of the water table;
- (c) Lack of fodder for livestock;
- (d) Lack of fuelwood;
- (e) Changes in peoples' living pattern, e.g. from sedentary to nomadic;
- (f) Drought, which is often followed by starvation of both men and livestock - Sahel is still fresh in our minds.

The above mentioned, briefly illustrate what calamities may befall man when, for whatever reason, he knowingly or unknowingly disrupts the environment which supports him and on which he depends for living. This disruption of the environment, or of the ecological balance, can be effected in many ways; one major way of setting off the chain reaction is deforestation!

The case of Kenya

When the Forestry services were established in the East African region (Kenya, Tanganyika and Uganda), the management practices adopted for each territory differed mainly because of the variations in climate. Kenya "seems" to have been selected for the production of fast growing exotic trees such as Pinus, Cupressus and Eucalyptus.

Kenya's indigenous natural forests were not as vast as those of Uganda, nor were they comparable to the Miombo woodlands of Tanganyika. Nevertheless, the indigenous forests of Kenya were subjected to wanton exploitation without silvicultural management. Consequently, those precious indigenous forests were gradually replaced by plantations of exotic trees, which may turn out to be harmful to the ecosystem in the long run.

Fortunately, however, the situation is not beyond remedy. The trends set by the first "Foresters" are being looked at more with caution than enthusiasm. Awareness of the value of our indigenous trees is on the increase. These days you find some indigenous trees being raised in some Forest Department nurseries, chief's nurseries, Ministry of Energy nurseries, women's groups nurseries and private nurseries. This is very encouraging indeed.

KENGO has been instrumental in the initiation and simulation of this tree planting revolution. It has been realized that because of past forestry practices, very little information on the potentials of Kenya's indigenous trees is documented. Some information is available within the communities in the country.

This information has been neglected by foresters because of the impression created in their minds that fast growing exotic species are in all ways superior to indigenous! Therefore, the tendency has been to prefer these exotic trees for tree raising in government and private nurseries, and to give them priority in planting. It is true that the returns from the fast growing exotics come earlier. That is, they have shorter rotation periods.

This cannot, be used as an excuse for neglecting the well known socio-economic, environmental, aesthetic and other benefits of the indigenous species.

The significance of these benefits should be reviewed. The people should be involved in all the stages of raising and tending their own trees. The people should be involved (with incentives) if necessary. The people should be the beneficiaries. To achieve this goal, a concerted effort in technical and public relations from all parties involved is called for. Our organisation, KENGO, is currently involved in undertaking some separate, but related projects. The first one is a directory of indigenous trees seed sources. This is being done jointly with KARI, University of Nairobi, Ministry of Energy/Energy Development International, the Forest Department and the Mennonite Central Committee. CARE Kenya is funding part of the Public Tree Seed Directory. There is a preliminary list of about 70 indigenous trees, 15 exotics and 10 fruit trees. We believe these trees have the characteristics required for agroforestry purposes. Information has been gathered from forest department staff, individual farmers, the East African Herbarium and from other literature sources.

This project was initiated after ICRAF and other organisations realised that seed shortage could become a serious bottleneck to tree planting. KARI, which undertakes seed supply throughout the country, is overextended, and the numbers and types of available indigenous seeds are small. The project aims to identify established and potential seed sources in the country. It will show agroforestry zones where species have their genetic climax, the agricultural uses of each tree species, seed collection methods and techniques, hints on presowing treatment of seed and storage (where available), and any other information regarding the uses and values of the trees. This information is to be compiled in simple, not too technical language for use by amateurs involved in tree planting.

The other project KENGO is embarking on is research on trees to be included in the proposed Resources Book on Indigenous Trees and Tree Planting in Kenya. For this project, funds are from Ford Foundation. (See manuscript for the rationale and proposed format of the Resource Book.)

KENGO is also involved in collecting indigenous seed to be sent to the KARI and to the Department of Botany at the University of Nairobi. Through their research it is hoped the presowing treatment methods will be found which will reduce germination periods.

KENGO has introduced the improved charcoal burning stove (Jiko) for field testing through Jeri International, and field follow up and monitoring is already carried out. This stove (Jiko) has been found to use as little as $\frac{1}{3}$ as much fuel as that used by the traditional metal jiko.

Last, but not least, are educational and information dissemination activities that KENGO coordinates between Government agencies, international organisations and non-governmental organisations.

"KENGO News" is published quarterly to advise its 29 member organisations on activities in renewable energy and community development in Kenya.

In addition to the newsletter, four workshops have been organised. The first one was held at Kabete in 1981 when KENGO was formed. The other seminars were held at Mtwapa (Coast), Kitui (Semi-Arid) and Kakamega (High potential areas), respectively. The next workshop is proposed for late November. To be able to carry out this work KENGO is run by three main committees:

- a tree planting committee,
- a fuelwood conservation committee; and
- a resource book committee.

Financial support has been received from the Ministry of Energy/Energy Development, PACT NORAD, CARE (Kenya) and Ford Foundation. Professionals consulted are foresters.

FORESTRY RESEARCH NEEDS AND POTENTIAL RESEARCH CONTRIBUTIONS
OF

KERIO VALLEY DEVELOPMENT AUTHORITY (KVDA)

by

P.K. arap KONUCHE 1/

Forestry Research Needs

Introduction

Kerio Valley Development Authority (KVDA) undertakes economic development activities in north-western Kenya covering the following administrative districts: Turkana, West Pokot, Baringo and Elgeyo-Marakwet. Western parts of Samburu, Isiolo and Laikipia districts are also included. Most of the Authority's area of operation has arid and semi-arid climatic conditions, and land degradation problems are common features. Livestock is the main means of livelihood of the people although subsistence farming is also practised in some areas. In recent years, a number of small scale irrigation schemes have been started by the Ministry of Agriculture and the Authority. Other schemes, including the Turkwell Gorge Multipurpose Project are also in the plan.

Forestry Programmes

Forestry has been recognized as an essential component of KVDA's development activities. Within the area, forestry has an important role to play in stabilizing traditional farming systems, regulating river flows for the benefit of irrigation schemes and inhabitants on lower areas, controlling soil erosion reducing siltation in dams, and providing a wide range of tree/shrub products.

1/ Forest Specialist K.V.D.A.

The following are KVDA's afforestation projects: Watershed rehabilitation, development of multipurpose small scale forest plantations, development of agroforestry systems and conducting problem-oriented research.

Forestry Research

Forestry research is directed at finding solutions to pressing technical problems related to planning and implementation of forestry projects. Not much research has been carried out within the area, and our research needs are currently in the following fields: species selection, agro-forestry and regeneration methods.

Species Selection

It is considered as the most important field of research. A number of species have been tried in the area, but the trials have not been systematic and there has been no recording in most cases. Consequently, selection of tree and shrub species for planting is unreliable. There is therefore a need to carry out systematic introduction of species as well as provenances of promising species. The Authority urgently needs information on suitable fast growing species for production of fodder, building materials, woodfuel, nectar for honey, cottage industries, soil enrichment and species which are effective in environmental stabilization.

Regeneration Methods

This is the second important field of research. Research investigations aim at developing tree establishment and regeneration methods which are effective, cheap and practical. Research needs are in the following fields: seed research, nursery techniques, vegetative propagation, planting techniques, field seeding and tending methods.

Agroforestry Systems Research

As part of traditional subsistence farming systems, agroforestry is practised in some parts of the Authority's area. There is, however, need for quantitative information on effectiveness or benefits of these systems. There is also need to test other agroforestry systems, particularly those involving fodder, fruit, honey and soil enriching production systems.

Co-operative Work

KVDA has limited resources available for research and can only conduct simple investigation of a short term nature. The Authority is therefore willing to co-operate with other institutions undertaking relevant fields of research. We look forward to benefiting greatly from research efforts of institutions such as FRD/KARI. Possible areas where collaborative research can be undertaken are: seed research, species and provenance research and agroforestry research.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS

of

KENYA RANGELAND ECOLOGICAL MONITORING UNIT (KREMU)

by

Mr. Andere D.K. 1/ & Mr. Buigutt K.A. 2/

Introduction

Remote sensing is a technique which uses electromagnetic energy sensors on space platforms, e.g. satellites, to acquire information on the various earth surface features which emit and reflect electromagnetic energy. The data in the form of imagery are then analysed for information being investigated.

The technology has been widely applied in various fields of study including vegetation surveys, geological mapping, soil mapping, oceanographic studies, glacial studies and agriculture.

The Kenya Rangeland Ecological Monitoring Unit (KREMU) has established a remote sensing section for use in monitoring various resources of relevance to government planning agencies in particular, and to scientists in general. KREMU was established to monitor and assess, through constant and periodic surveys, the Kenya rangelands ecology. It is required, among other things, to monitor vegetation changes in Kenya, including forest and other related resources.

The decision to establish KREMU came about because of the increasing conflicts of interest in land-use practices aggravated by the rapidly rising population. The increasing human

1/ Director, Kenya Rangeland Ecological Monitoring Unit

2/

population is making greater and greater demands on the limited forest resource.

As a result of continued pressure to convert forest land to agricultural uses, diminished forest land becomes less able to meet cultural and economic demands, e.g. recreation, fuelwood, timber, poles etc. This has resulted in the destabilization of the ecological balance in our environment.

To be able to assist planners and decision-makers, KREMU found it necessary to assess and monitor the forest resource with a view to meeting the following objectives:

1. Provide a complete and up-to-date inventory of the actual area under forest, particularly those forests which had not previously been surveyed.
2. Establish baseline data for monitoring the ecological status of the forest cover, particularly on the critical forests in the country.
3. Provide complementary information for optimal management of the forest resource within the framework of the conflicting land-use practices.

The survey carried out in 1980 covered the whole of Kenya using remote sensing techniques. A total of 270 forests were surveyed and mapped on 72 map sheets. The technique yielded an estimated total forest cover of 1,370,200 hectares broken down into 1,157,180 hectares of indigenous forest cover; 160,000 hectares of exotic forest; and 52,980 hectares of mangrove forest.

Discussion

In spite of the size of area covered (the whole of Kenya) we were able to complete the study and produce a report within

a period of several months. Results showed that depletion rates of area under natural forest vary from forest to forest. The highest annual rates of depletion were established for those forests found within densely populated, high potential agricultural areas, and also for those few forests found in arid and semi-arid lands which support excessive herds during the dry season.

One of the forests which is quickly being destroyed is the South Nandi Forest. Our results show that between 1972 and 1976 the South Nandi Forest was reduced by 3,222 ha. which represents 18 per cent of the area observed in 1972. Kakamega forest was reduced by 1,180 ha and North Nandi Forest by 1,630 ha, which represented a loss of 8 per cent and 14 per cent, respectively, of the size of the forests in 1972.

If these depletion rates are maintained, Kenya could have no indigenous forests by the turn of this century. The consequences could be severe because it is difficult to replace natural forests once depleted, especially in the high potential agricultural areas. The after effects of the changes, such as severe soil erosion and the tendency for excess human population to establish permanent settlements cannot be overlooked.

The results of our study showed that it is possible to detect and monitor changes that take place along the physical boundaries of forests at short time intervals and at reasonable cost using satellite imagery. Given this advantage, KREMU is currently undertaking detailed surveys of selected forests aimed at monitoring the extent and rate of change in natural forest vegetation, and also offering an assessment of species composition and plant production.

A comparison of forest area obtained during our survey and the official records of the Forest Department revealed some differences. There are several reasons for these differences.

First, we found that the Forest Department does not include in its records several large forests such as Nguruman, South Mau, Mau Narok and all those forests in the National Parks, e.g., parts of Aberdare, Mt. Elgon and Ol Doiyo Sabuk.

Second, we found that some gazetted forest areas are hardly forested. Mt. Kulal Forest, for example, officially has an area of 45,729 ha, yet only 2,240 ha of it is forested. Many of the forests listed by the Forest Department, especially in the northern districts, are small hills covered with woodland or bush and, therefore, not a true forest by definition.

Third, we also found that the official figures have in some cases not taken into account forest depletion, that is, forested land for some forests had not been corrected for depletion. In plantation areas, some forests had recently been felled, while others had just been planted with young trees.

Like any other technology, remote sensing has its drawbacks. We have found three main sources of error, which we have attempted to minimize. Since the scale of the maps was changed, it was estimated that a 1% error occurred for every change. Distortions caused by a scale-changing machine are, however, negligible if it is used carefully.

Area measurements were made by planimeter and major mistakes were eliminated by measuring each forest area twice. Each measurement has an estimated 0.3% error. An area where major errors may occur is the interpretation of the imagery. It may often be difficult to clearly differentiate between proper forest and other vegetation types such as thick bush or crop plantation, especially if there was a gradual change from forest to bush. The quality of colour composites of imagery is also an important factor in interpretation.

For greater accuracy in differentiating plantations and indigenous forests, and between forest and bushland, digital analysis of data is recommended.

Conclusion

The forest cover in Kenya is rapidly being depleted. The ability of our forest managers to control this trend depends, to a large extent, on the ability of researchers to provide them with recent and up-to-date data. Knowledge of existing forest cover forms the basis for correct appraisal of problems and the determination of possible solutions.

Over the last three years, remote sensing technology has enhanced the ability of KREMU in studying the national renewable resources. Remote sensing has, in addition to monitoring forests, been used in land-use mapping, wood biomass assessment in agriculturally high potential areas, detection of agricultural encroachment into rangelands, and crop area assessment and production estimates. The technique has also been used to monitor mangroves and sediment plumes in coastal areas.

This technology has shown its ability to provide required data over relatively short periods and at reasonable costs.

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KENYA RANGELAND ECOLOGICAL
MONITORING UNIT (KREMU)

1. Forestry Research Priorities

- a) Ecological research in natural forests on such aspects as vegetation composition, plant species regeneration potential, biomass, etc. This is important in that data on dynamics of different forests give an idea of available forest resources and possible replacement rates, and this will allow for the preparation of balanced budgets on long-term basis.
- b) Identify trends in the utilization of the forest resource by monitoring developmental impacts, so that negative effects can be identified in the early stages. Making a continuous assessment of forest resource availability and taking into consideration existing rates of change allows for prediction of future forest status.
- c) Identify areas which can be afforested without conflict with other land-use alternatives, so as to ease pressure on existing forest resources.
- d) Establish optimal or critical size of forest which can sustain a balanced forest structure and ecology.

2. Forestry Research: Collaboration and Inter-linkages

For sound appraisal of both short-term and long-term forestry problems, it is important to integrate the

efforts of forest managers, forest ecologists, land-use planners and interested organisations. This interdisciplinary approach could take the form of specialists working together and presenting a jointly-produced report.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS
of the
MINISTRY OF ENERGY AND REGIONAL DEVELOPMENT, WOODFUEL
SECTION

by
Mr. Musa Enyola

FORESTRY AND ENERGY IN KENYA

For ninety percent or more of all Kenyans the major energy source is woodfuel. In fact, approximately 75% of Kenya's total energy consumption is derived from woodfuel, mostly in the form of fuelwood and charcoal for domestic heating and cooking.

The consumption of woodfuel is expected to rise by approximately 6% per year to almost three times the present estimated annual consumption figure of 18.7 million tonnes of wood by the year 2,000. This trend is partly due to the rising population, and partly due to the rising cost of other forms of energy.

PROBLEMS AND OPPORTUNITIES IN MEETING NATIONAL WOODFUEL SUPPLY

Land Resources: One of the main problems in meeting the national woodfuel demand is scarcity of land in areas where consumption is highest, that is, in the high potential zone. The average size of land holdings is small due to high population density. This means that pressure for the same piece of land to produce human food, feed for animals, and energy for cooking and heating is high. The problem is compounded by the fact that wood is a bulky commodity and therefore relatively expensive to transport for long distances. In many cases this precludes the use of thinly populated, marginal lands to produce firewood.

Species Selection: Many of the tree species that have hitherto been made available for planting in large quantities have not been accepted by the farmers because in many cases they provide unhealthy competition for food crops or pasture. The economics of production and harvesting have tended to favour monocultural tree systems too, so that knowledge about inter-cropping of trees and shrubs with food crops has not kept pace with the demand.

Price of Wood: Traditionally, firewood has been collected free of charge in most rural communities, and the value of trees is not often realized until the trees are ready to be harvested. This means that the need to plant has not been appreciated, and thus tree planting has not kept pace with consumption.

Climate: The majority of Kenya's population live in the highlands and the coast which enjoy favourable growth conditions, especially rainfall, which means that maximum photosynthetic potential can be utilized in growing trees.

THE KENYA RENEWABLE ENERGY DEVELOPMENT PROJECT

Objectives of the Project: The Kenya Renewable Energy Development Project (KREDP) is a joint programme of the Ministries of Energy and Regional Development (MOE & RD), Agriculture and Livestock Development (MOAL) and Environment and Natural Resources (MENR). It is aimed, among other things, at providing rural populations with suitable tree species and tree/crop combinations through applied research and demonstration activities. The project is financed by USAID and GOK. For obvious reasons, the programme is housed in the Ministry of Energy and Regional Development. The other two Ministries' functions include, besides their tree planting programmes, overseeing the country's food production and management of the country's forest estate.

Fuelwood/Agroforestry Centres: Six Fuelwood/Agroforestry Demonstration/Extension Centres have been established under the project in six ecological zones of Kenya and all are operational.

The centres are at:-

1. Mtwapa Farmers' Training Centre, Coastal Zone.
2. Kitui Better Living Institute, Semi-Arid Zone.
3. Jamhuri Park/Ngong Forest Station, Nairobi.
4. Wambugu Farmers Training Centre, Eastern Highlands.
5. Bukura Agricultural Institute, Western Highlands.
6. Kisii Farmers' Training Centre, Lake Basin.

The Mtwapa Centre has started a sub-centre at Matuga District Development Centre (Kwale District), a step aimed at bringing centre energy demonstration activities closer to the farmer. Each centre is planned to have approximately five sub-centres when the project is fully implemented.

The centres are not only for fuelwood development and conservation demonstration, but also for other renewable energy technologies such as wind, solar, biogas and others suitable for rural areas. Because of its unique place in Kenya's energy consumption pattern, woodfuel will continue to dominate centre activities and extension efforts.

Inter-ministerial and Inter-Agency Cooperation:

In recognition of the complementary roles of the sectoral Ministries and other agencies outside GOK system, the project has placed a lot of emphasis on cooperation. Inter-ministerial cooperation was initiated through the signing of a memorandum of understanding between MOE & RD, MOAL and MENR in February, 1982, and more recently with the Office of the President in using the District Development Centres for agroforestry demonstration. The project has also involved Non-Governmental Organisations, especially in organizing training workshops for farmers and extension/testing of energy-saving domestic jikos. To date, four such workshops have been held at Kabete in Nairobi, Kanamai at the Coast, Kitui and Bukura. Further workshops are planned to be held at Nyeri and Kisii.

FUTURE PROSPECTS

The Ministry of Energy and Regional Development, through KREDP, has found that the concept of agroforestry is popular with farmers, and what is needed is to maintain the momentum through demonstration and to give farmers the right kinds of agroforestry trees for their region. For its part, MOE & RD is committed to Fuelwood/Agroforestry Research and Demonstration as one of the best means of ensuring self-sufficiency in rural energy supply.

FORESTRY RESEARCH NEEDS AND POTENTIAL
RESEARCH CONTRIBUTIONS

OF THE NATIONAL CHRISTIAN COUNCIL OF
KENYA (NCCCK)

by

Mr. Jidraph Kimura 1/

The church's role in the development of the total person cannot be complete without taking care of those basic needs of man which are vital for sustaining life. Realising that these needs cannot be adequately taken care of without the people's involvement in the conservation of our natural resources, and at the same time having been a witness to destruction of trees, especially in the newly settled areas, NCCCK took it as a duty to look seriously at afforestation in the areas accessible to it.

You are all aware of the Government's rural afforestation programme which is widespread around the country. Our work is similar, but we do not just set up tree nurseries. The most important aspect of our work in afforestation is the process itself; the humanising of the afforestation work so that whatever is done in raising tree seedlings and transplanting them happens within a community which understands what is involved; the bringing of awareness to the people on the practical value of planting trees.

For the last several years, in which we have focussed on afforestation and desert rehabilitation in Turkana, Marsabit and Mandera and even in other areas nearer Central Kenya, we have seen that a lot of resources and energy are wasted both by government and voluntary organizations. This

1/ Director, N.C.C.K.'S Rural Development Services

happens when officers trying to implement directives establish tree nurseries which yield good seedlings alright, but when it comes to transplanting them find that no one is interested. We have seen cases of officers tuck with overgrown tree seedlings in nurseries. When people are pushed to take them usually end up not planting them or, if they do, no watering is done. So the seedlings just dry up.

Human Relations in Afforestation

Our view is that no afforestation is possible if the people who are really owners of the land are not part of the process. It is not easy to involve the people unless one has patience and understanding enough to appreciate their problems. The fact that an area is denuded and eroded will not necessarily convince the people to start growing trees. We have learned that people have their priorities, and that afforestation should not be done in isolation. We have learned of the need to interest people in afforestation by convincing them of the benefits that will come after trees are established. At times you are talking about trees to people who feel that they have not had anyone come to talk to them about crops, which is what they really want as they fight with hunger.

Extension officers may do very well in research programmes, but we have seen that, especially in the rural marginal areas, there may not be people to make use of the research findings even in the near future. Yet it is in those areas where the need for forestry is greatest.

In the current, aggressive tree promotion campaigns in many parts of the country, one has the feeling that a lot of questions need to be asked and answered. Government officers and local chiefs should ask themselves some of the following questions:

1. Who needs the trees?
2. What are they for?
3. What is the degree of awareness among the people of the area in so far as afforestation is concerned?
4. What facilities exist to cater for the seedlings while still in the nurseries?
5. What education is needed on the care of tree seedlings in the post-nursery period, and who gives it to the people?

There are many more questions, but it was not until we learned to address ourselves to some of the above that positive things started to happen in our areas of involvement. We are pleased to say that in many areas where we have tree nurseries nowadays we are hard put to satisfy the needs of the people every season.

Afforestation and Tree Uses

Because we have come to recognize that people will only care for trees if they expect some returns, it is our policy to produce only those species that people need. If it is within the agricultural areas, we encourage agroforestry where fruit-trees or quick maturing wood trees grow alongside crops. In this way, the farmer is easily involved because he will not need to use extra time to go and care for the trees. He may have time only for his shamba.

When the work is being done in the nomadic areas, for instance in Isiolo district and other semi-dry areas, we encourage the growing of such trees as Leucaena and Acacia tortilis which livestock like as fodder. Although the pastoral people are now more or less sedentary, they have yet to see the need for fuelwood. Their life is very simple and just a few twigs will make enough fire for cooking their food. But talk of drought and the need to get feed for their goats, and

they will at once see the need for planting tortilis whose short-curved pods ripen just when the drought is at its height. People have always gone to the area where the tree abounds to feed their goats on those pods in times of need - so it is not difficult to get a person to plant his own trees for his own use both for feed and shade.

The above serves to illustrate the need for proper liaison and consultations in the afforestation programmes by whatever groups may be involved in a particular area. It is sad, and at times amusing to see a well-meaning voluntary organisation come into an area and put in a lot of money for afforestation work, then set up a programme with research facilities where exotic trees or even trees from other areas of Kenya are given priority over the local ones. When we help a local group to start a tree nursery we encourage the people to collect seeds within the locality of their nursery so that in case of a serious outbreak of tree diseases we are sure the tree seedlings will grow because they are already adapted to local conditions and climate.

Problems and Impediments

In the Churches' work in afforestation, one of the problems that we have to grapple with is lack of advice in case of diseases on trees. The Government research facilities are often too far away to be of any help in time of need. At times their advice is not relevant at all. Another problem is that of follow-up when seedlings have been distributed to people. There is need for extension services so that people feel encouraged, but at times we have no manpower or expertise to do so.

Still other problems are created by local administrators and politicians. You all know that a chief or a sub-chief is a very big man in a location. Because of his position, every-

thing done there is under him. It seems there is a directive that chiefs establish tree nurseries and because few of them are competent, or able to start any, they will go looking for the existing nurseries to show to their superiors. A few months ago we had a case where a local chief wanted to prove that his work is final and therefore proceeded to issue tree seedlings free of charge from a nursery we were assisting. He went on to say that tree seedlings are never to be sold and it is a Government directive. We ourselves do not give tree seedlings free. We make sure people pay for each seedling because it is only in this way they will be induced to take care of the planted young tree. When I came and found our field staff confused by the chief, I threatened to see his superiors over his illegal action and it is only then he apologised. There are many other problems.

In the coming years, N.C.C.K. sees its role in afforestation as complementary to the Government programmes. We also see educating the people through seminars and actual involvement as very important 'tools' in this complementary role. We hope to participate meaningfully in all afforestation programmes that the Government may have, but we are also prepared to ask legitimate questions when inconsiderate directives are given to the local groups from above. In effect, we want to encourage more interaction between people and Government officers so that wastage of public funds that we see in the field now is kept to a minimum.

FOREST RESEARCH NEEDS AND POTENTIAL RESEARCH
CONTRIBUTIONS OF PANAFRICAN PAPER MILLS

by
P.A. DIRO 1/

Kenya's pulp and paper mill uses Pinus radiata, P patula, Cupressus lusitanica and Eucalyptus saligna. Species proportions required by the mill for manufacture of pulp and paper are Pine 55%, Cypress 35% and Eucalyptus 10%. These species have been planted primarily in Eldoret Division, at altitudes between 2,288 - 2,745 m. Above sea level, and in Turbo Forest, below 2,135m altitude.

Planting in pulpwood areas is being carried out by the Forest Department, and the progress in re-planting the clearfelled areas is satisfactory.

Research Needs

Planting of P. radiata on a large scale has been discouraged since 1966 on technical grounds. - mainly due to heavy attack at the initial stages at about age three and four by Dothistroma pinii, commonly known as needle blight. This P patula, Cypress and E saligna remain the principle plantation species. Some of the last plantations of P radiata in the highland areas are now more than 15 years old.

In years 1979 and 1980, there was a long drought which caused very high mortality in some parts of Turbo and mostly affected plantations between age 6 and 12. Some of these plantations are being salvaged by PPM to avoid complete waste.

1/ Forest Manager, Panafrican Paper Mills.

Although P. patula plantations have so far been doing well, it does not make good commercial sense for the industry to depend on only one species. It should also be remembered that sometimes back P. patula was very much threatened by pine woolly aphids, and in some areas in the Uplands large plantations had to be cleared as a control measure against the spread of this pest.

Against this background, it would be proper to review and possibly revise the thinking about P. radiata as a plantation species, especially in selected areas within the pulpwood zone. P. radiata as a pulpwood species is superior to P. patula and Cypress for the following reasons:-

1. Growth rate is fast, hence capable of producing readily saleable material at a fast rate.
2. Because of the fast growth, the volume yield per unit areas is higher than for P. patula, and government gets more royalty per hectare of land.
3. P. radiata has a better yield of pulp and better strength properties than P. patula and Cypress.

In view of the superior qualities of P. radiata as a pulpwood species in Kenya, and also because P. radiata plantations were doing well in Kenya before being attacked by Dothistroma blight, it would be advisable to conduct detailed research into better ways of growing P. radiata, either by introducing biological control measures for the disease, or by adopting an alternative cost-effective way of treating the plantations and effects on growth and yield are not currently available to the writer. What is known is that aerial spray control of the disease was achieved, but it could not be continued due to its high cost.

Sometime back, at Muguga, there were trials of P. radiata plus trees, and also P. radiata trees which were resistant to

Dothistroma blight disease, under field conditions. Studies at that time revealed that selection for improved tree quality and health (straightness, fine branching, low-grain angle, freedom from disease) can be combined with selection for high volume and cellulose production. These studies might not have been concluded. Or perhaps the final result did not favour P. radiata plantations. If so, it may be opportune in this age of biotechnology to revive the subject and pursue it.

The foregoing discussion has established the superiority of Kenyan growth P. radiata as a pulpwood species compared to all other plantation species. It will be in the interest of the Industry, and the Kenya nation as a whole, if through research this important, valuable and renewable raw material could be re-established and grown more economically.

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FOREST RESEARCH NEEDS AND POTENTIAL RESEARCH CONTRIBUTIONS
AS SEEN BY THE

PERMANENT PRESIDENTIAL COMMISSION ON SOIL CONSERVATION AND
AFFORESTATION (PPCSCA)

by

T.K. Njagi 1/

Introduction

Kenya, being an agricultural country, strongly relies, and will continue to rely, upon the land resources to create surplus goods necessary for economic and social development. Rational planning of land resources utilization is a prerequisite for successful long term development whether the land is under intensive use, degraded or virgin. Land use planners therefore, should encourage serious environmental conservation measures, so that land unit yield can be maximised on a long term basis.

The management of the environment calls for inputs from many government, private and voluntary agencies. Hitherto, environmental conservation efforts have been individualistic. Consequently, different government ministries have been doing the same type of work. Economically and technically this has been a waste and has retarded development. The main problems which are presently being tackled include soil erosion, forest destruction and desertification, uncontrolled human settlement, over-grazing, air pollution and loss of wildlife habitat.

Efforts by experts within the various agencies have been in-house and have been unknown to other government ministries and to field extension officers. There is a strong need to formulate a strategy that will make information available to all sections for joint understanding and action.

1/ Forest Specialist.

Immediate Research Needs

Afforestation programmes in Kenya can be classified into three major groups:-

1. The industrial plantation programme which is restricted to state forest reserves.
2. Local afforestation schemes specializing in rehabilitation of denuded hills and other private trust lands.
3. The Rural Afforestation Extension Scheme, which is devoted to the promotion of tree planting and afforestation in farmholdings.

To meet the demand for tree seedlings for afforestation along the three fronts, the capacities of existing tree nurseries must be increased tremendously. The target would include a wide range of tree species and varieties from which selections may be made for specific planting sites, ecosystems and needs of the local community. This is a highly specialized task that calls for a back-up programme of research and development.

Deforestation and the change to other land uses emphasizes the need to apply scientific techniques and make forest land more productive. Therefore, land managers and foresters need to encourage research and demonstration programmes to extend the techniques and knowledge of sound forest management. In looking ahead, forest scientists must rise to the challenge of showing the public how to improve the productivity of the land without diminishing its continued health.

The national development programmes should, as far as possible, formulate strategies which comprehensively answer the following questions:-

- Which are and should remain forest or be reafforested to ensure a good hydrological balance and prevent erosion.
- To what extent and how can protective forests be economically used without any detrimental effect on their protective function.

- Which soils and lands are best suited for afforestation for commercial and household wood production.
- Where and how can trees be used to reclaim land or protect agricultural and pastoral land from degradation.
- Which tree species are best suited for each ecological site and purpose.
- Which combination, in time and space, of trees, food crops and other plants will make best use of each site without causing any deterioration.

Research Programmes and Priorities

Research will play an increasing role in development of both state and community forestry. As a first priority there is need to strengthen applied research by involving the planners and the people. At present, research results hardly influence policies and laws, as these are formulated and established on the basis of inadequate and imprecise knowledge, often by rule of thumb.

Forestry research, being a concern of many organizations, requires clear and close links between researchers, planners of government policy and action programmes so that the latter are closely co-ordinated and fully integrated in the government planning process. The integration can be achieved only through consultation with all interested organisations of both the direction to be followed by a national research programme as well as the research priorities within such a programme.

Co-ordination in Planning

Forestry research planning needs to be carried out within a well co-ordinated, multi-disciplinary framework. This will

not only eliminate gaps in planning, but also will significantly ease allocation of funds to programmes. It is recognized that laws and legislation governing agriculture, forestry, water and livestock are sectoral and are not inter-linked. Each suffers from not being harmonized with related legislation within other sectors. This has resulted in some conflict of laws, gaps in legislation and wasteful overlaps.

Researchers need to discuss in a common forum results of their endeavours and communicate findings to all implementing agencies. This will improve fund utilization and eliminate research duplication. Therefore, there is need to identify an agency which will receive all research proposals, allocate research responsibilities and co-ordinate all government forest research plans and programmes.

Manpower Training

While each government Ministry or other organisation is responsible for its own manpower training and development programmes, it is important that such programmes are harmonized with government policy. The government, together with the national educational institutions needs to develop a strategy of identifying and training technical and professional manpower in protection of the environment. Such programmes would ensure effective use of trained manpower. For those areas requiring immediate attention, in-service training in a specific field would suffice while long term, effective solutions are being formulated.

Forestry Research

An important forestry research need is to develop formulae geared to making management in areas within and outside gazetted forests more effective. To this end, new and alternative skills and appropriate silvicultural practices need to be explored. The expansion of the forest base through promotion of social forestry, agro-forestry and the afforestation of arid and semi-arid lands are important priority areas.

The major development strategy calls for establishment of national rural afforestation policy. This will require co-operation and co-ordination between the government and non-governmental organization; mass education to create mass awareness including broad public knowledge about trees and mass movements for tree planting and protection techniques and planning, monitoring, training and research. The policy aims at attaining self sufficiency for rural community in wood energy stabilization of soil and micro-climate; harmony and beauty of homesteads and landscapes- and improvement of the productivity of rural lands by developing agro-forestry and agri-silvi-pastoral systems.

Co-ordination of such an ambitious national rural afforestation policy cannot be done by a single agency. It requires implementation by chiefs, and this can be attained only through provincial administration. The tackling of forestry research programmes could be strengthened by expanding training and visitation programmes through which research results could be communicated to the extension officer and applied on demonstration sites. Through such approaches, the research findings will speedily reach the intended community.

Demonstration plots are usually the best means through which extension officers can communicate with people on the ground. These plots may be on government or private land, and may include pilot schemes, screen plots, arboreta and species trial plots

Rural Afforestation Extension Scheme

The Kenya forest department, which is responsible for the management of commercial forests, also manages the local afforestation and rural afforestation extension schemes outside the gazetted forests. The main objective of the two schemes is to improve the environment and augment forest resources by promoting development of forestry and agriculture on private lands.

The main thrust of the rural afforestation extension scheme is to raise, or encourage raising of, sufficient seedlings for

planting in the areas outside the state owned forests. This involves establishment of tree nurseries in or near populated areas. Since its inception in 1971, the rural afforestation extension scheme has established in each district a tree nursery and an extension officer whose main duty is to instill into the minds of the rural people the need to plant more and more trees. The scheme has encouraged the establishment of tree nurseries by chiefs, non-governmental organizations and institutions of learning.

Watershed Management Research

The Kenya government is committed to watershed management. Besides preserving water catchments the government has introduced local afforestation of bare hills and badly eroded lands around the country. The government is also educating people not to alter or destroy natural vegetation to accommodate community needs, stop over-exploitation, avoid overgrazing, avoid fires and cutting of forests. Reafforestation, proper utilization of water resources and restoration of vegetation in areas that need them are the main tools the government is using in order to maintain and increase the existing area of catchment forest. The rural afforestation extension scheme is also used in the watershed management campaign.

To ensure that the campaign succeeds, His Excellency the President formed a Permanent Presidential Commission on Soil Conservation and Afforestation to co-ordinate all ministries participating directly or indirectly in watershed management and environmental protection.

The co-ordination was best seen when the Food and Agricultural Organization, through the Permanent Presidential Commission on Soil Conservation and Afforestation, successfully organized a watershed management course for the African Region. The course gathered together watershed managers of different specialization from both governmental and non-governmental organisations from Kenya and other regional of Africa. The complexity of the

deliberations showed that watershed management research requires inputs from a cross-section of government ministries and non-governmental organisations and scientific institutions. It is felt that planning and organization of the said research can only be co-ordinated and deliberated by an agency with national responsibility. By co-ordinating the ideas of all the ministries, the best line of action will evolve.

Position of Permanent Presidential Commission On
Soil Conservation and Afforestation

The Permanent Presidential Commission on Soil Conservation and Afforestation was established by His Excellency the President on 21st January, 1981 and was given several specific functions pertaining to soil/water conservation and afforestation.

A few of those most relevant to this workshop are:-

1. to co-ordinate and monitor government planning efforts in the areas of soil and water conservation and afforestation;
2. to review, evaluate and identify gaps in performance of government agencies and to encourage private and voluntary efforts in carrying out environmental conservation programmes and projects;
3. to initiate and review such scientific and social research and studies as are necessary for efficient promotion of the conservation of the nation's natural resources base and setting up research priorities.
4. to promote the rehabilitation of all degraded forests and eroded lands, including the promotion of agroforestry and restoration of land ruined by mining, siltation and flooding;
5. to promote effective liaison between government bodies and private organizations, and to encourage private and voluntary efforts in carrying out conservation and afforestation programmes and projects and
6. to promote and disseminate scientific and popular

publications and to promote educational efforts that reach all levels of the population particularly as regards their environmental conservation needs.

The Commission's greatest role is that of over-seeing conservation activities of the environment. During field tours, all those problems identified are continually monitored and discussed with all concerned agencies in a bid to formulate corrective measures.

Conclusion

Quick answers to local problems cannot be achieved without involving the nation's research institutions. Usually, however, the work of these research institutions is tied to parent ministries and hardly known by outsiders. There is urgent need to compile a register of all institutions involved in forestry related research. While the register could appropriately be compiled by the Ministry of Education, Science and Technology, the Permanent Presidential Commission on Soil Conservation and Afforestation could see that planning and implementation of all projects involving environmental protection are co-ordinated, and that up-to-date scientific findings are incorporated in project designs.

In Kenya, preference should be given to short term, applied researches because most projects are just to demonstrate what to do. However, basic research can continue in parallel. Policy makers and planners should be left to choose between basic and applied studies when deciding upon the research priorities.

Programmes such as tree nursery establishment could easily be monitored by provincial administrations, which in essence co-ordinate commission activities in the field. They could monitor the success of the establishment of chief's nurseries.

Experience indicates that although many successful forestry researches have been concluded, the results are not usually

communicated to the other agencies or extension officers. This communication gap holds up implementation of important development projects beneficial to the whole nation.

The Commission therefore intends to influence the following:-

1. Communication improvement amongst agencies involved in forestry related researches.
2. Improvement of inter-agency co-ordination in the field of research planning and management.
3. Integration in choosing research priorities by agencies allied with forestry research.
4. Dissemination of scientific findings to the extension specialist, who can demonstrate their utility in visible projects, and thus improve acceptability and quick implementation.
5. Future research development and planning, to be centralized; and information dissemination to be of high priority. These techniques would improve information exchange between researchers involved in forestry research.
6. Formation of a national council to screen forestry research priorities in relation to the country's needs.
7. Monitoring of success in the utilization of research results.

FOREST RESEARCH NEEDS AND POTENTIAL RESEARCH CONTRIBUTIONS
AS SEEN BY THE
NATIONAL DRYLAND FARMING RESEARCH STATION, KATUMANI (NDFRS)

BY

J. K. MAVUA 1/

The National Dryland Farming Research Station - Katumani, an organ of research within the Scientific Research Division of the Ministry of Agriculture and Livestock Development, is charged with the responsibility of conducting agricultural research for the semi-arid areas of Kenya which are characterised by an annual rainfall of about 500 - 900mm and fall between agro-ecological zones three and five. For such research to be effective, its objectives ought to be relevant to both farmers' and societal goals which are spelt out in various government development plans. The current national goals are:-

- (a) the promotion of agricultural growth.
- (b) generation of employment and
- (c) conservation of natural resources.

All these are succinctly summarised in the single phase of "alleviation of poverty" as stated in the 1979 - 1983 Kenya Government Development Plan.

The contribution of agricultural research in achieving this goal is to arm farmers of this country with materials and technology with which to increase output - be it crop, animal or forestry products.

The mandate to plan and conduct research on dryland farming is interpreted to cover the following broad problem areas:

- (a) the development of methods which will ensure continued exploitation of land resources through farming without land deterioration.

1/ Agricultural Economist and Deputy Director.

- (b) the development of crop varieties and cultivars adapted to low rainfall and short growing seasons.
- (c) the identification of adapted, high yielding pasture grasses and legumes, forage and fodder crops, and development of appropriate management methods to maintain their productivity so as to increase feed resources for farm animals.
- (d) the selection and/or introduction of suitable animals capable of high and efficient production to exploit the improved feed resources.
- (e) the development of more productive, less risky farming systems designed to stabilize a productive and sustainable land use system compatible with prevailing ecological, cultural and economic circumstances and consistent with the development goals of the local people and the society at large through the most appropriate combination of crop, livestock and agro-forestry enterprises which are mutually interdependent.
- (f) the exploration and development of alternative uses of crop, livestock, forestry products so as to make them more useful and readily available to both rural and urban populations.
- (g) development of advisory capacity for farmers and extension workers.

In carrying out these responsibilities, the NDFRS - Katumani has adopted a farming system approach to agricultural research which is an integrated effort to make research more effective by being farmer based, comprehensive, problem solving complementary, iterative and dynamic, interdisciplinary and socio-economically responsive. It operates on the premise that effective agricultural research begins and ends with the farmer. The approach has three phases:-

- (a) Phase I - The identification, delineation and description of the existing farming systems, their problems, constraints and potential for

improvement and development. This phase recognises both the structural and functional nature of farming systems.

(b) Phase II

- (i) Formulation of relevant research programmes based on the information obtained in phase one.
- (ii) generation of appropriate technology through experimental research
- (iii) simultaneous monitoring of the research programmes to ensure that the initial objectives are kept in focus and consistent with farmers production possibilities.

(c) Phase III - Testing, evaluation and feedback through:-

- (i) Unit-farming trials which simulate farmers conditions but are under the researchers control.
- (ii) Whole-farm trials on farmers' fields under farmers' conditions and their control.
- (iii) Pre-extension trials on farm fields to test suitability and acceptability of technological package components before release to farmers as recommendations.
- (iv) Evaluation and feedback to the biophysical researchers, and extensionists, and formulation of farmer recommendations.

With this holistic approach, the NDFRS - Katumani has recently included agroforestry research in its research programmes in collaboration with the International Centre for Agroforestry (ICRAF), the Kenya Agricultural Research Institute (KARI) and the Machakos Integrated Development Programme (MIDP), with financial assistance from the International Development Research Centre (IDRC). The agroforestry project will be based in Machakos district where on-farm work

will be carried on at Kakuyuni Catchment area in Yatta Plateau. On-station work will be based at the N.D.R.F.S. - Katumani. Agroforestry is believed to be a superior land use system, and the ultimate test of its usefulness is the acceptance by farmers.

The agroforestry research programme aims at:-

- (a) developing an agro-forestry land use system for more sustainable crop production in the semi-arid lands.
- (b) developing silvi-pastoral systems to improve quantity and quality of fodder for domestic livestock.
- (c) developing agri-silvicultural systems to provide fuel and building materials for the farm family.
- (d) developing agri-horticultural systems to increase the cash production from the farms.

Through this integrated land use system of cropping, livestock and forestry it is hoped that research findings will be made effective, useful and relevant to farmers and to society at large, and will aid in promoting agricultural productivity and development.

FOREST RESEARCH NEEDS AND POTENTIAL RESEARCH
CONTRIBUTIONS OF THE MINISTRY OF
WATER DEVELOPMENT

WATER RESOURCES DEPARTMENT, NAIROBI

by

J.O. NYAGUA

Perhaps the best documented major forest research programme in Kenya was known as the EAFRO research catchments in the high potential rain forests at Kimakia and Kericho. The objective of the research was to find out the possible effect of replacing the indigenous highland forests with either plantation agriculture or exotic trees.

The criteria according to which the effects of these changes were to be monitored were essentially hydrological. These included the measurements of water yields, from the carefully selected catchments, under different land uses whose effects were under investigation.

Secondly, they included measurement of suspended sediment yields from such catchments, again under different land uses. Also, they looked at consumptive water use by the predominant vegetation of crop types in the research catchments.

The major research finding from these programmes after the first ten years at Kericho, showed that the water use and the water yield, especially in the dry season, were not significantly affected by the complete land use change from indigenous forest to tea plantation. At Kimakia, on the Aberdares at an altitude of 2650m and annual rainfall of 1250mm where the indigenous vegetation of bamboo, Arundinaria alpina were replaced with Pinus radiata and Cupressus lusitanica in experimental catchments, the main finding was that the short term rotation of softwoods could be expected to use about

the same amount of water as the original bamboo forest. The water yield increased during the first three years of clean weeding under plantation crops (Pereira 1973).

These results provided the scientific rationale for developing plantations such as tea or exotic softwoods on these highlands.

As a follow up of the EAFRO research programme, the Ministry of Water Development started another set of hydrological research catchments in 1976. These are called the Experimental Representative Basin Study. This programme was to be part of the country's activity during the internal Hydrological Programme.

The main objective of this research programme was to provide hydrological data from medium potential agroclimatic zones, where a paucity of hydrological data limited surface water development. The data collected from the intensively instrumented sample catchments also can be used to develop mathematical models.

The models may then be used to extend the hydrological data, e.g. run off record from these catchments retrospectively, if there are longer rainfall records. Besides, using methods of extrapolation of hydrological parameters, run off data can be derived for similar catchments in the same hydrological region, without collecting actual data.

The run off from sample catchments is monitored daily. So the effect of major changes in land use is likely to be detected from the records of run-off or suspended sediment yields being collected.

In the author's opinion, these catchments are ideal outdoor laboratories for investigating any aspect of land use change in this ecological set up. For example, the viability of carefully controlled agroforestry can be investigated.

In another example, in 1978, the Department collaborated with the Agricultural Engineering Department of the Nairobi University on rainfall simulation studies at Iiuni catchment in Machakos. The effect of varying storm intensities on selected small plots in the catchment were studied, and corresponding soil losses were measured. The students in the agricultural engineering department took opportunity of this to see the demonstration in the field.

Today, the Ministry is also involved in a reservoir sedimentation project with TRDA and the Hydraulic Research Laboratory in Wallingford. The project is funded by SIDA and is aimed at monitoring the suspended sediments going into the recently built upper reservoir at Masinga on the river Rana. The stations where samplings are done are actually on the tributaries of the Tana. The programme also involves taking depth soundings in the reservoir in order to determine the loss rate of the dam storage caused by sedimentation. Again, it needs to be stressed that the Upper Tana basin comprises the forested parts of the Aberdare and the slopes of Mt. Kenya, the source of water supplying Nairobi and other urban centres on the east of the Aberdares.

By way of review, the Ministry of Water Development continues to run the EAFRO catchments. The collection of hydrological data is ongoing, and the Ministry staff are responsible for servicing and maintenance of the hydrological instruments in these catchments.

Monitoring the hydrological parameters of the catchments has been shown to provide reliable indicators of the effects of changes in land use from indigenous high rainfall forests to either exotic or tea plantations.

Hydrologic research also has been used to study and attempt to understand the quick response runoff and base flow characteristics as well as analysing sediment yields from catchments in medium potential zones, where forestry is part of the land use pattern. The success of any soil and water conservation measure can really only be demonstrated in terms of changes in runoff volumes and peaks, as well as in the sediment yields.

In conclusion, it is felt the potential of hydrological study in forestry research is high.

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PART IV

INVITED PAPERS

GENERAL INTRODUCTION

GENERAL INTRODUCTION

During the course of the workshop, sixteen major papers were presented. They focussed on three topics: current needs for forestry research; how research and action agencies have organized and planned to meet these needs; and some of the major factors that need to be addressed in order to strengthen and improve the effectiveness of both the research and the application of research findings.

These papers are reproduced in their entirety on the following pages. Taken as a group, they helped to highlight for participants the problems facing forestry research in Kenya, and to illuminate possible ways of dealing with them. They provided the basis for discussions within the working groups which led eventually to the delineation of an effective development in Kenyan forestry.

FOREST & FORESTRY RESEARCH IN KENYA

BY O. MBURU

CHIEF CONSERVATOR OF FORESTS, OCTOBER 1983

Introduction:

Kenya, which has a total area of some 382,644 sq. km., is situated on the Equator and lies between 4°N and 4°S and between the Indian Ocean to the east and Lake Victoria to the west. The altitude rises gradually from sea-level to about 2000 metres at a point approximately 500 kilometres inland where the Great Rift Valley divides the country from north to south. To the West of the Rift Valley, the land again slopes gradually to Lake Victoria at about 1160 metres altitude.

East of the Rift Valley there are two mountain masses viz. Mt. Kenya rising to a peak of 5199 metres and the Aberdare ranges rising to a peak of 3964 metres. West of the Rift Valley are the Mau ranges, Tinderet, the Cherangani Hills and Mt. Elgon on the Uganda border with a peak of 4321 metres.

These geographical characteristics give rise to a considerable variation in climatic conditions from hot and humid through temperate to cold with permanent snow on Mt. Kenya. About two thirds of the country, covering the north, north-eastern and southern areas, is arid or semi-arid. The Central highlands between 1370 and 3000 metres enjoy good rainfall and dense natural high forest occurs.

Kenya is not endowed with a lot of mineral resources and depends to a large extent on agriculture, livestock, forestry and the industries based on these. The country's continued prosperity will therefore, to a large extent, be dependent upon the most optimum development of agriculture, livestock and forestry.

The Forest Policy for Kenya, as stated in Sessional Paper No. 1 of 1968, declares the dual role of Kenya's forests for conservation and production. The conservation role is vitally important in the regulation of water supplies and preservation of soil through prevention of desiccation and erosion. It is therefore very important for the protection of agriculture and the livelihood of the Urban population.

Self-reliance in forest products is one of the major objectives of the production role of the policy. The implications of such a policy are such that strategies, formulated programmes designed, and practices employed in production of wood resources and wood-based products should be geared towards the anticipated needs of the consumer. These strategies, programmes and practices must provide a balance between availability and demand of these products to be meaningful.

Our country is not endowed with a lot of forests, having only about 2.35 million hectares (1.57 gazetted and 0.73 un-gazetted), most of which serves the protective role. Indeed, the indigenous forests produce about a tenth of the timber produced by the 0.15 million or so hectares of man-made plantations mainly of fast-growing exotic species.

Forestry makes an important direct and indirect contribution to the Kenya economy. Currently it produces about 5% of the G.D.P. and employs about 4% of the wage earning population in forest management and forest industries, and stands high among those sectors with a high potential for increased production and value added. While in monetary terms the contribution to G.D.P. may seem small, forestry in the country plays a vital role in conservation as mentioned above, and in the non-monetary sector where it provides a life-style base for the rural sector whose population largely depends on it for fuel for domestic heating and cooking and for building.

Our strategies for forestry development must be geared towards continued supply of those goods and services without deterioration of the environment. It is estimated that by the year 2000 industrial wood requirement will be in the order of 2.3 million cubic metres, while 30 million cubic metres will be required for fuelwood. This requirement must be provided through proper forest management techniques that take into account all the other pressing land uses if the country is to support its ever-increasing population with improved living standards.

Forest Research

Proper forest management requires a strong research base to support it. As pointed out above, the forest area is very small. It was realised very early on that in order to meet the demands for forest products the forests must be more productive. Research towards this objective has been carried out by the Forest Department right from the beginning.

Plantations of indigenous species were found to be very slow growing, and a major effort was put into the development of exotic species (particularly pines and cypress) and provenance trials regeneration methods and cultural practices; espacement, thinning and pruning; forest genetics and tree improvement nutrition and site productivity and others. Pathology and Entomology research has gone hand in hand with silvicultural research, as has utilisation research. The former Forest Division of the former East African Agriculture and Forestry Research Organisation (EAAFRO) also carried out complementary research which has gone a long way to improving forest management.

It is not intended to give the impression that research in indigenous species and management of natural forest has

been entirely neglected. The area of forests occupied by plantations will always be small in relation to the total area of forests. The protective role is so important, as is the need to conserve genetic resources in situ, that the indigenous forests have always received some attention. But, in order to manage the natural forests as productively as possible, consistent with the need for protection and conservation, research in the management of natural forests needs to be intensified.

For many years the major research efforts were concentrated in the high potential areas, where most of the forests are located. However, in recent years it has become apparent that forestry and tree planting must be extended into the arid and semi-arid lands (ASALs). Research in ASALs was therefore started and needs to be intensified to develop proper nursery techniques for these areas; generate information on climate, soil, vegetation and rainfall to guide timing of tree planting and application of treatment; conduct species and provenances research; and develop establishment and management techniques. A great deal of information already has been gathered, and priority needs to be given to assembling it so that it is easily accessible to researchers and consumers.

Areas of Research Concentration proposed

(i) Agroforestry: Establishment of forest plantations in Kenya has entailed prior cultivation and growing of annual food crops for two years or so before tree planting, and continuing with food crops until the canopy has closed. The growing of food crops with trees has been formalised into research in Agroforestry. This should be continued and intensified and incorporated into the farming systems with the co-operation of the Ministry of Agriculture and Livestock Development and other relevant Ministries and Organisations, including international bodies such as the International Council for Research in Agroforestry (ICRAF). In view of the small area of the forest estate, forestry

development cannot only be confined to this area. It has to be incorporated into the farming systems.

(ii) Community Forestry: Community forestry is assuming ever greater importance all over the world, and comprehensive research is required to provide more information on site-species suitability and yield in different ecological zones outside the forest reserve; on social and economic values and to effect tree planting innovation among the rural people. Though allied to, this is not the same as agroforestry.

(iii) Arid and Semi-arid Lands Research: Tree planting in ASALs is going to assume ever greater importance, not only for forest plantations but in community forestry and agroforestry systems as well. It will be important to identify suitable drought tolerant species (both indigenous and exotic) and provenances and other relevant data - see paragraph 13 above. For example nursery techniques developed for the highlands may not necessarily be suitable for ASALs.

(iv) Tree Improvement: It is necessary to constantly aim at increasing yield per hectare, and tree breeding research must be intensified. It is not only important to improve yield but also to constantly improve quality of the desired characteristics for different end uses e.g. lumber, paper, fuel etc.

(v) Management of Natural Forests: As pointed out earlier the major part of the forest areas will continue to be managed as natural forests. Research into their management to maintain ecological balance, increase yield and maintain the catchment and protective values needs to be intensified.

(vi) Utilisation: There is a need to broaden research to promote complete and efficient utilisation of wood. There is need for new innovation into areas of research that have not in the past received a great deal of emphasis. Energy has become a critical factor in Kenya, and in co-operation with Ministry of Energy and other bodies, research conversion (including

charcoal) and cooking methods is vital. Facilities for research in such aspects as pulp and paper and other fields of wood chemistry need to be developed. Other aspects also of importance include development of other uses of wood and promotion, through proper understanding of their properties, of the use of the currently lesser known species.

(vii) Forest Economics & Marketing: Not much can be said to have been done in this field. Nevertheless, it is important to study the economics of silvicultural operations and management regimes as well as conversion operations with a view to improving them where appropriate. Marketing of both major and minor forest products also needs systematised research.

(viii) Workstudy and Ergonomics: Again hardly any work has been done in this field. Yet it is important for improved productivity and efficiency in forestry operations and should receive attention.

(ix) Forest Engineering: Again, there is a field that has received very little attention. Researches should include types and layout of roads and ridges, logging etc.

(x) Tree Seeds: for success of the increased forestry and tree planting programmes tree seed research will be essential. This will include management of seed stands and orchards; testing, germination etc.

(xi) Catchment Research: has been carried out by the former EAAFRO in conjunction with Forest Department and Water. This work needs to be revised and extended to the management of watersheds.

The above is not a comprehensive list of all that is required. It is also not in place of the traditional forest research that has been going on but in addition to it. What it means is that current research programmes should be continued while increasing emphasis should be directed to those programmes that have received relatively little limelight.

The forest department research branch and the forest division of the former EAAFRO incorporated together into the forestry research department of KARI. Though most of the forest research is formally done by this organisation, it would be wrong to assume that it is the only body carrying out forestry research. Indeed, many bodies including non governmental organisations are carrying out useful research relating to forestry. These must be encouraged to continue and extend their efforts. Indeed it is important that research carried out by these bodies be recognised, co-ordinated so as to avoid unnecessary duplication.

Research Organisation

The research facilities of the Forest Department were, in 1980, transferred to KARI and with the former EAAFRO forestry division, formed the Forestry Research Department of KARI. This is the body that has statutory responsibility for all forestry research in the country.

As pointed out above, many other bodies are involved in forestry or forestry-related research. No formal contact exists between these and KARI. The consumers are also left in the dark as to what is going on. It is true that the Agricultural Sciences Advisory Research Committee and the Natural Sciences Advisory Research Committee established under the Science & Technology Act do go some way to provide coordination. It has been decided to supplement these, and to strengthen the link between all forestry research bodies and consumers by the formation of a Forestry Research Advisory Committee. This will be representative of researchers and consumers. It is hoped that this Committee will, working to a research plan which hopefully will be developed by this Workshop, help formulate programmes and priorities and regularly advise the KARI Board of Management on these. It is also expected that this Committee will constantly monitor and evaluate the agreed programmes.

Forestry in its many forms yields a large variety of uses. Its value to the development of agriculture and livestock, to soil and water conservation, and to wildlife as well as to renewable energy is easily

recognised. However, it also plays a major role in recreation and the amenities and also in fisheries development both fresh water and marine. It is important that in considering the strengthening of forestry research, workers in these various fields be taken as an integral part of it.

Research Information

Good research will be of little value unless it is properly disseminated to the consumer. He is the most important person in this chain. Ways must therefore be developed to balance between the researcher's desire to shine among his peers and the important need to the consumer towards whom all this must aim. Extension research should be developed as part of the means of assuring effective dissemination of information to the consumer.

Staffing and Training

To carry out their increasing responsibilities research organizations must be adequately staffed. Currently the forestry research organizations are very inadequately staffed. Some of the needed forestry research fields have received low attention because of lack of trained personnel. Training must therefore be accorded sustained effort if the goals are to be met. After identifying the research priorities, efforts must be made to find staff and train it to meet them. Only then can the great expectations of forestry be met.

FORESTRY RESEARCH NEEDS AT GRASS ROOT LEVEL

B Y

A. H. CHAVANGI
FOREST DEPARTMENT

Summary

Forestry at the grass root level is one of the components of Community Development. It is a new people-oriented policy whose objective is to raise the living standards of the rural dwellers.

As research plays a very important role in the development of forestry, it is vital that research programmes should be developed to solve forestry problems at the grass root level.

Foresters responsible for the implementation of Forestry programmes at the grass root level have identified the following as their research needs:-

- Species and provenance trials
- Research in agroforestry systems.
- Soil research
- Research in species for fuelwood, timber and poles.
- Research in species with multiple uses.
- Seed Orchards and Seed banks
- Research in Termite control
- Research in the afforestation of irrigated lands.
- Socio-economic research
- Decentralization of research activities and improvement of communication channels.

Introduction

For many years, forestry research in the country was done by the East African Agriculture and Forestry Research Organization (EAAFRO) of the defunct East African Community. Research was done under three major sections, namely Tree Breeding, Forest Pathology and Forest Entomology, and evolved around the three exotic coniferous species Pinus patula, Schlechtend and Cham, P. radiata, D. Don and Cupressus lusitanica Mill.

Research done at this early state laid the groundwork for the establishment of industrial plantations. However, three major aspects were omitted from the research programmes. These were:-

- Research in indigenous tree species
- Research in the afforestation of arid and semi-arid lands.
- Research in multiple land-use through the integration of agriculture and forestry at the farm level.

Of late, there has been a shift in the manner forestry research and afforestation in the country should proceed. More emphasis is now placed on the management of indigenous forests, afforestation of arid and semi-arid lands and the development of farm forestry. It is therefore necessary to cater for these new requirements.

Research programmes developed should aim at solving problems. This paper outlines what forestry research needs at the grass root level are so that programmes developed are applied research programmes, field oriented and with clear objectives of solving problems at the grass root level.

FORESTRY RESEARCH NEEDS AT GRASS ROOT LEVEL

In order to determine what the forestry research needs at the grass root level are, letters were sent to the Chairman of all the District Development Committees, and to the foresters who are responsible for implementing forestry programmes at the grass root level. The letters contained four questions (Appendix 1) and the officers were asked to provide answers to these questions. In providing answers, the officers were asked to indicate what their research needs were, and also to indicate in which manner they would like to see the Forestry Research Department (FRD) of the Kenya Agricultural Research Institute (KARI) conduct its affairs to meet the current and future needs of these at the grass root level.

The responses to the letters have ranged from the high potential agricultural districts to the low rainfall districts and finally to the arid and semi-arid districts. Appendix 2 shows the districts which responded as well as what their research needs are.

Species and Provenance Trials.

The need for research on species and provenance trials has come out as the greatest research need. As foresters have indicated, there is lack of knowledge on what tree species should be planted in the different districts and also which provenances.

Many foresters responsible for forestry programmes at the grass root level are trained in industrial plantation forestry. Their knowledge is therefore confined to only a few exotic industrial plantation species which are planted in the higher rainfall areas of the country. Now it is the policy of the government to take forestry to the people through the promotion of rural afforestation. Lack of knowledge on tree species to plant in different environments therefore adversely

affects the implementation of the policy.

Kemp (1977) had defined species trials as the accurate determination of the comparative values of populations which are known to be genetically different. Research is therefore very necessary to determine which species are suitable for the different environments. This would ensure that foresters only promote planting of species of proven performance. Provenance research knowledge is also very vital. Foresters require to know the best provenances from the point of view of productivity, resistance to drought diseases and insect pests.

Research in Agroforestry Systems

The most common energy source for the rural populations in Kenya is fuelwood, the supply of which is getting more scarce all the time. In the high potential agricultural areas, the supply of fuelwood is getting scarce because priority in land-use is for growing of either subsistence crops or cash crops. In the dry areas of the country, the supply is getting scarce due to overexploitation coupled with low regenerative capacity due to adverse weather conditions. It is in these situations that most of the foresters are operating to try to solve people's problems which also include supply of timber and building poles.

The application of suitable agroforestry systems to different land-use situations has been suggested as one of the solutions to the problem of provision of fuelwood, timber and poles.

Agroforestry research should, among other items, include the following aspects:-

- Identification of land-use methods and the application of agroforestry systems to solve problems.
- Formulation of programmes for agroforestry research to identify suitable systems for application
- Investigation of the social constraints like to be associated with the application of agroforestry systems.

Soil Research

Success in afforestation in some districts is low due to lack of knowledge on soil types and the tree species suitable for the different soils. A need has therefore been expressed for research to be done aimed at giving guidelines on which tree species should be planted in different soils types.

Soil research should cover the following aspects:-

- Trials to identify tree species suitable for different soil types.
- Identification of nutrients limiting tree growth in different areas.
- Spacing trials to determine carrying capacity per unit area particularly in the dry areas.

Research in Indigenous Tree Species

Forestry research in Kenya for a long time was confined to a few exotic softwood tree species planted in the highlands for plantation development. These species are Cupressus lusitanica, Mill, Pinus patula, Schlechtend and Cham and P. radiata, D Don. Very little research has been done on the indigenous tree species of which there are hundreds of economic importance.

The exotic tree species for which there is adequate research information are not suitable for the arid and semi-arid lands which constitute the biggest area of the country. The species also are not suited to the farming practices in the rural areas. It is therefore noted that most of the research which has been done is of no immediate direct benefit to the rural populations. This is a situation which has got to be rectified due to the changed circumstances.

Indigenous trees planted properly are the best assurance of success in afforestation according to FAO (1955). It is therefore imperative that much more research on indigenous tree

species should be done. The research should aim at identifying species for use in the afforestation of arid and semi-arid lands as well as for use in different agroforestry systems. However, with proper judgement, introduction of exotic species should be tried as well.

It has been suggested that research in indigenous trees should cover the following aspects among others:-

- Seed collection and extraction.
- Seed storage and maintenance of viability.
- Natural regeneration of some species.
- Agroforestry species.

Research in Species for Fuelwood, Timber and Poles

The vegetation in the arid and semi-arid regions of the country consists of low shrubs and grass. The woody vegetation cannot meet the requirements of the people for fuelwood, timber and poles. In other areas, all the woody vegetation has disappeared completely due to over-exploitation. These areas are therefore deficient in fuelwood, timber and poles supplies.

In a paper entitled "China: Forestry Support for Agriculture, FAO (1978) states that research should be practical and should aim at solving the problems which people are facing. The problem of the inhabitants of the arid and semi-arid districts of the country is lack of fuelwood, timber and poles. It is important that research programmes for these areas should aim at solving this problem by coming up with suitable tree species for the afforestation of the areas.

Other important related aspects which should be studied are:-

- Surveys on a regular basis to determine demand and supply patterns for fuelwood, timber and poles.
- Better utilization methods for the products.

Research in Species with Multiple Use

In the past, investment and forestry research have been directed mainly to timber production and the protection roles of the forest. With all the wealth of information now available, there is a need to adopt this information for use to make forestry an effective tool of rural development.

According to FAO, (1982) forestry research at grass root level should lay greater emphasis on the benefits from forestry that can accrue directly to the rural people.

The needs of rural people are many and varied. Their requirement is therefore tree species which satisfy as many of their needs as possible. In conducting research, the aim should be to come up with tree species which meet the following needs:-

- Supply fuelwood, food, fodder and other products as well as controlling desertification.
- Soil conservation.
- Improve soil fertility through nitrogen fixation.
- Windbreaks and shelterbelts.

Seed Orchards and Seed Banks

The success of afforestation programmes in rural areas depends on the availability of seed of the right tree species and in sufficient quantities. This is particularly so at this time when so much interest in tree planting has been generated that the Forest Department is unable to supply seed to all the self-help tree nurseries which have been established. Lack of sufficient seed is therefore one of the factors hampering the promotion of afforestation in rural areas.

It has already been stated that exotic tree species commonly planted in the highlands which have high rainfall are not suitable for the dry areas. The species are also not

compatible with farming practices in rural areas. This leaves the option of trying indigenous species for these areas. Exotic species should be tried only often trials have proven them as suitable.

Knowledge of seed extraction, storage and maintenance of viability of the seed for indigenous species is limited. The result is that there are no sufficient supplies of seed for indigenous species,

According to Owen (1956), two factors affect viability of seed in storage. These are the moisture content of the seed and temperature. These are factors which foresters cannot control easily due to lack of proper facilities at their stations. Research in this field should therefore cover the following aspects:-

- Research and development programmes on the establishment and management of seed stands and tree seed orchards.
- Research on storage conditions for different types of tree seeds and maintenance of viability.
- Investigations to determine optimal requirements for maximum seed germination rates under different conditions.
- Development of seed banks.

Research in Termite Control

Termites have a countrywide distribution, although they are more common and cause much more damage in their drier districts than in those with more rainfall. They are a big problem in afforestation as they attack with young seeds and old trees.

According to the proceedings of an ICRAF/BAT sponsored workshop on Agroforestry systems for small-scale farmers held

in Nairobi Kenya, Aloo (1982) states that the presence of termites in the dry areas of tropical Africa is an obstacle to afforestation programmes. particularly with eucalypts.

Research in termite control should be considered as key to success in afforestation in the dry districts of the country. Although some indigenous tree species which are not attacked by termites are planted, it is necessary that some fast growing exotic species should also be planted to supply badly needed products like fuelwood and poles, some of the exotic species which should be tried are susceptible to termite attacks. It is therefore desirable that a vigorous research programme on termite control should be developed.

Research in Afforestation of Irrigated Lands

Afforestation in some of the dry districts like Tana River, West Pokot and Elgeyo Marakwet is possible through irrigation. There is however lack of knowledge on afforestation of irrigated lands. As the Ministry of Agriculture is putting these dry areas to crop production using irrigation, there is a need for afforestation to go hand in hand with agricultural development.

Research in afforestation of irrigated lands should cover the following aspects:-

- Trials to determine tree species which can be grown under irrigation.
- Control of weeds on irrigated lands.
- Water requirements of the tree to be planted.
- Accumulation of soluble salts likely to be harmful to trees.

Socio - Economic Studies

The need for Socio-economic studies has been identified by foresters as of great importance to their work. For Rural Development programmes of which afforestation is one to succeed, FAO (1978) states that the programmes developed should

reflect the peoples' own interpretation of their needs, problems and aspirations. This means that forestry for community development must therefore be forestry for the people and involving the people. The beneficiaries of the forestry programmes should be involved in the design and implementation of the programme.

As research plays an important role in the afforestation, any research done should be in conjunction with the local people. Socio-Economic surveys will determine the needs and problems of the people and research programmes formulated should as much as possible be based on this. The following areas are relevant for research.

- Social aspects of afforestation at the grass root level.
- Farming and silvicultural systems and techniques.
- Forestry and grazing.
- Product utilization.
- Identification of new sources of income.

It is important that social scientists should work with foresters in identifying the needs of a community, the constraints in meeting those needs and how to go about eliminating the constraints.

Decentralization of research and Improvement of Communication Channels

The forestry research needs of the districts are many and varied. In view of the fact that little as no research has been done in most of the districts, for research to have an impact within the shortest period, there should be decentralization of research activities.

Equally important is the improvement of communication between researchers and foresters at grass root level. It is

the view of many foresters that a lot of research material which could be of use to field officers is lying in files at research stations. Such research findings should be passed on to the foresters. There should also be link-up co-ordination between field foresters and researchers. This is vital lest research results end up as theoretical findings.

Appendix One

Questions put to the Foresters at the Grass Root Level.

1. What are the current forestry research needs of your district?
2. Which needs are being met by the Forestry Research Department of the Kenya Agricultural Research Institute (KARI)?
3. Which needs are not met and what problems do you have in your work as a result of this?
4. In what directions would you like to see the Forestry Research Department of KARI move to meet your current and future needs more effectively,

Appendix Two

Forestry Research Needs of The Districts

Species and Provenance Trials

| | | | |
|--------------|----------|-----------|------------|
| Kilifi | Machakos | Kirinyaga | Narok |
| Kwale | Embu | Murang'a | Nandi |
| Taita Taveta | | Nyeri | T/Nzoia |
| | | | W/Pokot |
| | | | Kajiado |
| | | | E/Marakwet |
| | | | Samburu |
| | | | Baringo |
| | | | Siaya |
| | | | Kisumu |

Research In Agroforestry Systems

| | | | | |
|--------|------|-----------------|----------|-------|
| Kilifi | Embu | Uasin Gishu | Kakamega | Kisii |
| | | Narok | Busia | Siaya |
| | | Kericho | | |
| | | Elgeyo Marakwet | | |
| | | Trans Nzoia | | |

Soil Research

| | | | | |
|--------|----------|----------|------------|-------|
| Kilifi | Marsabit | Murang'a | U/Gishu | Busia |
| | | Nyeri | Narok | |
| | | | West Pokot | |
| | | | Kajiado | |
| | | | Samburu | |

Research In Indigenous Tree Species

| | | | |
|------------|---------|----------|-------|
| Tana River | Nandi | Kakamega | Kisii |
| | Narok | | |
| | Kericho | | |
| | Baringo | | |

Research In Species for Fuelwood, Timber and Poles

| | | | |
|-------|----------|-----------|-----------------|
| Lamu | Marsabit | Kirinyaga | Uasin Gishu |
| Kwale | | | Elgeyo Marakwet |
| | | | Trans Nzoia |

Research In Species with Multiple Uses

| | | |
|--------|----------|-------------|
| Kilifi | Ma sabit | Narok |
| Kwale | | Kericho |
| | | Trans Nzoia |
| | | Samburu |

Seed Orchards and Seed Banks

| | | | |
|-------|-----------|------------|----------|
| Kwale | Kirinyaga | Nandi | Kakamega |
| Lamu | | Narok | |
| | | West Pokot | |

Research In Termite Control

| | | | |
|------------|-----------------|-------|--------|
| Tana River | West Pokot | Busia | Kisumu |
| | Kajiado | | |
| | Elgeyo Marakwet | | |

Research In Afforestation Of Irrigated Lands

| | |
|------------|-----------------|
| Tana River | West Pokot |
| | Elgeyo Marakwet |

Socio-Economic Studies

| | | | |
|------------|------|-------------|----------|
| Kilifi | Embu | Uasin Gishu | Kakamega |
| Tana River | | | |
| Kwale | | | |

Decentralization of Research and Improvement of Communication Channels

| | | | | |
|------------|----------|---------|----------|--------|
| Kilifi | Murang'a | Narok | Kakamega | Kisumu |
| Kwale | | Kericho | | Siaya |
| Tana River | | Samburu | | |
| | | Nandi | | |

ANALYSIS OF RESOURCE DEVELOPMENT TRENDS IN KENYA
AND THEIR POTENTIAL EFFECTS ON RESEARCH CHOICES

BY

F. J. WANG'ATI

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Introduction

The Fourth Development Plan for Kenya had the overall theme of alleviation of poverty. This theme was interpreted by various Ministries in terms of opening up economic opportunities for both urban and rural poor, and the creation of various infrastructures to promote economic and social development in these sectors. The strong national focus on the development of semi-arid areas in terms of agricultural productivity and resource conservation has influenced research priorities, and considerable resources have been directed to research in dryland farming, including afforestation, and soil conservation. The Fifth Development Plan has taken the theme "mobilization of domestic resources for equitable development". Achievement of equitable development requires continued effort in the programme initiated for alleviation of poverty, while emphasis on development of domestic resources calls for a closer look at the pattern of investment in terms of import content. Research will therefore be expected to concentrate not only on development of technology for mobilization of resources in the semi-arid areas, but also on the increased use of local manpower and funds in such activities. This paper therefore discusses briefly some of the potential effects of such development trends on research choices, especially in the field of forestry.

Requirements of a Changing Pattern of Settlement

It is widely recognized that, in spite of prominence of urban problems, at least 80% of the Kenya population live in the rural areas and derive their employment, subsistence and

developmental resources from various land use activities. All these activities, however, depend on energy availability, principally wood fuel, and forest products which constitute building materials, fencing and even support structures in construction industry and horticulture. In the past, support for human settlements in the semi-arid areas has not posed a serious problem. These areas were sparsely populated with limited need for permanent structures and social services. The rapid population growth in these areas, due to both immigration and natural growth, and the policy now adopted of subdivision of land and allocation of family holdings, will however pose problems of a different nature and research priorities will need constant review. The first problem will be the rapid depletion of trees species and changes in species composition. This will affect ecological balance between woody and grass species and could also affect nutrient recycling and replenishment. Since these changes would be difficult to counteract on a short term basis, a careful study of the existing interactions should be initiated as early as possible in order to establish a baseline for future evaluation.

The second problem arising from development of small-holder settlements in semi-arid areas is shortage of fuel wood. Assuming that the current programme of afforestation will be intensified with more hardy and reasonable productive species, it is unlikely that this effort alone will be sufficient to meet the fuel needs. The Kenya environment is however rich in indigenous rapidly regenerating plants which may be classified as scrub bush or thicket. Technology for selective harvesting and simple processing of such material to promote rapid regeneration, convenient handling and efficient utilization will need to be developed through research.

The third problem associated with changing settlement and land tenure system is the role of the communal wood lands as distinct from protected forest reserves which are unlikely to expand. With the likely eventual disappearance of such communal

Woodlands, the individual households will become almost entirely dependent on the tree crops on their own land and will have to manage these in an agro-forestry system. Forestry research will therefore have to intensify and orient research projects in all aspects of agro-forestry. This orientation would benefit greatly from a closer association with the disciplines of agriculture, animal production and soil/water conservation.

The Impact of Regional Development Authorities

Kenya has seen in the last few years an important change in approach to development. This is the establishment of regional Development Authorities with mandate to co-ordinate integrated development of well defined regions. This is no new concept in the world, and the choice of drainage basins provides a unique opportunity for both research and application of results. Some experience in studying an entire catchment area has been gained in the long term experiments at Kericho and Kimakia. These studies were, however, confined to hydrology and were carried out under conditions of controllable development in relatively small catchments. Development planning for an entire drainage basin, however, requires extrapolation of experience gained in small catchments and the development of models which incorporate various facts of land use. The role of tree crops as a more permanent feature of such drainage basins will therefore gain higher importance, particularly when considered as a dynamic resource varying with the activities of the resident population in the whole basin. This situation therefore calls for a multidisciplinary approach to research - including forestry research - through cooperative research programmes involving biologists, physical scientists, economists and sociologists. This is a new concept in Kenya research system which has up to now tended to emphasize and reward individual achievement as opposed to team effort in solving developmental problems.

The Influence of Manpower Development: Strategy

The implementation of research projects and programmes, however well thought out and planned, is in the final analysis dependent on the availability of well trained research staff, financial resources and research facilities and sound research management systems in that order. The current situation in Kenya regarding the first criterion, that is trained researchers, is unsatisfactory in many agricultural disciplines but is probably worst in the field of forestry where there are less than ten research officers trained up to M.Sc level. This situation will impose a severe limitation on the choice of research projects, leave alone the question of setting up multidisciplinary teams. The proposed programme of accelerated agricultural research manpower development in Kenya is therefore welcome and urgent particularly in forestry research. However, such a programme even when eventually set up will take at least four to six years to make significant impression on the quality and coverage of forestry research programmes. It is therefore proposed that in the interim, a mechanism be developed to facilitate participation of Kenyan scientists in various institutions like the University, the private sector and the non-government organizations in multidisciplinary research teams on priority fields of forestry research. It is hoped that this can be achieved to a large extent through voluntary co-ordination and collaboration in existing projects.

Influence of Availability of Financial Resources

Unlike most other forms of research where results can be seen in daily, weekly, monthly or seasonal changes in performance, forestry research usually takes years before benefits accrued can be demonstrated. This seems to have removed the element of urgency in funding forestry research, and the real social and economic values of tree crops have in the past not made sufficient impression on research funding

agencies. The situation seems however to have changed considerably since the establishment of UNEP and the preoccupation throughout the world with the environmental aspects of forestry. Recent analysis on resource allocation to agricultural research in Kenya showed that in 1979/80 total Government expenditure on forestry was only 2.9% of the national expenditure on R&D. It is therefore hoped that a much larger proportion of overall development funds currently devoted to afforestation and related activities will be allocated to research in order to develop technologies for long term sustenance of the tree crops being established.

Conclusion

In this brief paper it was not possible to provide a detailed analysis of the various major projects which may affect research choices in the area of forestry. Such details can be covered covered later in the course of reviewing activities of various institutions. It is, however, clear that the pattern of resource development should be taken into consideration in choice and design of research projects. It is also emphasized that in future every effort should be made to organize research projects around multidisciplinary teams of scientists.

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MAJOR CHARACTERISTICS OF FORESTRY RESEARCH IN KENYA

A Discussion Paper to the Workshop on Strengthening
Forestry Research in Kenya

by

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S U M M A R Y

Forestry Research is primarily concerned with finding solutions to forestry resource management problems. This aspect of forestry is steadily gaining importance as indicated by the ever increasing number of agencies and organizations involved in one form or another of forestry research in Kenya. This paper discusses some of the problems which have hitherto hindered the success of forestry research in Kenya. Proper planning of forestry research, communication among forest researchers and motivation and capability of the research scientists are proposed as the key to forestry research in Kenya.

MAJOR CHARACTERISTICS OF FORESTRY RESEARCH IN KENYA

To date most of the forest research in Kenya has been problem-oriented in response to specific forest resource management needs, such as forest protection, forest utilization and forest management (planning, inventory and silviculture). Except for the new projects undertaken by individual researchers in pursuit of higher academic qualifications, most of the research has been conducted by the Kenya Forest Department Research Section and the now defunct E.A.A.F.R.O. The issues discussed in this paper are therefore mainly a reflection of the level to which the institutional environment has affected forest research in Kenya.

Conceptually, forestry research should conform to acceptable research procedures, in that it should be properly planned and based on proper scientific methods to ensure objectivity. Figure 1 gives a general model for forest research as it has been in Kenya. As it is, the model is acceptable within the concepts advocated by Stoltenberg et al (1970). In spite of this, forestry research in Kenya can be said to have been characterized by:

1. Shortage of committed scientists.
2. Lack of effective planning
3. Lack of communication among forest researchers, leading to duplication of effort.

These three characteristics can be said to be interrelated in one way or another, and to be mainly a result of the institutional environment within which forestry research has been conducted in Kenya. A more detailed analysis of these problems supports this assertion:-

Shortage of committed scientists

Within the Kenya Forest Department, the general procedure for posting personnel to the research section up until recently

has been not necessarily on personal merit or individuals' choice but mainly on a random procedure, often biased to people who had proved themselves inept in other sections. This, and the prospects of transfer from the section at any time, led to despondency and lack of interest in forest research. A high rate of personnel turn-over in the section also led to lack of success of research projects due to discontinuity after the person who initiated the project was transferred. It is also an open secret that extra benefits enjoyed by personnel in other forestry sections attracted prospective researchers away from the research section.

For forestry research to succeed, the individual researcher has to be committed to his calling. This commitment can be enhanced if prospective researchers are motivated on the job through such incentives as job security, promotion prospects, prospects for further training and recognition of individual efforts as a basis for promotion. The setting up of research institutes, such as KARI, is a step in the right direction as they provide a viable environment within which individual researchers can be motivated. Another point that planners should consider is that to be a good scientist requires that much longer training and effort and therefore such scientists should be rewarded accordingly.

Lack of effective planning

Proper planning of forest research requires that there be a clear definition of what constitutes a researchable problem, and a statement on the criteria for assigning research priorities. Very often, in problem oriented research such as in Kenya, there is a tendency to look at a given resource problem from only one dimension. For example consider the case of wooly aphid (a pineus sp.) problem on pines. An initial indication would be that it is an entomological problem and the entomologist would begin studies of the ecology of the wooly aphid and methods

of control using biological or chemical methods, sometimes at great expense. An effective planner on the other hand would invite the silviculturist to look at the relationships between stand density and level of attack, the mensurationist to model effects of attack on growth rates, the ecologist to look at the ecological studies and methods of control of the aphid, and the economist to look at the cost effectiveness of each method of control. A coordinated attack on the problem would more than likely result in the most effective solution to the problem.

The above illustration aims at pointing to the need for cooperation among researchers and for discussing each other's research projects among themselves. My short experience within the Kenya Forest Department Research Section indicated that this cooperation was completely lacking, with each researcher working almost independently of the others. More effective planning of research activities would ameliorate the situation. It is suggested that:

1. All research projects to be evaluated and a priority list drawn.
2. Director of Research hold monthly meetings with project or section heads to evaluate and review research progress.

Lack of communication among forest researchers

The need for cooperation discussed under effective planning above touches on the need for communication among researchers within the same organization. The same applies at the national level. There are over 19 agencies and organizations currently involved in some form of forestry oriented research in Kenya (Armstrong 1983). Yet very few, if any, know of the existence of the other, let alone what they are researching on.

One cannot therefore overemphasize the need for a national forum as a means of coordinating and communicating forestry research information. Some food for thought:-

1. National Committee on forestry research.
2. A directory of forest research
3. Re-awaken the Kenya Forestry Association. It can serve as a forum for foresters and forest researchers.
4. Kenya Journal of Forest Research.

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ANALYSIS OF CURRENT FORESTRY RESEARCH
PROGRAMMES IN KENYA¹

BY

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Introduction

The closely inter-linked problems of food, energy and ecological sustainability often combine to threaten the very survival or to retard socio-economic progress of many developing countries in tropical regions like Kenya. Forests and forestry developments have important consequences in sustaining agricultural land productivity and in catchment stabilization. Kenya, like other countries within the region, is energy-deficient and has to rely on large oil imports. The ratio of the cost of oil import and total export earnings is about 0.4 with the obvious detrimental effects on the nation's balance of payment. Rapid development of indigenous and renewable source of energy is therefore given high priority in development planning. Fuelwood remains the dominant source of energy for domestic use particularly in rural areas. In addition, large quantities of fuelwood are required for agro-industrial processing i.e. for tobacco curing and tea leaf drying.

Energy balance forecasts for Kenya indicate that the country needs to mount a four-fold increase in afforestation efforts above the current levels. Land is limited in availability in high potential areas, so the bulk of this additional afforestation task has to be effected in marginal lands where relatively little afforestation research has been done before. Furthermore, the growing pressure on the limited arable land, as a result of high population growth rates, are such that foresters are being called upon to adopt new wood production technologies such as intensively managed energy

plantations, agro-forestry and rural forestry. This in turn calls for intensification of research in a greater diversity of lines. In what follows, an attempt is made to analyse existing forestry research programmes vis a vis future challenges.

2. Historical Background

The earliest task of foresters, at the turn of the century, was regulation of cut in mangrove forests in the coastal region. Pragmatic inventory research therefore was the first line of activity of record. This was soon followed by the Hutchins Commission of 1902 which encouraged the introduction of fast-growing species and thus led to the first set of compensatory plantation trials with Central American cypresses and pines and Australian eucalypts. The British Empire-wide Streets Commission recommended a shift in emphasis away from exotic species to better adapted indigenous species. This gave rise to the research and plantation trials of valuable indigenous species like Juniperus procera, Vitex keniensis etc

A forestry research nucleus was formally established in the mid thirties, originally as a small separate unit which was developed into sub-conservancy at the end of World War II. Upto this time forestry research was organized in three subject areas, silviculture, pathology and entomology. The period immediately following World War II was great intensification and proliferation of forestry research. Quite a few of the current forest management practices are founded on research accomplished during that prolific research period of 1945 - 1955. The East African Common Service Organization was founded in 1948 with the objective (among many others) of establishing research programmes of common interest to Kenya, Uganda and Tanzania. The constituent East African Agriculture and Forestry Research Organization (E.A.A.F.R.O.) was founded soon after with a

Forestry Research Division. Three forestry research programmes were defined for E.A.A.F.R.O., mainly silviculture, pathology and entomology, with a sub-programme in horticulture. In 1962, a tree breeding research programme was added with subsequent phasing out of the silviculture research programmes to national research institutions. In principle, research programmes at E.A.A.F.R.O., were supposed to be more basic and interdisciplinary in nature than national forestry research programmes. Following the break-up of the East African Community in 1976, there has been a protracted harmonization of the two levels of research on a national basis.

More recently other agencies have become involved in forestry research even if to a minor extent. The Ministry of Agriculture, Ministry of Energy, the University of Nairobi, the Kenya Rangeland Ecological Monitoring Unit and specific projects like the Embu Meru and Isiolo Project, NORAD project in Turkana, East Pokot Catholic Mission, Bamburi Cement Company, British American Tobacco (K) Limited etc.

3. Disciplinary Analysis

3.1 Ecological Research

This has been a badly neglected area of research. With the notable exceptions of the phytosociological studies of Trapnell and Langdale-Brown (1962) and the site changed of plantation rotation of Robinson et al (1967) there has been no consistent forest ecology research programme. Issues like site factors in relation to tree growth, effects of forestry operations on site quality, forest typology, land capability and land use evaluation, site classification for forestry in semi-arid areas are all important but relatively neglected areas of research. In fact, management of the existing indigenous forests for increased productivity/sustainability and the extension of forests to marginal areas are limited, to a large extent, by lack of such research data and information.

3.2 Hydrology and Watershed Research

While it is recognized that the limited forests of Kenya play a vital role in water catchment, there is no strong on-going water catchment research. The excellent research initiated by Pereira et al (1960) is not being effectively followed-up. Furthermore, many workers have stressed the need for inter-disciplinary research on watershed basis but little is forthcoming in terms of concrete research projects. Perhaps the regional development authorities could play a leading role in this area.

3.3 Silviculture

Silvicultural practices for plantation development in high potential areas have a commendable local research foundation. The move towards more intensively managed "energy Plantations" and towards agroforestry will be, however, hampered by lack of research data and information. Research in arid zone afforestation is barely started.

Perhaps the most disturbing observation is the attitude among some scientists that all is known about raising Pinus patula, Cupressus lusitanica etc. in the high potential areas and, therefore, that support for the existing silvicultural research should be reduced. This view has led to unfortunate, erratic changes in research. priority setting and planning, and has led to total neglect of some long-term silvicultural experiments. The inertia and cumulative characteristics of scientific research are particularly important for relatively long-term silvicultural research programmes.

3.4 Protection

There have been notable successes in the control of forest pests and diseases through research. Pest

examples include the control of stem bores and pine woolly aphid, while disease examples include cypress canker and Dothistroma needle blight. However, there is relatively little follow-up research, applied for basic research, for these and other pests and diseases. Research workers in these areas have tended to adopt a "research-upon-crisis" strategy in their work. Research is particularly wanting in applied (field) control methods.

Fire protection is very poorly developed in both research and practice. For a strange combination of reasons, the Forest Service has been unable to establish an effective Fire Protection Unit. This situation has led to the non-existence of forest fire protection research. The necessary research base for the development of appropriate fire rating and fire fighting systems is yet to be started.

3.5 Economics and Management Research

For a long time, forest management goals and objectives have been set with very little economic analysis. Economic analysis capability is absent in the research phase, and very poorly developed in the management planning phase. This constitutes the most serious research gap.

There is very little forest management research. Forest management planning has degenerated into a "play-it-by-ear" game. Fixity of views and ideas on forest management options within the forest service has been a strong influencing factor. New initiatives must be made for management of Energy plantations, agro-forestry and rural forestry projects. Forest labour management is another area which calls for immediate research.

3.6 Forest Products Research

Wood utilization research is carried out by the govern-

ment service and by private firms. In general, timber utilization research efforts by the forest service have lagged for reasons of inadequate equipment and lack of personnel training and motivation. More recently, research initiatives have been made in the area of charcoal production and stove designs.

There remains however, a wide range of other forest products which are well recognized but for which relatively little research is in the offing. These include wood distillates, food, fodder, exudates, thatching materials, fibres, medicinal products, cork, soil improvement (including nitrogen fixation) etc. It is quite obvious that the existing facilities and personnel are highly inadequate for the comprehensive forest products research which the nation requires.

3.7 Growth and yield research

The inventory section of the government forest service has not developed a strong research capability and image. A few studies have been accomplished in collaboration with the Commonwealth Forestry Institute or as specific thesis research projects. It appears that this is a research area which could be immediately strengthened given that we now have well qualified local people.

Some inventory research has been attempted at K.R.E.M.U. which is of value to forestry development planning, although this has been restricted to broad forest cover analysis.

3.8 Genetic and Tree Improvement Research

The population improvement breeding programme which was developed at the former East African Agriculture and Forestry Research Organization was disrupted at the level

of second generation selection. No adequate arrangements have been made for the continuation of this research effort, although personnel and facilities exist.

There appears a need to expand the scope of forest genetics research to take advantage of the more recent breakthroughs in genetic science and technology. Geneecological studies and valuable local species should be intensified.

3.9 Tree Physiology Research

This is an important research area which has been ignored both at the forestry research institutes and at the University. Immediate arrangements should be made to bridge this glaring research gap.

4. Agency Analysis

4.1 Research at the Kenya Agricultural Research Institute (K.A.R.I.)

Two years ago, the former Forestry Research Conservancy of the national forestry service was merged into the Forestry Division of the former East African Agriculture and Forestry Research Organization to constitute the Forestry Research Department of K.A.R.I.

While planning is in the advanced stages for a broadened and revitalized forestry research at K.A.R.I., the institute is presently poorly funded and is plagued by shortage of staff and low work morale. Attempts have been made to define new research priorities and programmes. Given the few and often relatively inexperienced research scientists at the institute, the recently proposed changes in scope and focus have not only appeared ambitious but have tended to disrupt

the few good research lines which had been developed.

Proposed changes aside, research continues in the three areas of silviculture, pathology and entomology with some sporadic effort made on tree breeding and forest ecology. Personnel motivation, institutional problems and staff shortage seem to be the major limiting factors for more progressive research at KARI and, if the above problems are solved, the institute should form a powerful nucleus for forestry research. A commendable attribute at K.A.R.I. is the existence of supporting research programmes and services like soil physics, soil chemistry, documentation and data analysis.

4.2 Research and Demonstration Activities of the Ministry of Agriculture

In the last few years, the Ministry of Agriculture has promoted tree planting as a component of the soil conservation programme. Species and provenance screening has been done at a few agricultural research stations, notably at Katumani and Kitale involving, for example species and provenances of Prosopis and Leucana

The Ministry of Agriculture has also initiated tree fodder research at Katumani research station, and at Kiboko range research station. In general, however, these forestry research activities of the Ministry of Agriculture have tended to be one-time, specified aid projects. The Ministry has not made long-term commitments for these valuable lines of research. This omission is underscored by the fact that agroforestry research and development is being promoted more by forest scientists than by agricultural scientists.

4.3 Research and Demonstration activities of the Ministry of Energy

The newly created Ministry of Energy has embarked on some forestry research and demonstration, particularly in the areas of wood and charcoal products utilization and agroforestry. In general, forestry research and demonstration activities of this Ministry appear to be weakly designed and terribly understaffed. As in the case of the Ministry of Agriculture, these research and demonstration projects are components of specific aid packages, and little thought and planning is being given long-term continuation with local resources beyond the aid periods.

4.4 Forest cover Monitoring Activities at K.R.E.M.U

The Kenya Rangeland Ecological Monitoring Unit (K.R.E.M.U.) has developed some capability for monitoring changes in forest cover using aerial photographs and satellite data. The existing facilities at K.R.E.M.U. can also be used in phytomass studies on a broad scale.

There exist some major institutional problems at K.R.E.M.U. since it was started as a specific aid project for which long-range continuation was overlooked at the beginning. K.R.E.M.U. has a large, relatively inexperienced team of local scientists, a few of whom undertake forestry related research.

4.5 Research Activities at the University of Nairobi.

Forestry research is still poorly developed at the University of Nairobi. There are a few on-going medium-scale projects on species and provenance screening for dryland afforestation and for fast-growing, nitrogen fixing capability. The existing staff and facilities at the University are relatively under-utilized and could immediately be deployed to boost research in ecology, tree

physiology, mensuration and genetics - if workable arrangements for collaborative research could be finalized. The University is also rapidly building up capability for research personnel training, either in the form of short-time specific training courses or in the form of formal post-graduate training.

4.6 Research activities by private firms

Research contributions by private firms in the area of forest products have already been noted. A few private companies and state corporations are also involved in afforestation. Notable examples are the British American Tobacco (Kenya) Limited (B.A.T.) in their farm woodlot development for tobacco curing, the Bamburi Cement Company in their site reclamation afforestation and the Broke Bond Liebig (Kenya) company in the afforestation programme for tea leaf drying. Some of these companies and corporations have engaged forestry research personnel who are making important contributions. For instance, B.A.T. is supporting research in arid zone tree planting and in agroforestry. Bamburi Cement Company has made important research contributions in the growing of Casuarina equisetifolia and Prosopis spp

It is to be expected that only large companies with interest in large-scale tree growing could support their own forestry research into the future. Smaller companies could, however, make their contributions by supporting specific research projects either at K.A.R.I. or at the University.

4.7 Research and Demonstration Activities by Non-Governmental Organisations

The Kenya Non-Governmental Organisations have formed

themselves into a loose network and have given tree planting high priority in their objectives and plan of activities. The Green Belt Movement, the East Pokot Catholic Mission, the National Council for Christian Churches are examples of KENGO member organizations that have made significant research contributions in forestry research and demonstration at specific localities. These organizations, however, are plagued by lack of either technically qualified staff or long-term funding commitments. They promise to be of great value in forestry in the national forestry extension programmes.

4.8 Contribution from International Organizations

Kenya has not only hosted two important United Nations Conferences (on desertification and on new and renewable sources of energy) recently, but is the host of a number of international organizations with forestry research interests. The United Nations Environment Programme (UNEP), UNESCO/UNEP supported Integrated Project for Arid Lands (I.P.A.L.), and the International Council for Research in Agroforestry (I.C.R.A.F.) are all headquartered in Kenya.

While realizing the international character and brief of these organisations, it has been the author's unfortunate observation that these organisations have contributed very little in strengthening forestry research programmes. Whenever pressed to yielding points, they have responded by floating "off-the-mark" and recommend expensive consultancies which developing countries like Kenya could ill afford.

5. Some concluding remarks

There has been a general decline in the volume and

quality of forestry research over the past ten years. This decline has occurred during a period when governmental and public support for increased afforestation has reached an all time high. This has left the forest research scientists in a difficult position of being offered plenty of opportunity to contribute to the greatly expanded forestry development programme from a dwindling research foundation.

The climate for increased national and donor support is still good, but it is unlikely to remain the same much longer. By the timely solution of some of the problems already identified, and by closing some of major forestry research gaps, Kenya has major opportunities in the immediate future for strengthening forestry research on a long-term basis. The challenge rests squarely on you gathered here at the workshop.

FORESTRY AND AGRICULTURAL RESEARCH PLANNING
AND IMPLEMENTATION

BY

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NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Introduction:

Agriculture and forestry share similar requirements in that they require the same basic resource, namely, land, and more often than not they are in competition for this resource. Both are crucial to man's survival, with agriculture providing food, and forest resources providing building and industrial wood products, fuel and recreation facilities. Indirectly, the latter provides vegetative cover and helps to maintain ecological balance. In the past, when land was abundantly available, our ancestors were able to have both without any conflicts arising. This was achieved through shifting cultivation, thereby allowing forest and vegetation to regenerate. As a result of rapid population growth, many countries have a shortage of good agricultural land capable of producing adequate food and incomes. Consequently, population pressure has forced people to cultivate more marginal lands and excise forest lands for food production, settlement and fuel.

Thus it is found that agriculture and forestry are linked by their basic resource requirement and research to solve one problem must necessarily be linked to the other. To give an example, Kenya has a total land area of 575,000 km² (ISNAR, 1982). Out of this only about 7% is good agricultural land with a further 33% being described as largely suitable for livestock production with some potential of crop production under irrigation systems. The rest of the country is arid or semi-desert. The high potential agricultural areas are also the areas supporting about 53,000 km² of Kenya's indigenous and planted forest. In addition, they are also the areas accommodating over 70% of the country's population. Thus, any research planning and management must recognize this fact.

Compatibility of Agriculture and Forestry

One of the reasons why forestry often loses to agriculture is the long time trees take to grow and yield economic returns. Planners in forestry research have to bear in mind that mistakes in design or concepts of implementation cannot be corrected without substantial loss of time and resources.

One of the ways recognized as having great potential for alleviating problems of agriculture, forestry and population pressure is the concept of agro-forestry. Although this is not a new concept, it is only recently that research, especially in developing countries, has been geared to it. Research so far has not kept up with the demand. There are many problems to be tackled, varying from tree species selection to compatibility with other land users. For example, different crops will react differently to the presence of certain trees, pasture may be affected either adversely or positively by presence of certain species. Even where these problems are solved to a certain extent, the end-use question of agro-forestry has not been satisfactorily solved by research.

The aim of agro-forestry should be to attain maximum productivity of land with the aim of meeting demands for food, fuel, pasture, forest products and enhancing the quality of the environment. In planning and executing agriculture and forestry research, mutual benefits of agriculture and forestry co-existence should be the guiding factor.

The mutual benefits of agriculture and forestry are not limited to end-use only. Forestry is a specialized aspect of crop agriculture. Better understanding of plant science is a common factor of benefit to both. Furthermore the research personnel share the same basic scientific disciplines of botany, physiology, pathology etc., and development in one branch is readily understood by the other.

Resource Allocation

Successful agricultural research planning and implementation depend very much on the question of resource allocation and institutional arrangement. In the former, it calls for adequate, well trained manpower and financial allocation. Very often semi-qualified staff have been deployed to carry out research. This is a waste of resources since, unlike other activities where unsatisfactory performance is better than no performance at all, research must be good for meaningful implementation of its results. Bad research results, if implemented, are likely to do more harm than good.

Manpower development is a vital part of research planning and implementation which is often overlooked. Good basic education is an essential requirement for research personnel. Added to this should be training in research methodologies in the relevant field. The latter is often achieved in the course of higher degrees. The research system should further ensure that research scientists keep in touch with developments in their particular fields of specialization. Finally, good research policies should ensure that research personnel get attractive terms and conditions of service, because only then will they have the motivation to remain in their selected fields long enough to develop their capability to solve research related problems.

Financial allocation should also be adequate. Every country experiences difficulties in realising adequate financial resources. It is more so in developing countries where research has to compete for meagre resources with pressing basic needs, and very often research loses out. It is therefore important that priorities should be set and resources directed to the most pressing needs. Mistakes are usually made by spreading resources so much that in the final analysis problems can be said to be tackled without obtaining implementable results.

Good institutional arrangement is a basic requirement for research. Very often related research is fragmented, duplicated or hindered because of lack of compatible institutional arrangements. A look at the present agricultural and forestry institutions in the country may serve to illustrate the difficulties which can be faced and see how they are currently being solved.

Agricultural and forestry research organization in Kenya is influenced by the historical background, administrative and advisory set ups. Thus, we find that agricultural research in the country started at the beginning of this century when a number of research institutions were established, followed by Scott Agricultural Laboratories (now National Agricultural Laboratories). Next the Coffee Research Service and Veterinary Research Laboratories were established in 1908 and 1910 respectively. The plant Breeding Station at Njoro was established in 1927. The next major development came in the 1940s and early 1950s when a number of research organization were established under the then East African High Commission. These were in agriculture, forestry, veterinary, tropical pesticides and trypanosomiasis. Other research activities developed gradually in government departments, the University of Nairobi and its predecessor, private institutions and international bodies.

Some of the above research organizations were established with narrow objectives, without necessarily considering how they would fit and function within the overall agricultural and forestry research structure. Furthermore, setting of research priorities was usually done within each establishment. This created some unnecessary overlaps, and by 1963 the Government foresaw the need for a machinery for making and implementing policy for science and technology including research activities. Various forms which the machinery could take were suggested, but it was not until 1977 that the Science and Technology Act (Laws of Kenya, Chapter 250) was enacted and subsequently amended in 1979. At present, the Act consists of the National Council for Science and Technology (NCST), the Advisory Research Committees (ARCs) and the Research Institutes.

One of the major objectives of the Science and Technology Act is the promotion and co-ordination of research. The NCST is expected to be involved in policies; the ARCs on the research programmes, budgets and dissemination of results of research; and the research institutes in the execution of actual research. A lot of research activities are also found in government departments and at the University of Nairobi (including Kenyatta University College).

The above machinery has been created in order to achieve more coordination of research, but no system is fool proof. The Ministries of Agriculture and Livestock Development and Environment and Natural Resources still receive research money directly from the Treasury and they are not bound to carry out the research which has been approved or passed by the NCST and the ARCs. The University personnel are not likewise compelled to work on approved research projects. There are also problems emanating from the Act itself in that in creating the ARCs they were expected to report to different Ministries. For example, the Agricultural Research Advisory Committee which covers agricultural crops, livestock and related problems-reports to the Ministry of Agriculture. The Natural Sciences Advisory Research Committee is expected to report to the Ministry of Environment and Natural Resources. A problem arises when a question of definition occurs as to what is agriculture and what is natural resources. In a certain context, forest can be classified under agriculture while it also falls under natural resources. Conflicting advice may arise when each of the two ARCs advises on forestry and then reports to different ministries.

The composition of the NCST membership ensures that relevant ministries are represented, and this minimises passing decisions which have no bearing on the situation at the implementing level. Likewise, suggestions have been made that all ARCs should fall under the NCST. This, if implemented, would ensure that conflicting advice on research activities would be harmonized at the NCST level. The NCST representation at the Boards of Management of the Research Institutes affords another link in the

coordination of the execution of research.

Although the above organization has gone a long way in improving linkages in agricultural and forestry research planning and implementation, there is room for further improvement. This was recognized by the International Service for National Agricultural Research (ISNAR, 1981) in its recent report on Kenya's National Agricultural Research System when it was stated:-

"The most crucial and fundamental conclusion is that there is needed a functional, semi-autonomous, comprehensive and cohesive organization charged with the responsibility of planning, executing and supervising a coordinated agricultural research program"

The term 'agricultural research' was used in a wider context which also included forestry and fisheries.

To the foregoing research planning and implementation considerations, there may be added the need to create a system which is flexible and which can react quickly to changes in general emphasis in development. Development in agro-forestry can be used to illustrate this. Recently, many countries have recommended the development of this system. However, many of them have found it difficult to incorporate it within the existing institutions which were established to serve agriculture and forestry separately.

Information Dissemination

Research in agriculture and forestry is not an end in itself. In most cases, research programmes in this area are conceived to serve identified objectives. It is therefore important that there should be information dissemination machinery within the research system. Very often, lack of development can be attributed to poor dissemination of available information and not to the need for carrying out research.

Successful implementation of research results, especially in agriculture and forestry where the end-user is usually the public, depends on assessment of social economic factors. It is therefore important that components of these are incorporated in the research system. The latter should be geared to receiving feedback from the end users. In this way, it can be assured that research is relevant.

Conclusion

In the foregoing paragraphs, it has been argued that forestry and agriculture share land as a common basic resource requirement. Forestry can further be described as a specialised branch of agriculture and as such they share the same basic science. Development in one will therefore complement the other. For these reasons, their planning and implementation should be especially linked where the objective is maximisation of productivity of the land. In planning and executing research programmes, adequate financial and human resources and a coordinated institutional framework are necessary. To this should be added adequate dissemination and feedback mechanisms. This is very important because, in the final analysis, the importance of research will be judged by its impact on socio-economic development.

The need to enhance and coordinate agricultural and forestry research is a stated objective of the Government (Republic of Kenya, 1979). It is stated here that the Forest Department will work closely with the Scientific Research Division of the Ministry of Agriculture and the National Council for Science and Technology. The remaining task is to evolve practical ways of bringing about effective coordination.

REFERENCES:

1. ISNAR, 1981; Kenya's National Agricultural Research System - A Report to the Government Kenya.
2. Laws of Kenya, Chapter 250; Science and Technology Act.
3. NCST, 1980; Science and Technology for Development A report of the National Council for Science and Technology.
4. Republic of Kenya, 1979; Development Plan 1979 - 1983.

LIST OF ABBREVIATIONS:

ARC - Advisory Research Committee

ISNAR - International Service for National Agricultural Research

NCST - National Council for Science and Technology.

SOME MAJOR OPPORTUNITIES FOR STRENGTHENING
FORESTRY RESEARCH IN KENYA

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Introduction:

The Government of Kenya recognizes the critical need for improved forest productivity to cope with increasing demand for forest goods and services, and its longer-term problems of self-sustaining and balanced economic growth. It also recognises the critical role of forestry research in generating and applying the improved technologies necessary for enhanced forest productivity.

Research accumulates information, analyses, interprets and provides management with improved alternative means of achieving management objectives and goals. In practice, research generates information of several different categories such as:

- (i) for direct assistance to forest managers in making effective decisions,
- (ii) for filling gaps in understanding of fundamental procedures and
- (iii) for its own sake, motivated largely by the curiosity of the investigator.

This paper examines current forestry research activities in Kenya, salient shortfalls in the research programme, and

constraints to research productivity. In a final submission, specific recommendations are made on possible avenues for strengthening the forestry research effort.

THE ROLE OF FORESTS IN KENYA

Although managed forestry in Kenya is relatively young, forestry has become an important driving factor of the economy. The forests constitute a leading renewable natural resource important for industrial uses and for ecological benefits.

Although forestry contributes a small proportion of the GDP, about 7.3 per cent, its contribution to the traditional economy is much greater. Forestry resources are important in the provision of basic needs, particularly through their protective aspect, conservation of climate, water and soil, as a source of supply of forest products including fuel, pulp and industrial wood, and as a revenue earner of growing potential. While at the grass roots forestry in Kenya's social and economic activities covers all sectors as summed up in figure 1.

The strategy to extend, improve and manage this resource calls for popularizing community forestry, increased per hectare yield with a view to enhancing total productivity in the small forest land base, expanding the forestry base into the arid and semi-arid land (ASAL) areas and managing indigenous forests productively on a sustained yield basis. These are largely new activities and indeed a big departure from the earlier policy of replacing indigenous forests with plantations of fast growing exotic species. It is therefore imperative that the research and development programme be revamped and re-equipped for it to be responsive to the urgent development needs, aspirations and programmes of the nation.

THE EMERGENCE OF THE FORESTRY RESEARCH PROGRAMME

The forestry research programme has evolved gradually from a simple background established by pioneer naturalists and foresters in the 20s. The first Research Officer was appointed in 1934, and formal silviculture and wood products research projects including species trials and establishment of sample plots geared to test species and plantation management practices, were established thereafter.

A major development in Kenya's forestry research sector came after World War II, following the recommendations of the forestry sub-committee of the Development Committee of 1945. A silviculturist, an assistant silviculturist, an entomologist and a mycologist were appointed. A little later, the forestry research programme in Kenya was greatly strengthened with the setting up of the East African Agricultural Research Organization (EAAFRO) with headquarters at Muguga in 1948.

The nucleus for the Kenya forest research unit first emerged in 1962 with the establishment of the position of Conservator of Forests in charge of Research and Planning, embracing responsibility for research, training, management and planning, surveys and inventory. In 1973, an integral Research Conservancy was established with responsibility in Silviculture, Entomology, Pathology and Utilization.

The Research Programme of the Forestry
Research Department of K.A.R.I.

Geographically Kenya is a land of contrasts. The coastal fringe facing the Indian Ocean is low. Inland the land rises to 304 and 608 m above the sea level. Further westward the land forms a plateau averaging 1520 m with

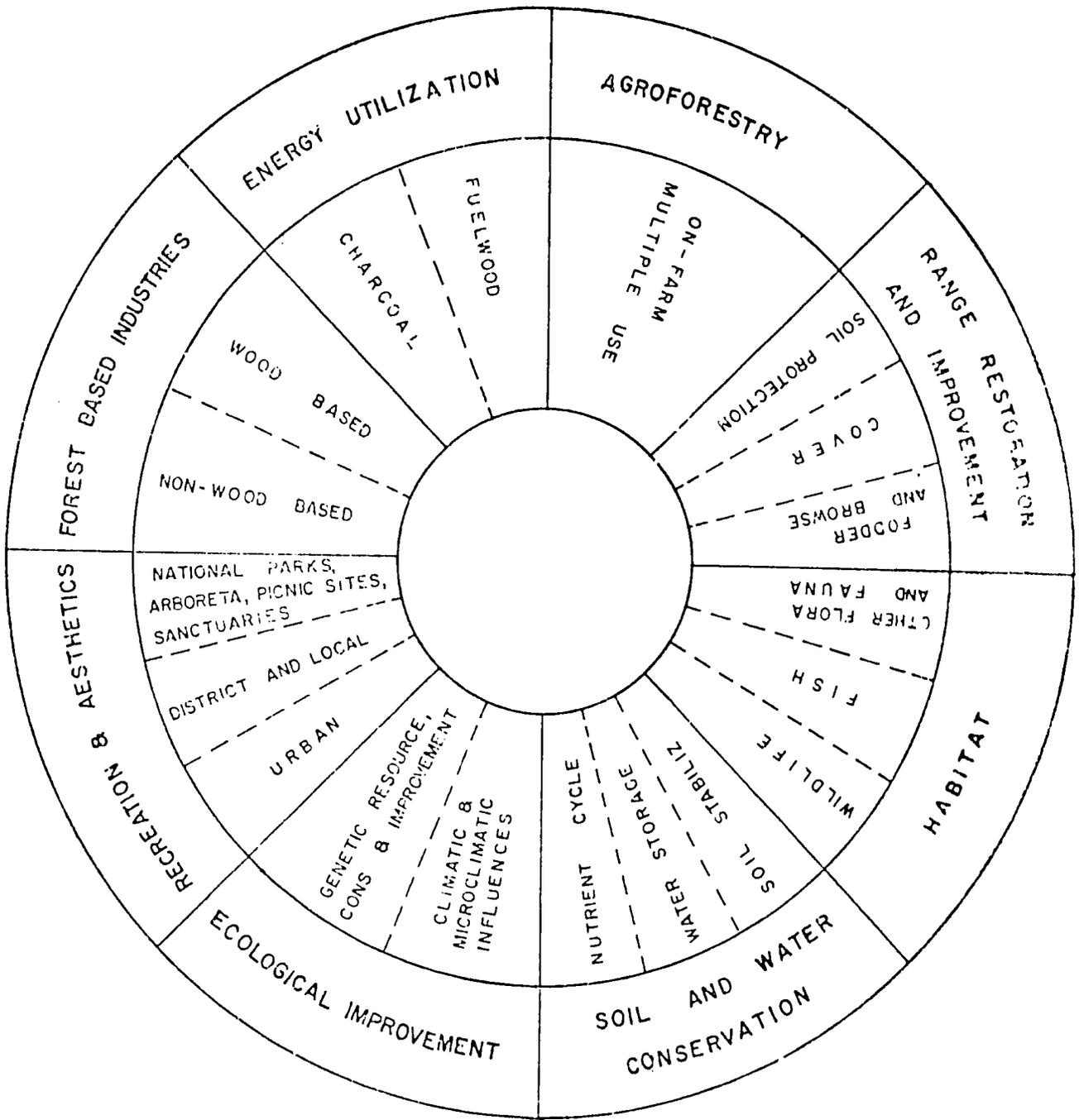


Fig. 1 THE CENTRAL ROLE OF FORESTS IN OUR LIVES

highlands rising to 2128 m. To cater for the wide ecological diversities the research programme is divided into four major areas.

1. Forest Environment and Silviculture
2. Forest Entomology and Zoology
3. Forest Pathology
4. Forest Products.

The forest environment and silviculture programme concentrates on:

- (a) production of planting stock
- (b) species and provenance research
- (c) establishment methods, plantation management, espacement, thinning and pruning research
- (d) forest genetics and tree improvement
- (e) dryland afforestation systems
- (f) management of natural forests.

The areas of emphasis under forest protection have varied, from time to time, according to prevailing incidences of specific forest pests and diseases.

The forest entomology and zoology programme concentrates on the biology and ecologies and possible avenues of control of defoliating, sap sucking, wood and bark beetles of economic importance and of termites affecting plantation species.

The forest pathology programme concentrates on foliage diseases, stem and root canker, and the development of ectomycorrhizal fungi for supporting tree establishment in the hot dry lowlands.

Forest products research serves wood based industries and consumers especially by providing information on timber properties and qualities for a wide array of end uses. The

current programme concentrates on wood engineering, wood chemistry and processing, wood anatomy and wood technology.

Other Institutions with some Activities
on Forestry Research

1. Research Activities of the Forestry Department of the University of Nairobi.

The University staff are currently involved in the following research activities:

- . Dryland afforestation,
- . Growth, yield and silviculture of exotic timber species,
- . Fast growing, nitrogen-fixing trees in Kenya.

2. Renewable Energy Project Trials:

The Ministry of Energy has established renewable energy centres in four major ecological zones of Kenya -- the highlands, upland savannahs with poorly drained soils, semi-arid lands and the coastal lowlands. The major activities include:

- (a) evaluation and screening of candidate agroforestry/woodfuel species
- (b) establishment and maintenance of seed production stands
- (c) seed and seedling distribution and extension
- (d) agroforestry research
- (e) agroforestry training and technical assistance.

3. Baringo Semi-Arid area Project:

This project was designed to demonstrate appropriate land management techniques for sustained woodfuel production.

4. The Euphorbia Project:

A pilot project developed to determine commercial production of hydrocarbon fuel from Euphorbia tirucalli.

5. East Pokot Agricultural Project:

This is an integrated development project. The tree growing component concentrates on species trials, and on appraisal of tree planting methods appropriate to the semi-arid land areas of Pokot; so that plantations can be established to provide a source of tree seed.

6. Turkana Development Project:

The forestry component of the NORAD financed Turkana Development project is focussed on conservation of existing forestry resources, forest education and establishment of limited planting and species trials.

7. B A T Kenya Woodlot Project:

BAT, in an attempt to enable farmer self-sufficiency in wood fuel for curing tobacco, instituted an afforestation project within the company in 1977. The following activities are undertaken:

- (i) Controlled supply of seedlings to tobacco growers.
Thus each grower of some 0.5 ha of tobacco is required to successfully plant a minimum of 1000 Eucalyptus trees for flue-curing or 300 Markhamia trees for fire curing the tobacco.
- (ii) An annual supply of seedlings from the company tree nurseries for planting by the public at a subsidized price.
- (iii) The company leases county council and public land for tree growing.

Toward the accomplishment of the above, the company established nine tree nurseries within the tobacco growing area. The company has employed a forester (silviculturist) who works in close collaboration with the forestry service and allied agencies.

8. The Ministry of Agriculture:

The Ministry of Agriculture operates a number of tree nurseries and promotes tree planting for soil conservation and partly to meet woodfuel requirements for domestic and agro-industries.

9. Baobab Quarry Woodlots:

The Baobab cement factory has devised an impressive system of rehabilitating quarries after deep ripping to obtain material for cement manufacture. A number of tree species including Casuarina equisetifolia, Gonocarpus and Prosopis are successfully cultivated.

SOME IMPORTANT AREAS CURRENTLY INADEQUATELY COVERED

It is clear from the above that the current forestry activities in Kenya generally focus on site assessment, species evaluation, production of planting stock, plantation establishment and management and forestry products research with a bias on traditional forest products. There is a relatively strong programme of forest protection comprising forest entomology and pathology. But research on protection against fire and its control is practically non-existent.

It is evident that economic assessment of forestry activities is inadequate. Regular inventory of forest resources is limited to production of information for assessment of revenue. The work on dryland afforestation system and on tree improvement has been constrained by inadequate financial and manpower allocation.

Activities Recommended for Additional Support

The present programme, drawn up about ten years ago, can no longer service the much expanded forest development needs. Work must therefore be redirected toward the sustained yield management of existing forests and to the development of multiple purpose farm plantings and rural afforestation in marginal areas. The research programme should be expanded to cover at least the following areas:

1. Forest mensuration and economics:

In the current programme economic assessments of forestry system is almost totally lacking. Very little attention is accorded to forecasting and trend analysis as a guide for planning, goal setting, priority assessment and management decision.

The silviculture division manages a large number of experiments touching on forest mensuration. Over 80 permanent sample plots (PSPs) and sample plots (SPs) including both exotics and indigenous trees are being maintained. These studies, and new ones which must be initiated, should be handled by scientists with competent training in forest mensuration and economics. Proposed investigations include:

Studies on forest biomass and dendrology of plantations and natural forest stands --

their structures, regeneration, and growth -- to enable guidance to management on harvesting practices that would ensure sustained yield of desirable tree species. Growth models for trees and stand simulation for better understanding of growing conditions and management alternatives. Economics of silvicultural operations, including thinning schedules,

pruning intensities, spacings, rotation, volume and value increments.

Economics of other forestry operations including establishment, tending and protection.

Investigations of the marketing of all forest products and market outlets.

Economics of sawmill operations throughout the country, and identification of ways of improving the same.

2. Dryland afforestation systems:

The arid and semi-arid land (ASAL) areas constitute about 80 per cent of Kenya's land area. Conservation of the meagre vegetative cover, with concomittant afforestation of selected sites, is an important solution to development bottle-necks in these areas, because both man and livestock depend entirely on the vegetation.

Little is known about tree species and techniques of tree establishment in the dry areas of Kenya. Intensive interdisciplinary research effort is therefore needed to generate new knowledge rapidly, and to make possible the formulation of new packages for testing. This programme should involve the establishment of a new research centre and substations to undertake and co-ordinate studies on dryland afforestation systems including establishment and development of forests and tree lots for provision of fuel, fodder, cover and construction poles and timber.

Many NGOs have initiated important studies on species choice for dry land areas. While this work has given some impressive results in some areas, these studies generally lack scientific designs and have been restricted to available seed,

often of unknown origin. However, there is an urgent need to evaluate all species tried in Kenya, review the performance of candidate exotic species elsewhere, and to determine the most reliable sources of seeds for servicing a comprehensive programme of well replicated species trials in representative sites in ASALs.

3. Development of Farm Woodlots:

Although there is a strong government commitment on soil conservation, development of farm forestry and acceptance of forestry as an instrument for rural development, benefits from this stance can only occur on a significant scale upon the application of scientific skills to the task of integrating trees in farms. To date developments in farm forestry and agroforestry systems are still handicapped by inherent weaknesses of the basic data.

There is urgent need for information on tree growth and yield of different tree species that have been introduced and are grown in farm holding by farmers for poles, woodfuel, soil conservation and protection, and production of fodder etc. in different ecological zones. It is particularly important to identify and document tree species for planting on specific rotations. This would provide a data-base that would hence give a farmer clear options for planned land use, given expected returns over a given rotation. This information is quite deficient to date.

4. Watershed Management and Forest Environment:

The general belief that a forest cover is the most effective vegetative cover for the conservation of spring flow, has become the subject of heated debate as results from hydrological studies become available. Indeed, concern is being

expressed that trees, particularly the large and fast-growing types like many eucalypts, take more water out of the soil than they conserve and hence disturb the soil water regime causing possible allelopathy.

This calls for studies in tree physiology with emphasis on tree-water relations and water use by quick growing species to determine trees suitable for farm forestry, river bank stabilization and for watershed management.

Studies on the forest environment should be structured to undertake work on forest soils and to investigate chemical factors affecting growth and development of the nursery stock and the effect of application of certain fertilizers on tree growth, nutrient cycling with rotations, energy balance, site evaluation and classification.

5. Tree Seed Technology:

Today's public response to calls for tree planting has created great demand for planting stock which cannot be met in quantity or variety by the existing facilities. Consequently seeds are being acquired from both Kenyan and foreign sources without regard to certification, or origin information. It is imperative that the seed unit be strengthened to enable it to cope with the demands on seed collection, storage and distribution. This would facilitate co-ordination of the supply of all tree seeds, and proper siting and rational species choice and use of genetically improved material, and to maintain a record of what species are tried where.

6. Forest Genetics and Tree Improvement:

Breeding for improved per hectare yield holds considerable promise both for the development of plantations and farm

forestry. Although this programme has hitherto concentrated on softwood plantation species, tree improvement/breeding strategies must now be extended to all species being cultivated including eucalypts, which have shown dramatic increases in yield through breeding in Brazil, Zaire and elsewhere. Breeding for resistance to pests and diseases is also important.

7. Forest Products Research:

The programme on forest products should be reorganized to provide a deserved attention on traditional forest products and the "minor" forest products, particularly those associated with farm forestry. The assessment of calorific, browse and nitrogen fixation values of species for farm forestry would be very desirable. There is a need for developing simple timber preservation methods for poles and improved sawing methods suited for fast growing eucalypts in the small scale and village context.

SOME IMPORTANT CONSTRAINTS TO GROWTH IN THE FORESTRY RESEARCH PROGRAMME AND POSSIBLE AVENUES FOR THEIR SOLUTION

Today great pressures are being placed upon Kenya's forest research programme to provide information on a much expanded and diversified forestry world. This situation, coupled with information already presented, clearly underpins the need for strengthening Kenya's forestry research capability so it can co-ordinate and articulate forest research effort in the many different areas of national development. The major factors that handicap the forestry research and development programme include inadequate provision of resources, a deficient institutional and organizational base, and lack of basic facilities.

A. Allocation of Resources to Forestry Research

The forestry research system in Kenya has access to the physical, manpower and financial resources built up by the Ministry of Environment and Natural Resources, and the defunct East African Community. These include research buildings and laboratories at Muguga and Karura, plus seven regional research stations and substations located throughout the country. University facilities for teaching and research also supplement research activities through their contribution to training of research scientists and individual participation of the lecturing staff in research programmes of national interest. The Ministry of Energy and various Non-Governmental Organizations (NGOs) have recently established some facilities and activities or research and development in different parts of the country.

The overall picture of allocation of human and other resources in comparison to the central role of forestry in national development show that resources are inadequate. Some of the research stations lack critical masses of staff to organize and execute research programmes.

Although the number of research scientists in FRD KARI increased from 16 to 26 between 1975 and 1983, the present base of 26 scientists is less than 25 per cent of the forest graduates working in the country. This is evidently low in the light of pressing research needs. While the ratio of MSc forest scientists to BSc holders (Table I) remains favourable, the small number of PhD scientists is noticeable, 2:19. In view of the critically important role of PhD scientists in conducting research, supervising and providing leadership to their junior colleagues, the small proportion of scientists with PhDs has serious implications for both the quantity and quality of research that can be undertaken and the effectiveness of training programmes.

According to Table I, a high level of attrition of forest research scientists is evident. Between 1975 and 1983, fifteen of the scientists employed in forestry research either resigned or opted for higher jobs in forest management. It is evident that the research division has been used as a training ground for young graduates who as soon as they have gained experience seek jobs elsewhere.

The number of technical support staff has also remained extremely low, especially for such specialized areas as forestry products. This picture has been exacerbated by the large number of technician/technologist trainees who have failed to get advancement following completion of training allegedly due to non-availability of posts.

The build up of financial allocation to forestry research has also been slow (Table 2). By 1981, only 0.03 per cent of forestry GDP was spent on forestry research and only 3.9 per cent of the total annual investment on forestry. The programme has experienced severe strain during the current financial stringency. Within KARI, only the forestry department maintains a network of regional stations with field experiments established in different parts of the country. Despite this commitment, the forestry programme has suffered the heaviest cuts. Within the KARI set up, the forestry research programme is greatly disadvantaged in the scramble for the meagre financial resources, with animals and crops being given preference. Funds available for forest research today cannot meet station maintenance needs, let alone keeping a functional status.

Donor support to forestry research remains inadequate. While most donors recognise the need for forest development this has stopped short of supporting the research component (Table 3). Between 1975 and 1983, donor funding to research stood at only 3.6 per cent of similar funding to forest management. A classical example of this irrational insensitivity to realities

TABLE I

STAFF POSITIONS IN THE FORESTRY RESEARCH DEPARTMENT

| 1975-80 | ESTABLISHMENT | | | ESTABLISHMENT | |
|--------------------------|---------------|-----|-----------|---------------|-----------|
| | Msc | PhD | Attrition | Bsc | Attrition |
| <u>DIVISION</u> | | | | | |
| Env. & Silviculture | 4 | - | 3 | 3 | 1 |
| Ent. & Zoology | 1 | 1 | 1 | - | - |
| Forest Products | 2 | - | 1 | 2 | 2 |
| Forest Pathology | - | 1 | 1 | 1 | 1 |
| 1980-83 | | | | | |
| Env. & Silviculture | 7 | - | 2 | 8 | 1 |
| Ent. Zoology | 1 | - | - | 1 | - |
| Forest Products | 2 | - | - | 3 | 1 |
| Forest Pathology | - | 1 | - | 3 | 1 |
| University of Nairobi | 3 | 3 | | | |

TABLE 2

ALLOCATION OF RESEARCH SCIENTISTS, TECHNICAL SUPPORT STAFF
OF FINANCIAL RESOURCES BY PROGRAMMES

| STATION | YEAR | PROGRAMME | TECHNICAL STAFF | LAB & OFFICE & FAC | FINANCIAL RESOURCES ALLOCATED | |
|---------|---------|-------------------|--------------------------|-------------------------------------|-------------------------------|-------------|
| | | | | | RECURRENT | DEVELOPMENT |
| Muguga | 1975-80 | Env. & Silv | 4 RO 3 ARO | Office and lab. + 6 sub stations | 44815 | 10,045 |
| | | Forest Pathology | 1 RO 1 ARO | Office and lab. and 1 substation | 24783 | 11,388 |
| | | Forest Entomology | 1 RO 5 Tech. | Office, lab and 2 substations | 26739 | 9711 |
| | | Forest Products | 2 RO 2 ARO 2 Tech | Office and lab. | 38103 | 46,405 |
| | 1981/83 | Env. & Silv. | 7 RO 8 ARO 8 Tech | Office, lab and 6 substations | 31216 | 274,185 |
| | | Forest Pathology | 1 RO 3 ARO 5 Tech | Office, lab and 1 substation | 11429 | 5,314 |
| | | Forest Entomology | 1 RO 1 ARO 5 Tech. | Office, lab and 2 substations | 12357 | 1,081 |
| | | Forest Products | 2 RO 3 ARO 4 Tech | Office, lab and workshop | 15318 | 33,157 |

includes funding of establishment of new nurseries and increased production of nursery stock in an arid district dominated by pastoral nomads. This anomaly stems from the fact that practically all funding agencies approach the ministry and the parent department for discussions on possible projects for funding. It is only when the latter find it fit that they ask for candidate projects from the research department.

Recommendation 1:

Allocation of New Forestry Research Scientists

It is evident from information already presented that there is a great need to increase the manpower resources engaged in forestry research. The stock of experienced and young forest scientists required to date is 51 (Table 4). The projections provided by ISNAR (1982) shows this rising to 92 by 1988, and to 200 in 1993. ISNAR (1982) further recommended that forestry manpower be expanded annually to offset past neglect, by adding 10 research officers annually, and as a general policy they should work for at least one year before beginning MSc training.

Recommendation 2:

Training and staff Development

Training is an important input in strengthening Kenya's national forestry research system. The overall strategy for strengthening national and regional research stations, and the capacity for adaptive and on-farm research implies that a substantial proportion of recruits should have comprehensive training in forestry science, either at the first degree or during post graduate training.

A COMPARISON OF SUPPORT TO FOREST RESEARCH AND MANAGEMENT PROGRAMMES
BY VARIOUS DONORS BETWEEN 1975 TO 1983

| Year | Forest Research | | | Forest Management and Extension | | |
|---------|---------------------------------|------------|---|---------------------------------|----------------|--|
| | Financial Resources Allocated £ | Agency | Activity | Financial Resources Allocated £ | Agency | Activity |
| 1980-81 | 162,050 | IDRC | Dryland afforestation systems | 531,236 | IDRC | Forest plantation development |
| 1975-80 | 64,677 | World Bank | Afforestation of coastal lowlands | 552,6494 5100 | IDA SIDA | Local and rural Road Construction and Sawmill |
| 1979-83 | | | | 113,179 | UNIDO/ UNDP | Timber Project |
| 1979-83 | 127,485 | EEC | Dryland afforestation research in Kibwezi | | | |
| 1980-81 | | | | 60,000 | Finish | Forest Industrial Training Centre |
| 1980-91 | | | | 129,310 | USAID | Arid and semi arid land project in Kitui district |
| 1981-83 | | | | 98,400 | NORAD | Afforestation in Turkana district. Turkana Integrated Project. |
| 1981-83 | | | | 194,976 | UK | Development afforestation in Embu/ Meru/Isiolo districts. |
| 1981-83 | | | | 622,955 | Belgium | Euphorbia Project |
| 1981-83 | | | | 2,105,592 | Swiss | Tural Afforestation Extension Program |
| Total | 336,212 | | | 9,389,242 | | |

AN ESTIMATE OF NATIONAL REQUIREMENTS OF SCIENTISTS FOR
FORESTRY RESEARCH DEPARTMENT

| <u>Programme</u> | <u>Number of Scientists</u> |
|---|-----------------------------|
| Tree Improvement and Afforestation | |
| Tree Breeders | 3 |
| Silviculture | 2 |
| Agro-forestry | 2 |
| Water Management and Forest Environment | |
| Forest Ecologists | 4 |
| Watershed Management Scientists | 2 |
| Soil Scientists | 2 |
| Forest Protection | |
| Forest Entomologists | 6 |
| Forest Zoologists | 2 |
| Fire Control Specialists | 3 |
| Forest Pathologists | 5 |
| Forest Products | |
| Wood Engineers | 3 |
| Wood Chemists | 2 |
| Wood Anatomists | 2 |
| Wood Utilizations Technologists | 3 |
| Economics and Marketing | |
| Forest Mensurationists | 3 |
| Forest Economists | 2 |
| Genetic Resource Conservation | |
| Forest Tree Geneticists | 1 |
| Total | 47 |

On the whole, both BSc (forestry) and BSc (science) graduates need training in research and production skills before they can become productive in field-oriented forestry research programmes. While they can pick up many of these skills on the job after one year of internship, they should get a chance of undertaking post graduate training. Post-graduate training at the MSc level should be considered the minimum qualification for all senior research scientists, while PhD level training should be extended to young scientists who have demonstrated outstanding academic performance and on-the-job research ability. Post graduate training should cover specialization in areas relevant to the new challenges facing forest development. PhD level training should be strengthened to offset the existing imbalance already discussed.

Systematic staff development, and an effective training programme, would generate a calibre of forestry research scientists who are sensitive to the wider technical, environmental and socio-economic implications of forest research, and who would offer leadership in the articulation and execution of research programmes.

A two-pronged approach of (a) technical assistance for personnel and (b) an accelerated training programmes is recommended for solving this problem. Staffing assistance, including supplementation and substituting for staff on training, should effect an immediate injection of qualified personnel who would provide desirable guidance and support to the young graduates during the first year of internship; and subsequently support the programme when the local counterparts are undertaking post graduate training.

Recommendation 3:

Allocation of motivated Technical Support Staff

A cadre of well-trained technical support personnel is also required to work with, service and repair scientific

equipment currently lying idle, and for the execution of field and laboratory studies. The technicians and technologists should advance gainfully within their schemes of service, without impediments, to foster a favourable environment for research.

B. Institutional and Organizational Base

Planned expansion of the forestry research programme has suffered severely since 1978. Following the collapse of the East African Community (EAC) while discussions were under way on the formation of institutes, many activities, including staff development, were deferred in the anticipation that these would be achieved with the realization of the institute.

In spite the effort of the last four to five years to establish an institutional framework for forestry research, there has not yet emerged a functional, comprehensive, and a cohesive organization with responsibilities for planning, co-ordination, execution and supervision of forestry research programmes.

Since forestry research joined the KARI bandwagon, KARI has been shifted to two different ministries within two years, resulting in widespread instability.

Recommendation 4:

Providing a Stable Institutional and Organizational Base

It is now evident that the marriage with the agricultural subsector has become estranged and that forestry research deserves a permanent home where it can articulate its own research programmes and apportion resources accordingly. Past and current experience show that forestry research needs can only be conceptualized and recognized when they are related to forest development needs and goals. Forestry research should therefore have a substantive Forestry Research Institute.

C. Lack of Basic Facilities

Currently many buildings and laboratories in the stations are old fashioned and lack appropriate infrastructural facilities and equipments. These resources can only play a full part in the research activities if they are adequately equipped and functional.

Recommendation 5:

Improved Research Facilities

A high priority should be accorded to this area in the national recurrent and development plan, to provide improved field and laboratory space and equipment for some of the stations and laboratories, and financial resources for an approved research programme. This is necessary for supporting a functional programme directly, and for providing a healthy working environment.

Other Avenues for Strengthening the National Forestry Research System

Recommendation 6:

Fostering Interaction Between Agencies with Interest in Forestry Research

Communications between agencies and organizations involved in forestry oriented research activities is extremely deficient. Such communication is greatly desirable for forestalling inter-agency jealousies, competition and duplication of effort by keeping workers in effective contact with one another as well as guiding and harmonizing their efforts. A regular seminar or workshop should be organized annually to bring together forestry research scientists and workers in other agencies including the NGOs who are working on forestry research or development. The discussion themes can be varied but could

include such topics as "the development of social forestry in Kenya". This would facilitate collaboration and information sharing and more importantly would enable leading research scientists to provide leadership and guidance on species selection, and experimental designs etc. The need for maintaining a central record of species introduction already expressed would be achieved through this avenue.

Participation in such workshops and seminars should include policy makers and forest resource managers as users of the research product to make them aware of the research output and its relevance to development. Where it is appropriate, networking of forestry research activities could be worked out between the forest research organization, the university, other government agencies and the NGOs.

Recommendation 7:

Creating a Favourable Working Environment

In addition to investments on staff development, training and institutional building, a productive forestry research environment must consider the physical, social, remunerative, organizational, management and intellectual conditions under which the research personnel work. First, the forestry research scientists and their role in forestry development lack recognition. Second, the research cadres have tended to receive less remuneration than their counterparts in management. Third, the schemes of service does not provide for unimpeded cadre development, recognition and reward for research productivity.

The forestry research system should offer an improved work environment including the physical, social, cultural and intellectual environment for its research personnel, in addition to recognition, remuneration, and opportunities for self improvement. A favourable working environment can most effectively be realized when the forestry research programme is housed in its own institute.

Recommendation 8:

Constituting Research Advisory Committees

Scientific programmes can lose direction or cease to be productive if they are not subjected to thorough periodic reviews. The forestry research advisory committee should be reconstituted to undertake a regular review of forestry research policies, programmes and priorities and to monitor the implementation of approved programmes. Priorities for research must be carefully assessed and assigned regularly.

A functional research advisory committee would also create a national focus and strategy for forestry research and development by providing a forum for discussing inter-agency activities. This would facilitate division of labour, possibly through networking, while generating savings by avoiding duplication of effort. The Forestry Research Organization or the forest research advisory committee should be allowed to establish channels of communications with donor agencies to enable the latter to present candidate projects for funding, based on national priorities, without going through a fourth party.

Recommendation 9:

Establishment of a Forestry Research/
Extension Liaison Unit

A new unit of forestry extension/research liaison and communication should be established to provide a linkage mechanism in the forestry research delivery system. This unit could also help retrieve the incredibly rich array of research studies completed in Kenya over the past half century, but now widely scattered in small libraries both in and outside the country.

A B S T R A C T

The government realizes that the future of the nation depends on how well forest and other resources are harnessed to facilitate self sufficiency in all types of goods and services to provide a basis for accelerated industrialization. It is noted that although forestry plays a central role in the economic and social activities of the nation, current investment on its research development is dismal. Moreover, the current forestry research activities are largely focussed on site assessment, species evaluation, production of planting stock, cultural practices, forest products research and forest protection.

The paper lists important areas, including forest mensuration and economics, dryland afforestation system, farm and social forestry, watershed management, tree seed technology, forest genetics and tree improvement and forest products research, which deserve increased national and technical assistance support.

Some salient constraints to implementation of the forest research programme are identified. These include inadequate allocation of resources, a deficient institutional and organizational base and lack of basic facilities.

Specific recommendations are made on how these deficiencies can be improved. The need for increasing the manpower resources engaged in forestry research with a parallel training programme both on the job and at the post graduate level is stressed. The importance of staffing assistance and substituting for staff on training is noted.

In a balanced argument, the paper recommends the need for equipping forestry research with a firm and sound insti-

tutional and organizational base, and improved facilities. Other recommendations touch on the need for developing working channels of communication between agencies and organizations with working interest on forestry research; and the importance of creating a favourable working environment covering the physical, social, remunerative conditions under which the research personnel work.

R E F E R E N C E S

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SETTING PRIORITIES FOR REGIONAL AND NATURAL
RESEARCH PROGRAMMES

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Introduction

The process of planning research can be addressed at a variety of levels-- from the setting of broad national priorities to the identification and preparation of individual research study plans. Most scientists deal with the latter -- developing study plans and setting priorities for studies to solve a particular problem or set of problems. However, national or regional administrators who control large programmes need a process for priority setting that takes into account a variety of organizations that perform research, fund research, or use the research outputs.

I would like to discuss two examples of how national and regional forestry research priorities were developed by the forestry research community in the United States. The two examples concern similar institutions and processes. The same processes may not work entirely in other countries, but perhaps they can be modified to fit specific situations.

Forestry Research in the United States

In the United States, forestry and related natural resources research is carried out by a variety of research performers, in government, academic institutions and industry. The largest share of national, or federal, forestry research is done by the Forest Service, an agency of the U.S. Department

conferences -- Northeast, North Central, Southern, and Western -- were held. Before the actual conferences, ad hoc task forces of scientists began the process by preparing reports suggesting high priority problems within 19 major research programme areas such as timber management, forest protection, range and wildlife, and others. Their reports served as reference materials for delegates to the regional conferences.

At the regional working conferences, delegates and participants, representing a large variety of organizations who use or are affected by forestry research, identified and rated high priority research problems on a scale ranging from "of very little importance" to "of utmost importance", within the 19 subject areas. The 19 subject areas were then rated on the same scale. Thus, research planners were given users' views of the relative importance of specific lines of research, and an average ranking of all problems was made possible. With the help of portable computer terminals and printers, it was possible to provide summary lists of problem and subject area ranking to delegates during the conference.

After the conferences, review committees of technical specialists checked problem classifications, judged whether problems were researchable, evaluated scientific opportunities and the likelihood of successful solution, and recommended resources needed to do the research. Later, research administrators from within a region, representing public and private agencies, met to evaluate the conference, the scientists' task force reports, the review committee's recommendations, results of the national conference, which is described next, and input from individual research administrators. A final document, or plan, was then developed for each region.

of Agriculture (USDA). The Forest Service has about 840 scientists, an annual budget of slightly over \$100 million (U.S.), eight regional research stations, and one national laboratory -- the Forest Products Laboratory. These units consist of nearly 80 different field laboratories working on problem-related research varying from fundamental studies in wood chemistry and forest genetics to very applied field studies in silviculture and range management.

More than 60 universities have teaching and research underway in forestry or natural resources schools that receive some special federal funds for conducting forestry research. The universities also receive state, other federal, or private funds for additional research endeavours. Most of these universities are linked with the Forest Service in cooperative studies.

Additional forestry research is carried on by private industry in the various fields of processes and products, as well as the basic and applied aspects of forest management. The larger industrial companies have research organizations and often sponsor university studies, too.

Setting Priorities in a National Conference

From 1976 to 1978, a major effort was carried out in the United States to examine the conduct and content of forestry research supported by the U.S. Department of Agriculture: work done by the Forest Service and by more than 60 universities receiving federal funds.

The planning for this work was a multi-step process involving federal and university research administrators, scientists, and many users of research results. To adequately consider the regionality of natural resources, four regional

Before specific regional plans were developed, the regional research issues were assembled for discussion at a national conference. This meeting followed a similar format and procedure, with delegates representing the national offices of user organizations and each of the four regional conferences. Research problems identified in the regional conferences as well as problems submitted by the national delegates were evaluated and rated, by subject areas, with full consideration of the national perspective. Follow up activities, similar to those of the regional conferences then took place, and ended with a national summary document and national "program" of research. These conferences provided very helpful user insights for the development of the research programmes of the Forest Service and the forestry schools.

Setting Priorities in a Multi-Organizational Environment

During the last ten years, the U.S. Department of Agriculture and the various state agricultural experiment stations (one in each of the 50 states) have maintained an on-going process for coordinated planning of publicly funded agricultural and forestry research. The major participants in the "system" of regional and national planning are the research performing agencies within the U.S. Department of Agriculture, including the Forest Service, the State agricultural experiment stations, schools of forestry, land-grant colleges, colleges and departments of veterinary medicine and home economics, cooperative extension and private industry.

Four regional agricultural research committees have major responsibility for coordinating the research planning process. Regional reports of research priorities flow up to a national council which uses them to prepare an annual report of priorities to the Secretary of Agriculture. I would like to share with you my experiences as a co-chairperson of one of these four committees -- the Western Agricultural Research Committee.

The work of the Western Agricultural Research Committee has two major components. The first component, a set of standing subcommittees has been organized around broad subject-matter areas, such as forestry, crops, animals, and others. These subcommittees have representatives from the federal agencies, the universities, and private industry who are scientist-administrators and technical experts in their fields. These people, most importantly, can examine the adequacy of treatment, balance, gaps, and opportunities in their subject areas.

The second component is a projection process, which requires research administrators to look systematically at each program element and project future resource needs of scientists. The two key elements in this process are a common classification of research and a computerized data base for all organizations developed over a number of years. The process also assumes that the administrators are well informed of their organization's goals and objectives, are aware of users' and advisory groups' desires, and are knowledgeable of the subject matter areas.

Every two years the Western Agricultural Research Committee updates its projection of research needs in the agricultural and forestry sciences. It follows two steps. First, the subject-matter subcommittees described earlier are asked for their view of five to ten critical research needs in their areas of expertise. Research administrators of each of the USDA research agency field units in the West, such as the four Forest Service experiment stations, and all of the university research administrators in the agricultural sciences, forestry, home economics, and related disciplines are also asked for research needs. The Western Agricultural Research Committee analyzes these needs, groups and consolidates similar needs, and develops an initial priority list of the top needs. This list is cycled back through the administrators and subcommittees for comments.

This process produces a subjective list of high priority research needs.

At the same time, the research administrators are asked for a specific projection of scientist-years of effort that they would assign to different subject areas if they had freedom to do so. Each administrator is asked to project scientist-year needs at a point five years in the future and within the dual constraints of a "non-increase" budget or a "20 per cent increase" in the budget. These projections provide quantitative estimates of resource needs by all key administrators within a common program structure and within similar time frames and constraints.

The Western Agricultural Research Committee analyzes the information obtained at both steps and produces a report of the highest priority research needs in agriculture and forestry for the western United States.

This region-national process of periodic updating of high priority research needs has been used with some modifications by the forestry research community to basically update the general needs identified in the series of regional and national conferences. Thus the processes have been linked by the participation of the same performers of research at each level.

Summary

The two examples outlined describe ways of reaching a consensus about research priorities at the region and national levels. In the first example, the process used a conference method to bring together representatives of research user groups to help identify and actually rate research needs. Key elements of the process were the development of reference material on specific subject-matter areas in forestry; selection

of representatives from important groups of the users of research; a conference method for rating research needs; post-conference data analysis and finally, use of the information in specific agency planning at the local and national level.

In the second example, the process is a method of identifying and periodically up-dating agricultural and forestry research needs in a multi-organizational environment. Key elements of this process are an organizational structure of a broad planning committee and subject-matter subcommittees already in place; a common data base in place; primary reliance on scientists and research administrators to carry out the process and to be knowledgeable of user needs; and the provision for continuity or periodic up-dating of the data base and narrative descriptions of the highest priority research needs.

Both processes require commitment of agencies and people. The first was an intensive effort over a short period of time involving a large number of research users and scientists. The second is a continuing process involving periodic meetings of the key committees and subcommittees with short periods of intensive effort every 2 years.

Neither of the two approaches may be completely suitable in other countries, but parts of them might be modified to fill specific needs in the development of forestry research programmes.

ICRAF:

Its Role and Techniques of Research Problem Selection

by

B. Lundgren and

J.B. Raintree

Research Needs

The International Council for Research in Agroforestry (ICRAF) was set up in 1977 at the Royal Tropical Institute in Amsterdam. It moved to its present headquarters in Nairobi Kenya in 1978. ICRAF's mandate is to stimulate, initiate, and support research for the development of sustainable and productive land-use systems (in the developing world) based on the integration of woody perennials with crops and/or animals.

The Council, governed by an international board of trustees, is entirely independent from all supra-national bodies, and receives its operational funds principally from various bilateral donor agencies and private foundations.

ICRAF spent some initial years searching for an identity and a strategy to fulfill its mandate. This was no easy task in a new and exciting field, one full of temptations in the form of a practically unlimited number of challenging and interesting problems and activities. ICRAF set to work, moreover, in an atmosphere charged with enormous international expectations; but it was endowed with extremely modest funds. At its 1981 and 1982 meetings ICRAF's Board of Trustees finally agreed upon a comprehensive work plan for the coming four-year period. This plan had three foci:

- 1) The development within ICRAF of an interdisciplinary capacity and appropriate methodologies to assess constraints in land-use systems and to identify agroforestry solutions to overcome these constraints. In order to achieve this end, after systematically identifying the expertise and knowledge required in the field of agroforestry, ICRAF recruited a

1 From "Agricultural Research for Development : Potentials and challenges in Asia. ISNAR, Den Haag, Netherlands, 1983

multidisciplinary core team of scientists and land use experts. The team consists of an agronomist, a horticulturist, a forester, an animal husbandry expert, a social anthropologist, a farm economist, a bio-climatologist and a physical land evaluation expert/soil scientist. Both in Kenya and elsewhere through collaboration with international, regional, and national institutions, the team is now working on the development of a diagnostic and design methodology.

- 2) The systematic collection and evaluation of existing knowledge about agroforestry technologies, and the development of methods for the appropriate study of such information.
- 3) The establishment of an efficient programme for disseminating information about agroforestry methods and technologies to scientists, development planners, and institutions in developing countries.

These objectives are to be achieved through seven mutually supportive programmes within which all ICRAF projects and activities will be carried out.

- 1) Management and administration - this component deals with programme planning and coordination, fund raising, public relations, and general administration;
- 2) information services - Icraf will offer an information request service and assemble documentation files on agroforestry, particularly on various agroforestry systems and on multipurpose trees. It will have a library for in-house and external use and produce publications on agroforestry. An IDRC information specialist, a documentation, a library assistant and publications officer make up the library staff, with disciplinary inputs provided by other staff where necessary;

- 3) training and education - ICRAF will mount training courses in agroforestry research and development methods and in material development. Fellowships and on-the-job training will be available. This programme, supported by USAID and the Ford Foundation and led by a recently recruited training officer, is expected to get under way in 1983;
- 4) agroforestry systems research and evaluation - the development of interdisciplinary methods to study and develop agroforestry systems, e.g., the diagnostic and design (D&D) methodology, economic evaluation of agroforestry systems, and methods of assessing systemic sustainability. This programme will also be responsible for a global inventory and evaluation of existing agroforestry systems;
- 5) agroforestry technology research evaluation - ICRAF will review the potential role of agroforestry technologies for enhancing food, fuel and fodder production, soil conservation, and socioeconomic well-being and develop methods to study and evaluate agroforestry technologies particularly those which involve multipurpose trees;
- 6) field station - a small (40 ha) field station, 70 km outside Nairobi, is being developed as a support for other ICRAF programmes. It will include agroforestry demonstration plots for training and public relations. It will also be a site for field research in connection with methodology development;
- 7) collaborative and special projects - the creation of an international network of agroforestry research and development projects in developing countries will facilitate the dissemination and testing of the Council's interdisciplinary diagnostic and design methodology.

Projects are under way with institutions in Peru (INIPA CIAT, North Carolina State University), Philippines (SEARCA VISCA) Costa Rica (CATIE), and Kenya (National Dryland

Farming Research at Katumani). Preliminary contacts have been made with ICARDA in Syria, IITA in Nigeria, CAZRI (ICAR) in India, and EMBRAPA in Brazil.

It must be stressed that ICRAF is not set up as an institute to generate locally adapted agroforestry technologies or whole systems through field research. This can only be done by local institutions with the facilities required to carry out long-term field research. Nor is ICRAF able to fund the work of other institutions. It is a council, housed in a mid-city office building in Nairobi, with a modest annual budget and a senior scientific and administrative staff of 15. It is, however, the only institution established expressly to work with agroforestry research issues on a global scale. It is one of the few organizations in the world with the professional competence to deal with practically all aspects of land development: physical, biological, social and economic. The fact that ICRAF's scientists retain and cultivate working relations with outside colleges and institutes has led to a situation where the Council's network of contacts not only crosses international and language barriers, but also transcends disciplinary and institutional boundaries. This situation, makes it possible for ICRAF not only to collaborate with any type of institution, but also to initiate cooperation between scientists and institutes in both developing and developed countries.

How to Identify Relevant Agroforestry Research - ICRAF's Diagnostic and Design Approach

Research towards development of locally adapted agroforestry technologies and systems attempts to address the real problems of farmers and other land-users. In so doing it invariably encounters difficulties at many different levels:

- 1) how to identify relevant research topics;
- 2) how to ensure a sufficiently multi-disciplinary input;
- 3) how to cope, in field research and trials, with the complexity (interactive components) and periodization (rotation of trees/shrubs) inevitably involved in

- agroforestry technology validation research;
- 4) how to develop, evaluate, and rate, in quantitative terms, the germplasm of multipurpose trees/shrubs.

The second question has been partially answered in the previous text. The third has been discussed in several papers by Huxley (1979, 1981a, 1981b, 1981c, 1982a, and 1982b). The fourth is the subject of an ongoing joint project between ICRAF and the Commonwealth Forestry Institute (CFI), financed by the U.S. National Academy of Sciences. This project will draw up guidelines for an international network of national research projects aimed at developing fast-growing nitrogen-fixing trees. The problem of genetic development of multipurpose trees and of agroforestry combinates of trees and herbaceous crops has also been discussed by both Burley (1979) and Pickersgill (1981) and was the subject of an ICRAF/IBPGR/CFI workshop in mid-1983.

The remaining question, the first one, how to identify relevant research topics, will be considered here. If agroforestry is to live up to the world's expectations with regard to its problem-solving capabilities, it will have to significantly improve its ability to choose research topics and embark on development efforts which accord with the actual needs and potentials of tropical land-use systems. ICRAF's research strategy places a major emphasis on the development of a diagnostic and design methodology to guide agroforestry research and development (R&D) toward relevant and practical solutions to location-specific land-management problems. A sketch of the principal features of this evolving methodology appears below together with an explanation of their internal logic and rationale.

Why Diagnosis is Necessary

Our ultimate aim is to develop land-management systems and technologies with specific capabilities to solve land-use problems in areas where agroforestry is deemed to have a role. When confronted with an ailing land-use system, agroforestry planners and practitioners must identify and prescribe relevant problem-solving treatments. The nature of their task is analogous in many respects to that of a doctor who confronts a diseased human organism.

It is a cardinal rule in the medical profession that diagnosis should precede treatment. In practice there are exceptions to this rule, of course, but it would be unthinkable for doctors ever simply to ignore the diagnostic process altogether, and prescribe treatment without due regard for the specific nature of the patient's illness. We would hardly tolerate a haphazard, hit-or-miss approach to treatment from professions dealing with human pathologies.

How strange then that we have come to accept such an approach when it comes to treating pathologies arising from man's use of the earth. Is this not in fact what happens in many cases when a traditional agricultural or forestry research station develops a new technology and recommends it for dissemination? In how many instances is the treatment preceded by an adequate diagnosis of the actual and perceived problems which confront the majority of land-users in the recommendation domain? The answer of many researchers, that they "already know what the problems are" without having to bother with the complications of a formal diagnostic procedure, is analogous to a doctor's making either the patently absurd assumption that a well-trained practitioner is able to treat patients without recourse to an examination.

No wonder the cure rate for land-use problems is so low! Technologies developed for conditions which prevail on research stations, high access farms (Rolling, 1980), and forest management units are often abysmally inappropriate when extended to the majority of land-users in an agro-ecological zone. The problem is not that the biophysical parameters of the zone have not been taken into account. To the contrary, these are usually well understood. What goes wrong is that single discipline-oriented researchers too often fail to perceive that the "patient" in the final analysis is the existing land-use system, which has its own internal organization and its own unique set of operational constraints and potentials.

The problems with an ad hoc approach to technology generation is that researchers are rarely capable of taking the full set of relevant design criteria into consideration. It was never a very effective strategy to design technology on the

basis of only a partial set of design criteria and then to treat the failure of farmers to adopt the resulting technology as an extension problem. It will almost always be more useful to place the onus of responsibility for unsuccessful transfer of relevant technology squarely on technology development professionals, recognizing that the problem is, in the first instance, a design problem. There is simply no substitute for good design. To achieve this objective will usually require coordinated inputs from an interdisciplinary team of professionals, as well as from the intended users of the eventual technology product.

A problem-oriented diagnostic approach to agroforestry design is felt to be the most direct and local route to effective and transferable agroforestry technologies and land-management systems. In developing its diagnostic and design methodology, ICRAF recognizes that a quick turnaround on diagnostic and design activities is absolutely necessary in order to have a timely influence on the project planning cycle. It is not envisaged that a long drawn-out survey process will be either necessary or useful. Rather, the council's aim is to develop a practical, effective, and quickly realizable D&D protocol which can prove its utility in a wide range of environments around the world.

The Logic of Agroforestry Diagnosis and Design

The logic of any methodology must be compatible with its aims, and the aims of ICRAF's D&D methodology are eminently practical. In the final analysis the success of the methodology will be judged not by the number or by the elegance of resultant agroforestry technologies, but by the impact of the methodology on the total landscape, i.e., how effective it has been in the transformation of human landscapes into more productive and sustainable land-use systems. A successful D&D methodology must somehow guide potential users to agroforestry technologies which embody three essential attributes: productivity, sustainability, and adoptability.

The first two criteria are virtually axiomatic. Agroforestry has been almost universally defined as an approach

which seeks to improve the productivity and sustainability of land-use systems. Plenty of technologies are capable of increasing productivity, but are they also sustainable? Likewise, there are numerous technologies for resource conservation, but are they productive? Agroforestry has demonstrated significant potential for achieving both objectives simultaneously. This combination of goals is not, of course, an automatic feature of every conceivable agroforestry system, but it is indeed part of good agroforestry design, where measurable production and conservation benefits are, or ought to be, two sides of the same coin.

With regard to the adoptability of new agroforestry programmes, it is perhaps not superfluous to point out that any technology, no matter how efficient or elegant in its problem-solving capabilities, will have little impact unless it is acceptable to a significant percentage of its intended users.

Nutritionists refer to an analogous fact of life when they note that the nutritional value of any food that is not eaten is zero, regardless of its chemical composition. The practical point for agroforestry diagnosis and design is that many factors other than gross technological irrelevance may limit the adoptability of an otherwise promising technology. These factors must somehow be identified, and dealt with by the D&D process.

Most possible adoption constraints have to do with the level of available resources and management skills in a given system, or with the incompatibility of candidate technology with either existing practices and/or cultural norms and values associated with the general technological tradition of the area. It may be difficult, or even impossible, to diagnose all of the potential adoption constraints before undertaking farm trials or candidate technologies. The D&D process can, however, be guided initially by a certain psychological corollary to basic problem-solving technique: it is not the solution of problems per se which is of greatest interest to potential technology-adopters, but the solution of perceived problems. The core of ICRAF strategy is the common-sense assumption that the ability to solve a problem begins with the ability to define it.

Such an orientation advances us half way towards our goal, inasmuch as technologies capable of solving local problems are more likely to be adopted than those which are not. The most common error of the R&D/extension process is the local introduction of technologies which solve problems which exist somewhere else, e.g., on a research station or in some other land-use pattern.

For an adoption-oriented, impact-maximizing strategy which focusses R&D attention on the solution of perceived problems in existing land-use systems, two practical implications stand out. The first pertains to the diagnostic phase, a time when it is absolutely essential to involve the land-user in the R&D process, for only he or she can shed light on perceived problems. This realization explains the importance in ICRAF's D&D methodology which is placed on analyzing perceived management problems and strategies at the household or unit management level. The second implication pertains to the design phase. It arises from the fact that not all problems which constrain the productivity and sustainability of a household land-management system are necessarily perceived, its solution may not rank high in the farmer's priorities so that technologies designed to solve the problem fail to awake user interest. Many people may regard this as an extension education problem, but it can clearly also be considered a problem of technology design.

Where research scientists and land managers may not share similar perceptions of land-use problems, in certain instances the multifunctional nature of many potential agro-forestry technologies may come to the rescue. The challenge for the technology designer is to find an attractive way to link an unwanted conservation function, for example to some desirable production function of a well-chosen multipurpose technology. One might then obtain sustainability benefits as a by-product of a farmer's decision to adopt the proposed technology for its production incentives, i.e., for the help it gives him in solving some high-priority household supply problem.

By way of illustration, in our D&D work in Kenya we have encountered farmers with little or no present interest in

erosion control, a severe problem in dry hill areas. These farmers, nevertheless, appear very interested in planting hedgerows of fast-growing leguminous trees to satisfy their household fuelwood needs. By planting dense hedgerows of coppicing fuelwood trees on the contour with row spacings selected for effective erosion control, we can achieve two ends with a single, appealing design. Such design tactics lend themselves well to the incorporation of flexibility for future functional expansion. Other farmers in Kenya, for example, have been identified as having a definite, present interest in erosion control, but no immediate, perceived problem with fuelwood supply. Where trend analysis indicates a future fuelwood problem such farmers can be induced to plant dense hedgerows with fuelwood potential in order to hold down the soil. Presently the farmers can begin to manage the hedgerows for fuelwood once the anticipated crunch does come.

Productivity and sustainability, then, are the criteria we apply in analyzing existing land-use systems in order to diagnose constraints which limit the performance of the system. Productivity, sustainability, and adoptability are the criteria we use to identify corresponding agroforestry potentials and to evaluate candidate technologies and land-use system designs. In our analyses it is necessary to distinguish between two distinct levels or orders of constraints and potentials: those pertaining to the performance of output sub-systems in existing land-use systems, and those pertaining to the appropriateness of candidate agroforestry technologies.

Thus two orders of evaluation, each dealing with constraints and potentials of a different type, are required for thorough research. These two orders of evaluation are embedded in the following sequence of analytic activities which progresses from diagnosis to design:

- 1) characterize essential features of structure and function in the existing land-use system and identify output sub-systems;
- 2) evaluate the performance of the sub-systems (identify problems);
- 3) determine what constraints limit the performance of the sub-systems;
- 4) identify general potentials for performance-improving (constraint-removing) interventions of an agroforestry nature (candidate technologies);
- 5) determine constraints which may impair the appropriateness of candidate agroforestry technologies (components and practices);
- 6) identify remaining potentials for specific agroforestry technologies (existing or to developed).

The above conceptual background is used by ICRAF both in the design of programmes and in the identification of research topics and priorities.

GUIDELINES FOR EFFECTIVE EVALUATION OF
FORESTRY RESEARCH PROGRAMMES

BY

G. R. ARMSTRONG

Evaluation of a research programme represents a search for efficiency. Fundamentally, one seeks to determine whether the expensive, often scarce, specialized human and physical resources employed are being used to good purpose to meet specified goals. To do this, one must first decide what constitutes good purpose, and whether there are other resource combinations that could more effectively meet that purpose.

Who should make such an evaluation? Those who will profit most from it are the research director and his staff. The wiser ones will perform such evaluations themselves, so that when others from outside the institution come to review its activities the research director will be able to explain and justify institutional actions, define institutional needs and demonstrate institutional contributions easily and effectively, without hesitation.

The process of evaluation and the process of research programme development are closely linked. If the programme is intelligently constructed, the evaluation will reflect it. Both the director and the evaluator will find that they have asked similar questions: what are the goals; what are the feasible ways of meeting them; which among these feasible alternatives are the best paths to follow; how do realized payoffs from the research compare with expected payoffs; if there are differences what are the root causes; and how can the programme be revised to generate larger future payoffs. Such questions may look easy to answer. They are not. Each merits some additional consideration.

What are the goals?

The basic goal of a research institution is not to conduct

research or even to complete research projects. Whether public or private, general or specialized, basic or applied the goal of the institution is to help meet the needs of its constituents through research. For public research institutions, a common and highly acceptable general goal is to help improve national welfare. Such improvement may be expressed in terms of rising incomes or employment, reductions in cost of living, or better quality of goods and services. It is knowledge of the special needs of clients that helps place emphasis on one or more of these values. The requirements of urbanites are not like those of rural residents; those of nomadic herdsmen not like those of valley farmers. So the first task of any research group is to look outside the organization, find out who its constituents are, and work hard to get to identify and understand their needs and problems. This external orientation is essential. It establishes the research not as an end in itself but as a means to an end. It provides a view of research as a service rather than as a product. And by directing attention to needs, it sets the stage for the next question, "by what logical paths can such needs be met through research?"

What Are the Feasible Alternatives?

Theoretically, the research possibilities for improving welfare are infinite. But many options are immediately ruled out by the special and often limiting needs and characteristics of the institution, or its publics, or the physical, social, political, scientific and economics environment within which it operates. Here in Kenya, for example, guidelines and recommendations by government and by private constituents currently include requests for special attention to forestry problems of the arid and semi-arid zones, to forest establishment and replenishment rather than to management and development of existing forests, to farm forestry as opposed to industrial forestry, and to the relationships between forestry activity

and soil protection, water supply and other environmental conditions. Thus, large sets of options are given emphasis and others, temporarily at least, given a lower priority.

Important internal constraints that affect choice of research topics, at least for the short run, typically include the institutional mandate; the numbers, types of specialization, education, experience and personal motivations of staff; the kinds of capital resources available to the institute; current commitments and programme responsibilities inherited from the past; and the prospective budget.

Environmental constraints may include such diverse items as geographic location of the research facility, predicted government expenditure patterns, current and planned activities of other research organizations, government rules regarding land ownership, local attitudes toward the utility of forest cover, and heavy grazing pressures.

In the last analysis, every aspect of the institutional environment makes its impact on the choice of options. Research personnel cannot hope to monitor them all. What they can do is to carefully review expressed needs and interests, both national and regional, with particular attention to how and why those needs might be changing; assess their own abilities to conduct research of various kinds; and monitor major changes in the scientific, economic, social, legal and political atmosphere so as to anticipate at least some of the factors that promise to realign research options.

What are the Best Paths to Follow?

Even at this stage of development, the potential research programs lacks specificity. Though the field of activity has been narrowed down by reference to external and internal limitations and preferences, the options are still numerous. Somehow, priorities have to be established among them.

To illustrate the selection procedure, let us assume that the mandate of our institution, as set forth in its charter, is to conduct fuelwood-oriented research, and that government has suggested strongly that research efforts be concentrated in the semi-arid zone. We have polled the forestry needs of publics in that area and find that fuelwood scarcity is creating three kinds of problems: prices are rising in the towns; low income groups are more strongly affected than higher income groups because everyone needs fuel for cooking and heating and there are no ready substitutes; and in the rural areas more and more time and effort is consumed in gathering because fuelwood supplies must be found further and further away. Expectations are that these problems will get worse because the nearby forests are being depleted faster than they are growing; patterns of fuel use are not expected to change materially in the near future; and populations are rising.

A summary review of population distribution in the semi-arid areas reveals that population is concentrated for the most part in two large towns and is expected to rise most rapidly there. We reason that the greatest short term public benefit will accrue if we can, through research, devise methods to bring the fuelwood price down in these two towns (or even to keep it from rising). We suspect that the techniques we work out may be applied later in other areas with similar success. At this point in our deliberations we have finally developed a specific goal that can be expressed in welfare terms: to prevent fuelwood costs from rising in towns X and Y.

Next it is necessary to examine the various paths by which such a particular goal can be met. The easiest way to visualize the alternatives is to chart them, as in Figure 1. This is a staff function, and may require a lot of time and debate because the options are rarely immediately evident. The important thing is not to omit any major alternatives.

In this case, we know from our elementary economics that price is a function of demand and supply. Price reduction therefore entails either a reduction in demand or an increase in supply or both. To reduce the demand, what might we do? Figure 1 shows that one option is to develop substitutes. Another is to increase the heating and cooking value per ton so people will use less wood than before. Are there other options? Probably not. At least none come readily to mind. To increase the heating and cooking value per ton we can name further options. We can squeeze more value into the wood (by increasing its quality), or we can squeeze more value out of the wood (by improving the consumption technology). The diagram shows that in this way we can move from the general welfare goal to very specific, relatively narrow activities. All we have to do is continue to break down the foregoing element into components.

This kind of general outline provides the key to selection of priority research areas. Much of what has been said at this conference has dealt with priority determination between and among institutions. Here, we are dealing with priority selection primarily at the project level. Although it continues to be something of an art, some scientific tools can be borrowed from the fields of economics and decision theory to weigh the alternatives.

What the research director and his staff must do is to compare the costs and time expenditure expected in following a particular research path with the risks of failure and potential payoffs. In our example, staff specialists may have to estimate whether greater net research payoffs (i.e., greater price reductions) lie with the development of efficient wood fuel cookers or, say, with the development of wood alcohol plants. To do this, they must call upon their research experience to determine what technical approach or approaches are most viable; to judge how long it will take to get results; to estimate what resource inputs will be required; and to

predict both the chances of ending up in a blind alley (e.g. alcohol yields from available species are too low for the process to be economically feasible) and the potential payoffs of success (i.e., the probable effects on local fuel availability and price).

Such estimates as these are typically made by the research director and a small group of senior staff. They are typically subjective and often highly speculative. This does not sound like a solid foundation for the establishment of programme plans or decisions to go ahead with particular projects, but there is still another step which, if carried out faithfully, tends to repair errors of judgement.

Measure Performance

We have noted that the decision to attack a particular research problem in a particular way rests on several estimates:

1. How long the job will take
2. What inputs (men, money, materials) will be required
3. The risks of failure (usually in percentage terms) together with recognition of possible reasons for failure.
4. The expected payoff in welfare terms.
5. Who will be affected.

As the project progresses, by establishing recognized benchmarks it is possible to measure how realistic those estimates were. Such feedback very often has a negative aspect. Projects fall behind schedule, more resources are required than were originally planned for, experiments fail. Researchers understandably don't like to draw attention to such outcomes, particularly if they feel such results will be misinterpreted because the wrong rules are being used in measuring success. But when such information is used constructively it can improve programme efficiency tremendously. It provides early warning of the need for adjustment in programme. It highlights opportunities for control of both internal and external factors. And it

serves to improve staff skills at estimating inputs needs and the real time required to get certain types of jobs done.

What one does during this stage is to ask not only whether the job took longer than expected, or required more or less man hours, or paid off more or less than expected, but why these things happened. Sometimes it takes quite a bit of digging to understand why. But the experience gained in this way, over a period of time, generates ability to make increasingly better estimates and to reap more certain returns from the research programme.

What are the High Points of the Process?

In this very brief review, we have seen that development of an effective research programme depends first on understanding and agreement regarding whose needs are to be met and on thorough, careful study of what those client needs really are. Programmes dominated by the special interests of staff members are quite likely to be inefficient and often off target. Adopting an external viewpoint, and visualizing research as a service to others is a powerful stride toward introducing relevance and immediacy into research activities and reducing the isolationist, ivory-tower attitude that can come creeping in to obscure the relationship between what happens in the laboratory and what one's countrymen need in the way of forest goods and services.

The second step is to identify the major routes that the institution can follow in attempting to meet such needs. Like a good ship captain, the research director examines the strengths and weaknesses of his vessel and crew, the various types of perils and obstacles that they might encounter while trying to reach accepted objectives and heeds the guidelines and directives that are provided by authorities above him. These, taken in combination, provide the basis for selecting certain routes for closer examination and for abandoning others.

The third major step is to select among the more promising research alternatives those that the institute feels will best meet the goals. This difficult step depends heavily on informed estimates by professional staff and administrators. It is a kind of subjective cost-benefit analysis performed before the work begins. It is critical, because it is on the basis of those estimates that major program decisions are made.

Finally there is feedback gained by monitoring the progress of projects that together make up the program. This periodic review of job schedules, input requirements, risk and payoff is of critical value in reallocating institutional resources and in otherwise adjusting the program to accommodate for change. In this step it is necessary to ask not only how reality compares with expectations but also why there is a difference and how this knowledge can be used to advantage in adjusting or redesigning the program?

There is one last point to be made. The ultimate utility of any research program rests in its application. Unless there is concrete evidence of increased welfare, the research program cannot pretend to be efficient. The last important step in research is always in seeing that the results are used.

Now we have come full circle, from recognition of the welfare goal to its partial satisfaction by means of a series of logical steps that a research director and his staff will want to take in order to increase their efficiency and contribution. Those outside the institution who have monitoring or coordinative roles can do no better than to follow through these same steps in close consultation with the director and staff and to examine the logic of the ways in which they are being handled.

There are certain characteristics of the system that merit further comment. It is complex. First attempts to use it are apt to fall short of the mark. It takes several years of diligent effort to learn how to carry out the several steps

effectively. It is self correcting. Because the feedback loop provides for adjustment to changes in the system, the program is constantly open for improvement. It is broadening. Researchers using the system are encouraged to look outside their own field and institution for many of the forces that modify and guide their actions and decisions. In this way, the linkages between diverse events become more clear. The rationale for cooperative action is easier to understand and to endorse. It is protective. Those who work through the several steps are really creating a healthy justification for what they are doing. Critics are forced to abandon arbitrariness and to voice their objections on logical grounds, if they can. Furthermore, new staff are provided with a clear picture of goals, objectives and procedures that will guide them along lines congruent with institutional needs.

I hope you find such a system worthy of adoption. It comes highly recommended by those who have tried it.

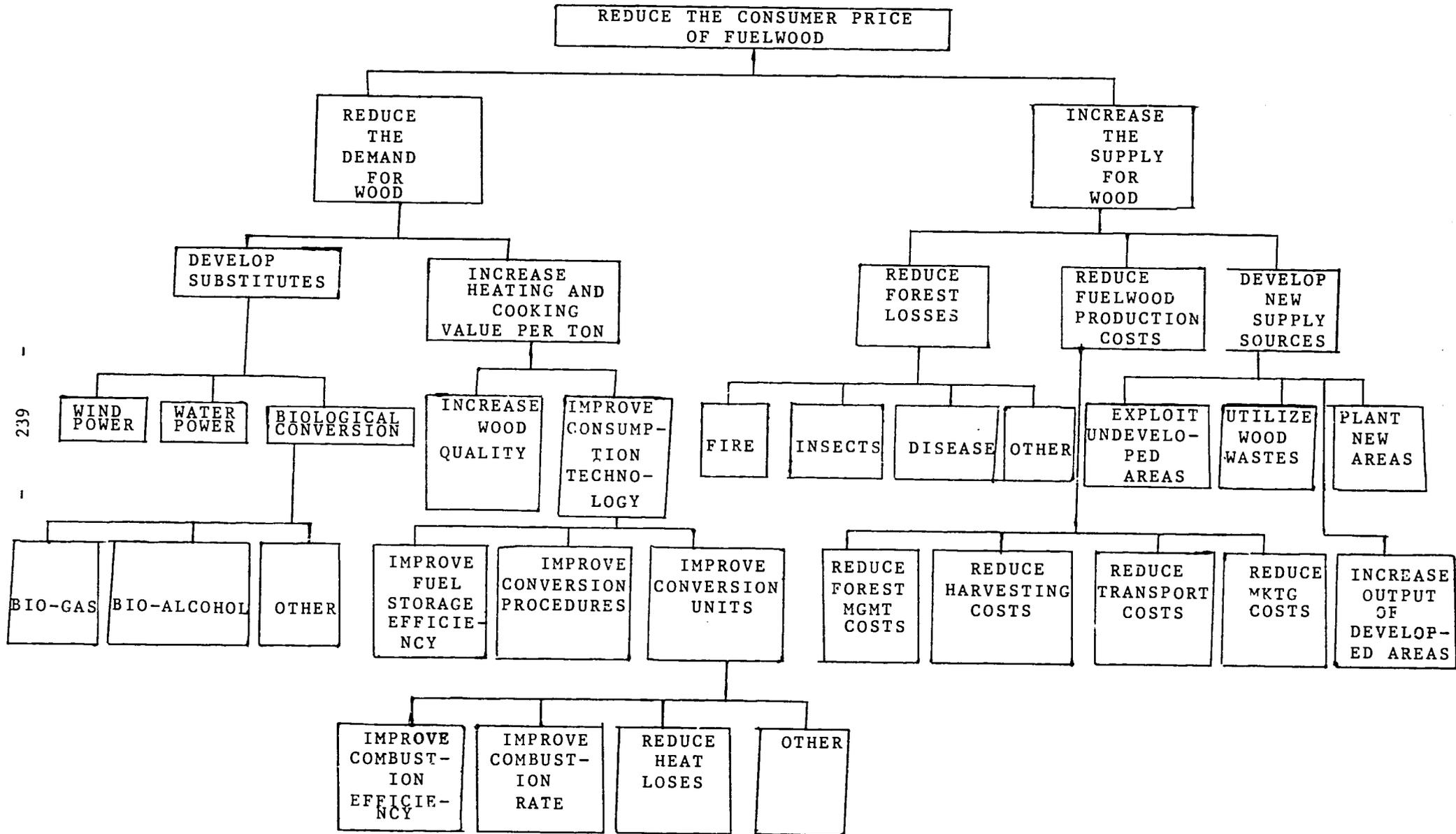


FIG. 1 PARTIAL CHECKLIST OF OPTIONS FOR REDUCING THE CONSUMER PRICE OF FUELWOOD

THE POTENTIAL ROLE OF THE UNIVERSITY IN
STRENGTHENING FORESTRY RESEARCH IN KENYA

by Dr. W.J.K. Mathu,

Department of Forestry, University of Nairobi

Introduction:

One of the key elements in forestry research is the scientist himself. Besides dedication and motivation, the scientist has to be well trained not only in the basic forestry science but also in scientific methods and procedures. Although scientific methods and procedures can be studied in schools, colleges and universities, most of the experience in research and research philosophy is acquired on the job, through performance and constant contact with other researchers. In addition, considerable experience and knowledge in research is gained through such forums as research seminars, workshops, conferences, and symposiums, all of which bring scientists together to discuss, expand and exchange ideas on their research activities. Proceedings from such forums often communication among scientists - even to those who cannot participate in person.

In most developed countries, forestry departments in universities have played, and continue to play, a leading role in forestry research. This is mainly because the departments bring together a body of scientists whose opportunities for promotion depend on this research output. In addition, most postgraduate programmes in universities are essentially research programmes. These programmes are the major source of research personnel. The staff in the forestry departments of the universities therefore play a key role in direct forestry research and also in molding the quality and the capability of the forest scientists in the country as a whole.

This paper discusses the potential role of the Department of Forestry at the University of Nairobi in strengthening forestry research in Kenya.

Major performers of forestry research in Kenya:

Past - Until very recently, there have been only two main performers of forestry research in Kenya: The Kenya Forestry Department's Research Conservancy and the East African Agricultural and Forestry Research Organization of the now defunct East African Community. The research by the Kenya Forestry Department Research conservancy was by and large problem-oriented, and was conducted on an ad hoc basis as forest resource management problems arose. As an example, main research activities evolved around wood utilization research, silvicultural research and forest protection research (entomology and pathology). The main characteristics of forestry research in Kenya are discussed in another workshop discussion paper "Major characteristics of Forestry Research in Kenya" and so these will not be discussed any further in this paper. However, it should be noted that these problems arose mainly because of lack of a definite forestry research policy in Kenya.

The E.A.A.F.R.O. Forestry Section on the other hand conducted basic forestry research such as forest genetics, tree physiology and wood science, in addition to forest resource management problems research, biased towards those problems that were common to the three East African countries. In general, the organization was well established for research and tended to attract highly motivated and capable scientists. However, the collapse of the East African Community in 1977 brought this research to a halt.

Present and Future - The Science and Technology Act of 1977 set up the National Council for Science and Technology

(NCST) as the principal body advising the Kenya Government on science and technology policy. One of its five research advisory committees is the Agricultural Sciences Advisory Research Committee (ASARC) whose primary responsibility is the monitoring and evaluation of research programmes in the Ministries of Agriculture and Livestock Development, Environment and Natural Resources, Water Development, and Tourism and Wildlife. In this respect therefore ASARC is responsible for the formulation of forestry research policy and the coordination and evaluation of forestry research programmes for the Kenya Government, International organisations and non-governmental organisations. The Science and Technology Act therefore is a major milestone in the development of forestry research in Kenya.

One of the achievements of ASARC is the setting up of the Kenya Agricultural Research Institute (K.A.R.I.) as the principal national research institute responsible for agricultural research. Within the institute is the Forestry Research Department, headed by a Deputy Director. This again, when fully operational, will be the main body responsible for forestry research in Kenya.

Another major development related to forestry research in Kenya was the establishment of a Department of Forestry in the Faculty of Agriculture at the university of Nairobi in 1977. The department presently has a staff establishment of six as follows:

| | |
|-----------------|---|
| Professor | 1 |
| Senior lecturer | 1 |
| Lecturers | 4 |

This establishment is expected to be increased to 12 in the near future. When fully established, this body of academic staff will form a strong base for forestry research.

Since establishment, the department has graduated students with B.Sc. Forestry as follows:-

| | |
|-------|----------------|
| 1980 | 8 |
| 1981 | 13 |
| 1982 | 15 to graduate |
| 1983 | |
| Total | <u>36</u> |

Four of these graduates have already been absorbed by K.A.R.I. for further training or for deployment as forestry researchers. The rest have been absorbed in the Kenya Forest Department or other organizations involved in some form of forestry research or management. The potential annual student output for the department presently stands at 40. Already the department has started receiving applications for postgraduate training, and postgraduate programmes are expected to start soon. These will further enhance the contribution of the University to forestry research in Kenya.

Besides K.A.R.I. and Department of Forestry of the University of Nairobi, several other agencies and organizations are expected to play a significant role in the field of forestry research in Kenya. Appendix 1 gives a tentative list of these organizations - according to Armstrong 1983. Most of these have come up within the last five years.

The Role of the University in Strengthening Forestry Research in Kenya

In general, the University as an institute of higher learning has three major roles to play in nation building:

1. Training personnel for the various governmental and non-governmental organizations in the country.

2. Research, both basic and applied, needed to resolve problems that affect the country.
3. Dissemination of knowledge.

The Department of Forestry of the University of Nairobi is structured and is being developed to perform these three roles in the field of forestry education in Kenya, as follows:

Training

The primary responsibility of the Department of Forestry is to train professional foresters (B.Bc. level and above) who until 1977 were being trained outside the country. These foresters are expected to join the forestry sector after graduation, either as forest managers or forest researchers.

The present B.Sc. degree programme is a three year course. Entering students must offer two principal level passes in Biology and in either, Chemistry, Geography, Mathematics or Physics. Holders of Diplomas (with credit or distinction) in forestry or agriculture from Forestry or agricultural institutes are also considered for admission to the programme. The present curriculum for the programme is similar to those followed in the University of Dar-es-Salaam, Tanzania and Ibadan, Nigeria and is summarized in Appendix II. It should, however, be noted here that this curriculum is currently under review and a revised version will soon be adopted.

In addition to undergraduate training, the department is expected to embark on postgraduate training soon. As mentioned in the introduction, this aspect of training will contribute greatly to forestry research in Kenya. A major cause for delay in launching the programme has been shortage of staff in the department to supervise and direct graduate students.

There is no doubt that the Department of Forestry - when fully staffed, will have great potential for training potential forestry researchers. However, several questions need to be answered if the University is to be effective in this role:-

1. What kind of training is required for forestry research?

In this regard, forestry research organizations and agencies must cooperate and wherever possible participate in the training process so as to interest the students in their organizations and also to determine in some measure the quality of researchers that they will eventually hire.

2. Is the University training enough students for forestry research and for other forestry organizations?

To date, the number of students admitted for training is mainly determined by the Forest Department's manpower requirements, while other organizations thrive on poaching professionals from the government. Private and international agencies should consult with the University as to what their manpower requirement will be. This will help the University to determine how many students to admit. In this respect, a manpower, training and education requirement for forestry in Kenya is needed.

3. Has the University got the required facilities and manpower to meet the training requirement for forestry research?

At the moment no. And it is unlikely that it will ever at any one time be wholly self-sufficient in both facilities and manpower to meet all the training needs

for Kenya. However, with cooperation and participation of other forestry research organizations and agencies, the University will continue playing a significant role in training for forestry research. The present staff strength in the department is summarized in appendix 3.

Research

Since the Department of Forestry was established, the staff have engaged in several research projects - summarized as follows:-

| Project Title and Status | Funding Agent | Coordinator |
|---|---|-------------------------------|
| Dryland Afforestation Research Project 1979 (ongoing) | National Council for Science & Technology | Dr. W.J. Mathu & D.M. Kamweti |
| Growth, Yield and Silviculture of Exotic Timber Species in Kenya 1980-1983 completed | I.D.A. (A World Bank Education Project to Kenya Government) | Dr. W.J. Mathu |
| Fast-growing Nitrogen Fixing Trees in Kenya 1983 (ongoing) | U.S. National Academy of Sciences | Dr. F. Owino |

In addition to these projects, staff members have been engaged in several consultancy services and public service activities, e.g.

- Fuelwood supply and demand for Eastern Africa Ethiopia, Kenya, Malawi, Somali, Tanzania and Zambia, an F.A.O. Consultancy, by Kamweti.
- Beijer Institute Fuelwood Development in Kenya D.M. Kamweti.

- Water Catchment Protection and Management, Lake Basin Development Authority. Dr. F. Owino.

Information on the research and consultancy activities of the Forestry staff can be obtained from the publications listed in appendix 4.

An important point to note in connection with the research activities at the University is the variety of funding organizations or agencies. Thus the University is dependent on the goodwill and research interests of organizations and agencies to maintain its research momentum. This underlines the need for coordination and cooperation between other research organizations and the University to ensure that the former are aware of the research capabilities of the latter, and the latter is assured of continued funding of their research.

Another interesting factor is the nature of forestry research at the University. This has been mainly problem-oriented research geared towards solving some national problems related to forest resource management. This is mainly a reflection of the funding agencies research interests. This is important in that the research interests of the national government and most international agencies (the main funding agencies) reflect the national forestry resource research priorities. It is also important that the researchers at the University demonstrate a sense of social responsibility by addressing their research to national issues. Thus, for the foreseeable future, forestry research activities will be directed mainly at meeting such national needs as for dryland afforestation, agroforestry, forestry for local community development and wood for energy.

Important as the problem-oriented forestry research is, it is also necessary to recognize the University as an

institute of higher learning where pursuit of knowledge for its own sake may be justified. It is therefore imperative that academically oriented forestry research, such as tree physiology, biometry and genetics and tree breeding be accommodated at the University - in fairness to the scientists and their right to academic freedom. Also, the so called non-problem oriented research sooner or later gets adopted for solving some practical problem. Hence what is considered non-problem oriented research in the short-term may be considered problem-oriented in the long term. The Kenya Government therefore should recognize the potential for non-problem oriented forestry research at the University and devise a scheme for funding such research. In the meantime, however, emphasis will be for problem oriented forestry research.

Dissemination of Knowledge

The third important role that the university can play to strengthen forestry research in Kenya is dissemination of information on research and development. In its role as the centre for higher learning, the University is expected to be at the forefront of knowledge, and to keep abreast of the latest developments in any field of endeavour. This knowledge must be communicated not only to students and other members of staff but also to other researchers and managers in the field. In forest research, this information can be communicated through seminars, workshops, conference, symposiums, short courses and the like.

From these forums come proceedings or information documents which give the latest developments and advances in any given field of forestry research. An example, is the proceedings which emerged from the Kenya National Seminar on Agroforestry organized by the University of Nairobi and ICRAF. These kinds of forum are essential as a means of communication and exchange of information among forest researchers. It is ex-

pected that the University will in future play a more active role in the dissemination of knowledge through these forums. In this respect, collaboration with national and international agencies is needed, especially as funding is usually the limiting factor.

Final Comments

The foregoing discussion has outlined the potential contribution of the University in strengthening forestry research in Kenya. To realise this potential however, two other important inputs are required:-

1. Collaboration and Cooperation with other forestry organizations and agencies. These are essential if the University training and research are to be relevant to the national goals and aspirations. This cooperation would also ensure more efficient use of research resources through sharing of facilities (manpower and equipment) and exchange of information.

2. Strengthen the Department of Forestry of the University

through hiring of high calibre scientists and provision of research facilities. For effective research and training, the staff must be both capable and dedicated. In general, the University administration hires the best lecturers available. Unfortunately, the local salaries for lecturers are hardly attractive, so that the very best in the country are likely to be attracted elsewhere. The University administration must give more thought to this issue.

With respect to motivation, most staff in the University are there because they are interested in research or in an academic career. In addition, research is part

of the lecturers' responsibility - an important criterion for promotion. They are therefore self-motivated to research. However, facilities and funds for research must be made available to the researcher. Often, these are the limiting factors to forestry research.

In summary, the success of forestry research in Kenya will depend on proper planning of forestry research and the capability and motivation of the researchers. The University is in a position to play a significant role in the training of forestry researchers, in directing forestry research and in dissemination of forestry research information. It is therefore important that these roles are recognised by the national government, research institutions and other national and international organizations so that the necessary funding, collaboration and cooperation are extended to the University to strengthen its effectiveness.

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Table 1. Tentative List of Agencies and Organizations
concerned with Forestry Oriented Research in Kenya.

Broad, General Responsibility

1. National Council for Science and Technology
2. Presidential Commission on Soil Conservation and Afforestation.
3. Forest Department of the Ministry of Natural Resources
4. Forestry Research Department, K.A.R.I.
5. Department of Forestry, College of Agriculture, University of Nairobi.
6. Kenya Rangeland Ecological Monitoring Unit (KREMU).

Forest Based Industry

7. Kenya Industrial Research and Development Institute (KIRDI).

Energy Utilization

8. Ministry of Energy
KIRDI

Agroforestry

9. Ministry of Agriculture incl. Dryland Farming Research Station at Katumani
10. ICRAF.
11. KENGO.
12. IPAL? EMI - Integrated Development Program.

Range Management

13. Ministry of Livestock Development and Improvement.
14. International Livestock Centre for Africa.
15. National Range Research Station, Kiboko

Habitat (Fish and Wildlife)

- 16. Ministry of Wildlife and Tourism.
- 17. Kenya Marine and Fisheries Research Institute.

Soil and Water Conservation

- 18. Ministry of Water Development (water Dept. and Engineering Dept.).
- 19. Ministry of Agriculture, Scientific Research Division (Soil Survey Unit).

Summary of the B.Sc. Forestry Curriculum at the University of Nairobi

First Year

| <u>Title</u> | <u>Contact Hours</u> |
|--|----------------------|
| Plant Physiology | 65 |
| Forest Ecology and Climatology | 40 |
| Dendrology | 40 |
| Genetics and Plant Breeding | 90 |
| Biochemistry | 90 |
| Forest Economics 1 | 45 |
| Forest Botany | 130 |
| Mathematics and Statistics | 110 |
| Introduction to East African Agriculture | 50 |
| Chemistry | 110 |
| | <hr/> |
| | 770 |
| | <hr/> |

Second Year

| <u>Title</u> | <u>Contact Hours</u> |
|-----------------------------|----------------------|
| Forest Economics II | 40 |
| Soil and Water Conservation | 80 |
| Forest Engineering I | 80 |

| | |
|---------------------------------|----------------|
| Soil Science I | 110 |
| Mensuration | 80 |
| Silviculture | 80 |
| Wood Utilization I | 40 |
| Wildlife Ecology and Management | 40 |
| Forest Policy and Law | 60 |
| Surveying | 80 |
| Forest Practice (Field work) | <u>9 weeks</u> |
| | 690 |
| | ----- |

Third Year

| <u>Title</u> | <u>Contact Hours</u> |
|-------------------------|----------------------|
| Forest Protection | 80 |
| Forest Management I | 80 |
| Forest Management II | 80 |
| Forest Engineering II | 40 |
| Wood Utilization II | 80 |
| Arid Land Afforestation | 40 |
| Soil Science II | 100 |
| Forest Practice Report | |
| | ----- |
| | 500 |
| | ----- |

STAFF STRENGTH IN THE DEPARTMENT OF FORESTRY
UNIVERSITY OF NAIROBI 1983/84 -

Dr. F. Owino, B.Sc. (Nairobi), M.Sc & Ph.D (North
 Carolina State)
 Tree Breeding & Chairman of the
 Department.

Dr. W.J.K. Mathu, B.Sc (New Brunswick), M.Sc. Dar es Salaam,
 Ph.D (British Columbia)

Mr. D.M. Kamweti, B.Sc. (For) (New Brunswick), M.Sc.
 (Oxford) Forest Policy and Management.

Mrs. C.C. Fayad, B.Sc. (University of California, Santa Cruz,
 M.Sc. (University of Michigan)
 Resource Ecology

Mr. H.O. Kojwa'ng, B.Sc. (For.) (Nairobi), M.Sc. (Finland)
 Pathology

Mr. R.K. Omwami, B.Sc. (Nairobi), M.Sc. (Finland)
 Forest Economics

Mr. E.N. Muriu - Chief Technician

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FORESTRY, UNIVERSITY OF NAIROBI 1979 - 1982

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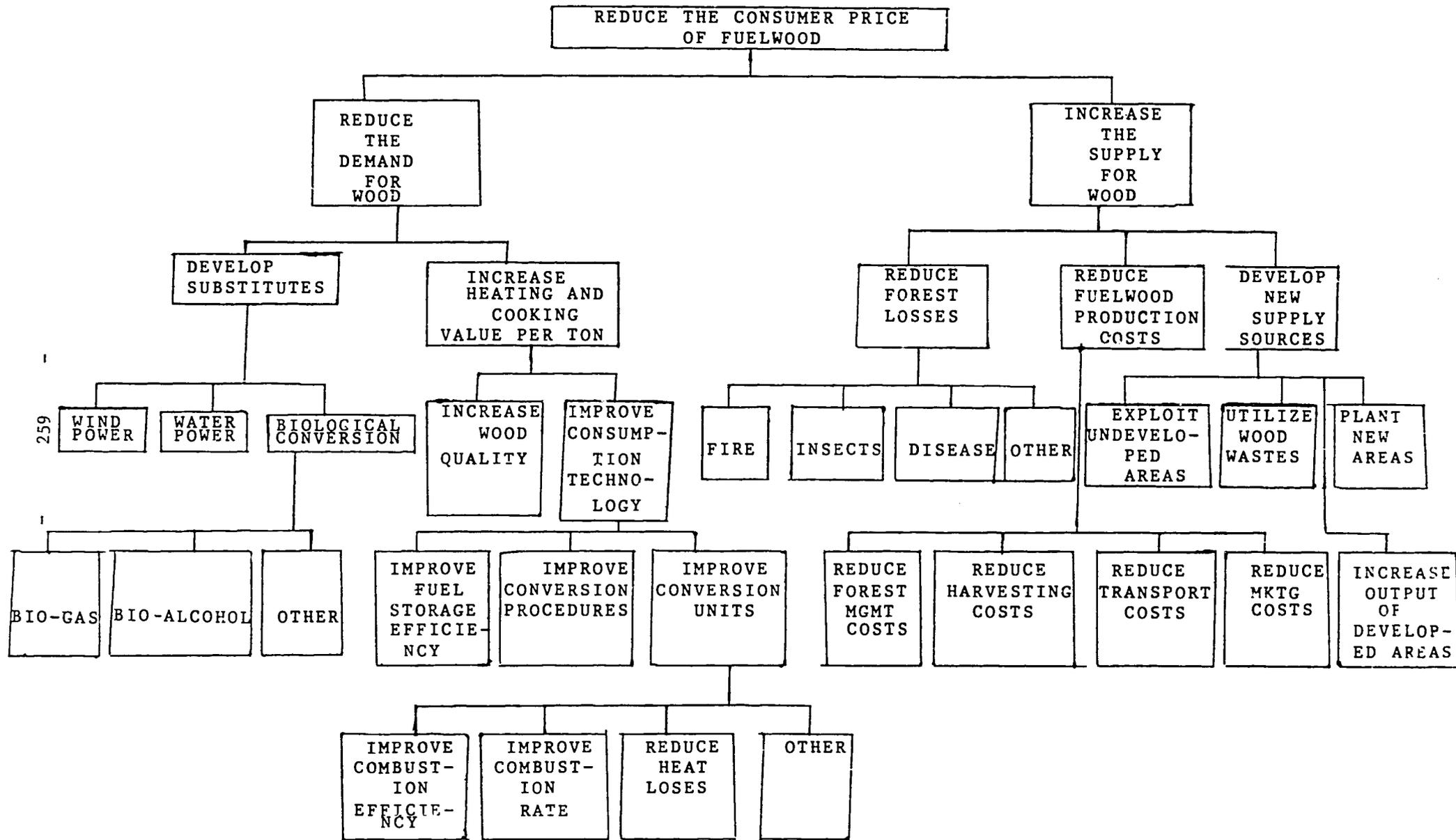


FIG. 1 PARTIAL CHECKLIST OF OPTIONS FOR REDUCING THE CONSUMER PRICE OF FUELWOOD

FACTORS AFFECTING THE MOTIVATION OF RESEARCH PERSONNEL

BY

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Introduction

The application of science and technology has contributed heavily in enhancing the quality of life in many countries of the world, especially in the industrialized countries of the 'North'. In spite of the great fund of scientific knowledge and technological advances made by the developed countries of the North, the developing countries of the 'South' have in comparison benefited relatively little, and their progress in satisfying the basic needs of the majority of their peoples has been slow. Nevertheless, most of the developing countries now realise that the application of science and technology is a basic requirement for their economic and social development. Consequently, many developing countries have given more attention to planning and establishing scientific and technological institutions during the past two to three decades. Although this paper is invited specifically to discuss factors affecting the motivation of research personnel, some peripheral issues relating to research and experimental development (R & D) in developing countries deserve a brief discussion. Some of these issues are the basic problems which research personnel face, and together determine the scientific environment in which they must operate.

Motivation of research personnel is but one of the many factors affecting R & D and the application of science and technology for development in developing countries. Developing countries are by no means a homogenous group. They differ with respect to natural resources endowment, richness of their human heritage of productive skills, geographical

positioning, cultural, social and religious and political ideals and so on. Developing countries include the fabulously oil-rich countries, semi-industrialized nations that are making great strides in applying modern science and technology for development, potentially rich nations with vast under-exploited natural resources and countries that are just emerging from isolated tribal traditions and still practising primitive agriculture. In spite of all these differences, developing countries share certain common characteristics some of which are mentioned below:

- Inadequate provision of basic needs of modern life such as food and water, house, health care and energy;
- High rates of unemployment or underemployment;
- Comparatively high population growth rates;
- Under-exploited and under-explored natural resources;
- Inherited colonial political, educational and bureaucratic backgrounds;
- Lack of indigenous scientific and technological traditions, and continuing lack of public appreciation for science and technology;
- Political instability and chauvinism and;
- Small size of internal markets and uneven distribution of incomes.

This paper will focus especially on the R & D problems facing the less developed countries within the rather broad and heterogeneous community of the developing countries. It is noteworthy that there is no single formula for strengthening R & D in developing countries. Eventually, the measurement of progress in R & D must be at the national level because it is at this level that policy decisions on development options are taken: they can promote, retard or be indifferent to science and

technology for development.

Rationalizing Scientific Research

Naturally, during the pre-independence era R & D efforts were directed at exploring and exploiting natural resources to provide raw materials for the booming 'home' industries of the colonial powers. Colonial scientific interests therefore revolved around agriculture, specially cash crops, forestry, and mineral prospecting and extraction, to name but a few. Involvement by the natives was virtually non-existent, and moreover the type of research was overwhelmingly, as developing countries emerged from colonial rule (most of them 20-30 years ago), they lacked indigenous scientific research capabilities.

Realising the importance of science and technology in social and economic development, newly independent countries are making great efforts not only to rationalise their scientific institutions but also to ensure that these capabilities help meet pressing development needs. Unesco (8) in particular has pioneered this awareness by sponsoring various conferences, seminars and consultancies to assist developing countries in shaping national science policies and organization of scientific research and technological activities. On the African scene, the International Conference on the Organization of Research and Training in Africa in Relation to the Study, Conservation and Utilization of Natural Resources (1) resulted in certain recommendations by the African countries which were in effect a declaration of intent for the development of scientific research to utilize natural resources for the well-being of their people. As a result of this awareness, a number of African countries have established bodies to formulate the 'so-called' Science Policies'. Whereas the National Development Plans in the years immediately after independence contained

little in terms of the role of science and technology, an increasing number of developing countries are now including explicit statements on how scientific and technological know-how can be harnessed for national development. For example, the establishment of the National Council for Science and Technology in Kenya (5, 6) has resulted in a report spelling out the role of science and technology in a wide range of sectors (7) and for the first time since independence the current Five Year Development Plan explicitly recognizes science and technology (1). The African countries, in their efforts to accelerate development by the year 2000, have produced an impressive blue print in which science and technology features prominently (3)

In spite of all the elaborate science policies, conferences, consultancies and prestigious scientific institutions established during the past two or three decades, only a few developing countries have made appreciable progress in evolving indigenous scientific and technological capabilities. Most countries are still backward as the gap between developed and developing countries continues to widen with regard to the use of science and technology for development. The problems connected with this retarded growth are many and varied. Furthermore, it is difficult to discuss factors affecting the motivation of research manpower in isolation from other constraints to R & D in developing countries like Kenya. In the discussion that follows some of the major constraints will be explored.

SOME CONSTRAINTS TO SCIENTIFIC RESEARCH WITH
SPECIAL REFERENCE TO MANPOWER

Based purely on intuitive assessment, the major constraints to scientific research in developing countries, especially African countries, would seem to stem from:

1. Lack of an environment conducive to scientific activity:
2. Poor planning and generally negative attitudes towards scientific research.

3. Lack of political patronage,
4. Inadequate manpower or its misallocation
5. Insufficient funding and facilities.

All of these factors are inter-related, and their presentation here is by no means in order of importance.

Political Patronage

Political patronage of scientific research is either lacking or weak in many developing countries. Where it exists in weak form it is often demonstrated by the establishment of institutional frameworks through Acts of Parliament and occasionally by high sounding statements by politicians. These Acts and statements are rarely followed up by the necessary reforms to create an environment in which scientific research can flourish. Oftentimes this is so because the desired reforms and actions impinge upon or conflict with established government bureaucratic and static traditions dominated by non-scientists who do not understand the nature of scientific research. Consequently, a state of inertia persists, even when comprehensive policies have been accepted at the highest political level.

In Kenya, the Government has approved the establishment of statutory Research Institutes with the following terms of reference (6).

- a) to establish a management body with the desirable independence and assured Government financial support for the execution of short and long-range research in response to present and future national needs;
- b) to continually improve the ways and means whereby scientific knowledge and results are promoted and applied for the benefit of Kenyans;
- c) To cherish an environment in which creative and imaginative research can be undertaken through

suitable management structures.

- d) To attract research managers of outstanding calibre and who are sensitive to practical national needs relative to their own areas of specialization; and
- e) to establish a critical mass of scientists capable of multidisciplinary approach to problems, but flexible enough to be re-arranged in accordance with programme requirements.

These terms of reference indicate the Government's commitment to the promotion of scientific research and in order to meet these goals, a highly motivated scientific community is needed.

Pre-requisites for Effective Research

An environment conducive to productive research requires proper leadership at all levels of the research system; adequate and assured financial support, equipment and facilities, a good measure of independence, high calibre scientists sensitive to the development needs of the country, and fair reward and recognition for the contributions made by research scientists. Such an environment is necessary in order to provide the stability and continuity to pursue research problems which are often of a long-term nature. In recognition of the special needs of scientific research, the Lagos Conference (1, 4) has recommended that scientific institutions in general be outside the civil service structure. If, however, these institutions remain in the civil service, special career structures (schemes of service) should be developed so as to attract and retain high calibre scientific personnel. In response to this recommendation it is gratifying to note that Kenya has made an encouraging 'start-right' by establishing statutory Research Institutes.

Resource Allocation

Adequate funding to achieve the stated goals of a research programme is a crucial factor in motivating scientists who are sensitive to national development needs. In general, however, developing countries invest only a small fraction of their GNP on R & D compared with developed countries. This in effect means that even where developing countries have endorsed impressive science policies and have established scientific institutions, R & D as a whole is 'starved' of funds and therefore cannot be productive. In such cases, even highly paid scientists cannot be motivated for lack of basic equipment and materials required for their work.

In poor countries with pressing basic development needs, it is easy to guess why there is so little investment in R & D. First, scientific research is expensive and often takes a long time to yield results. Second, even when practical research results are obtained there is a long time lag between the time they are released to the time they are adopted such that they can contribute to national economic and social needs. In times of financial scarcity, policy makers are likely to assign low priority to scientific research. For example, the current Five Year Development Plan (1) aims at spending one per cent of the GNP on R & D in the long run. The present global recession affecting Kenya, however, places some doubt as to whether this percentage will be achieved as projected. In the last two or three years, reductions in R & D budgets have shown how even the most motivated research personnel can achieve nothing though they may still be paid an attractive salary

Research Management and Administration

Proper management and administrative structures are important factors in motivating and inspiring research

scientists. Management and administration are principally concerned with planning, direction and control of programmes and the resources allocated to them. Motivation should really commence at the management, administrative and institutional level. The Research Institute as a whole should have goals and challenges to mobilize all resources for the solution of priority problems. The management and administrative set-up should be 'impact oriented' in order to win public appreciation, and hopefully public financial support. Research managers should therefore be highly sensitive to the practical economic and social requirements of their countries. They should have the tact to identify problems, plan strategies for solutions, mobilize resources and be accountable to the public.

Great attention is being given to institutionalization of research management by many agencies including UNESCO, IDRC, ISNAR and the Commonwealth Scientific Committee through training courses organized in developing countries. While these courses contribute considerably to the improvement of research management and administration, their effectiveness depends on a number of factors, including the natural ability of a scientist to be a good manager and administrator. A substantial proportion of scientists who attend such courses can never acquire the qualities of good managers and administrators to motivate other scientists.

Recruitment, Training and Initiation of Research Personnel

Recruitment, training and proper initiation of young scientists into research careers are very important motivating factors. In recruiting young scientists, one of the easiest criteria to use, which is very frequently adopted, is the strength of scholastic records of candidates. This is in spite of the fact that there is little evidence to show that grades alone can be used to predict the success of a research worker. Other criteria such as ability for team work, persistence and initiative should also be taken into account. The recruitment process should therefore be gradual. Ideally,

undergraduates should have an opportunity to work in research institutions during vacations. This serves two very useful purposes. First, young scientists have an opportunity to acquaint themselves with the research profession, and second the research manager can assess the qualities of future scientists at an early stage. Following recruitment, it is important for young scientists to be attached to experienced research workers who should have the patience and sympathy to give encouragement to fresh graduates. Availability of training scholarships for high qualifications in reputable institutions greatly motivates young scientists to choose scientific research as their career.

Conclusion

While the application of science and technology has contributed heavily to economic and social change in industrialized countries, developing countries have benefited relatively little, and most of them are still deprived of the basic needs for a decent life. Many developing countries have therefore realized the importance of scientific research and are at different stages of implementing policies designed to explicitly use science and technology for development. Political commitment is certainly the major factor in determining the place of science and technology in development, and all other factors depend on this. Motivated research scientists are needed to help enhance the quality of life in developing countries, but the factors affecting motivation are many and varied. A few of the major factors are discussed in this paper, but they should not be regarded as a panacea for scientific and technological advance. The challenge is a national one, and should be faced by bold reforms and national development options.

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MECHANISMS FOR EFFECTIVE DISSEMINATION OF RESEARCH
FINDINGS TO VARIOUS END-USERS/COMMUNITIES

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Introduction:

The development of national scientific research institutions, and the programmes they are supposed to service in any give country or community require, as a pre-requisite, a rationally and clearly thought out pattern of results that should be generated from them. But it seems to me that perhaps of more significance is the awareness these results generate within the community of their consumption and utility. In the developed countries, these institutions have undergone several metamorphoses and adjustments during their long periods of industrialization, in an attempt to making them relevant to their needs. These adjustments have consequently injected several sophisticated models and modernization to make the expected results match with the developments in those countries for their Research and Development (R & D) needs.

In their endeavour to develop such institutions, the developing countries have copied models from the developed countries without due regard for their level of sophistication. The belief has been that because these research institutional structures in developed countries are more advanced, then the developing countries should follow the same strategy by copying the layout and the hardware from them without due regard to what use the accruing results will be put. More often than not, these institutional research infrastructures, like equipment that is being copied by developing countries, are either obsolete or are seriously undergoing major overhauls in their country of origin to suit prevailing local needs. Imitations have often led to the development of what can be termed as "white elephant" institutions in developing countries, which have proved very expensive to maintain and produce results which in many ways are

unpopular with the public.

Perhaps the most serious weakness in the system is the mode of training of the personnel that man the R & D institutions in developing countries. Most of them happen to have received this training in developed countries, and having used sophisticated hardware during their training period they are left with very little leeway in deciding what equipment they will require back home other than that to which they have been exposed e.g. electrophotometers, ultra-centrifuges, the non-fluoride tooth-pastes and the tooth brushes that go with them. The end result is that these personnel churn out work the results of which are alien and in many ways inapplicable to local conditions. The system in general thus becomes inefficient, because the context and the environment are such that the imported hardware and technologies become superficial and afford no guarantee whatsoever that they will operate with an element of positive contribution to the development of these countries. But whatever contribution these R & D institutions are able to offer to the peoples of the developing countries, there must also be an efficient mechanism for disseminating these findings to the various end-users, and this mechanism must also have an in-built Research and Technology (R & T) element which will interpret the scientific results to the public and show them the right and proper ways of absorbing and diffusing these research findings for the betterment of the society.

Within the Ministry of Agriculture and Livestock Development in Kenya, there are some built-in mechanism for dissemination of research findings and information which are to some extent satisfactory. These mechanisms take the form of "Open days" when farmers visit various research institutions and see for themselves what research findings are generated by these institutions and see their mode of application in the form of demonstration plots. Perhaps of more significance is the open discussions that ensue between the research personnel and the farmers themselves during such an occasion. Dissemination of these findings also take the form of publicity through various information centres which act to convey findings to consumers through a simplified language which is easily understood by farmers in the form of pamphlets, posters and other public media.

Although these methods may be far from satisfactory, they nevertheless serve to stimulate some awareness in farmers of the most modern available scientific findings and their field applications for the betterment of their farm practices. Thus, the farmers are encouraged to apply these results and methods on their own farms and gain some satisfaction in themselves when they see their yields improve as a result of the application of these modern scientific techniques.

In forestry, on the other hand, the situation is somewhat different. It is different in that the institution that generates research results related to the forestry development in the country and the consumer of these results is one and the same - the Government. In Kenya, all gazetted forest plantations are Government owned plus a few pockets that are owned by some county councils. Consequently, any publicity of research findings by these institutions are only aimed at attracting the attention of just one consumer.

Some practical ways of improving and disseminating research findings

Building up of institutions for Science and Technology (S & T) capacity or even contemplating to do so in developing countries almost invariably creates a collision course with the acute shortage of qualified man-power to operate and service them. This in itself underlines the importance of good coordination between the S & T policy and the education policy. For instance, going by the internationally set standards, a researcher is judged by the number and quality of scientific papers he has published and the journals that have accepted these papers for publication. By implication, these scientists must therefore pass through internationally recognised training systems to be able to compete favourably under the set norms of the game. Under the present set up, most of the scientists in the developing countries have at some stage in their scientific

development been trained or had strong overseas ties. By the same token their work must equate favourably and sometimes surpass in quality that which is done in developed countries. It has been stated elsewhere that the scientific needs of developing countries differ markedly from those of developed countries. By the same analogy it seems to me that most, if not all of the scientific work that is carried out in developing countries is therefore of somewhat reduced utility and relevance to those countries because it must by design conform to the international norms of science practice which are suited to satisfy the needs of the developed countries. There is therefore a need to critically look at ways and means that we have adopted for training of our scientists who are now more "overseas oriented" than "home oriented". By this I mean that we now need scientists who know the local needs, their obligations to the nation and the kind of service the nation expects from them for the promotion of S & T programmes. It is therefore desirable to train and produce able and creative scientists at home in strong academic institutions rather than to depend on training overseas, so as to expose them to local problems while undergoing their training, at least at the second degree stage of their scientific training. Furthermore, care should be taken not to allow usefulness of research to underplay the role of basic research, because a good level of excellence is crucial for producing competent researchers and professionals. Basic research also provides standards of quality for applied research and it supplies applied research with much-needed inputs in the forms of required knowledge or advice, while opening windows to the outer world of science.

Given that the country has devised methods of training and producing effective scientists who are able to churn out results which have relevance to the needs of the country, it is desirable to find effective means of disseminating this information to the end-user.

One of the ways in which this task can be accomplished is by having an effective and active liaison or a linkage personnel component within a research institution. The task this component has to carry out is to translate the scientific data into a form suitable for consumption by the public. And to effect speedy dissemination of these results it will be desirable to:-

1. Encourage "open days" during which members of the public visit research institutions. On these days, the liaison officer should explain in simple language to the public the work that is being carried out at the institution, the results that have so far been obtained and the utility of these results.
2. They should be exposed to demonstration plots depicting application of these results to show them the merits and perhaps the demerits of application of these results so that they can convince themselves of the usefulness of these results before they can adopt them on their farms. Also during these open days all the scientists, including the research administrative cadre, should be at hand to answer questions and discuss the scientific background of their results, and their rationale in terms of the farm scale application.
3. The research results should be available to the farmers on a free-flow basis. This will induce the farmers to readily apply the results without an element of cost which might discourage their desire to apply them. In this regard, the liaison officer should be able to interpret results that are published in scientific jargon into simple

terms for easy consumption by laymen. These interpretations should take the form of hand-outs to the farmers with full explanation as to their meanings and application at the farm level. The liaison officer should therefore be fully conversant with all the operations of the research establishment, personnel and programmes. He should also be an effective go-between.

MODELS FOR EFFECTIVE FORESTRY EXTENSION
PROGRAMMES AND THE ROLE OF NON-GOVERN-
MENTAL AGENCIES IN NATIONAL AFFORESTATION

BY

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Introduction

There is a tendency to lay more emphasis on rural afforestation programmes because in the foreseeable future it is possible that the bulk of people's wood requirement will be met from the agricultural land. In any case, wood is a bulky commodity and should be provided where people are. Currently, Beijer biomass energy studies have indicated that 25% of total woodfuel comes from the rural area. With population growth, it is feasible that most of the people's need in woodfuel will increasingly be met from the rural area and the proportion of woodfuel coming from rural area is likely to increase in the face of the limited alternatives.

Although rural areas hold such importance in provision for wood for fuel and poles, the extension programme has not been well planned and implemented. The Forest Department has an extension arm by the name of Rural Afforestation Extension Scheme, but due to staff and financial limitations, the Unit has not effectively penetrated the rural areas. In fact, one forester per district is certainly not enough. The counterparts in the agriculture department have intensified this programme by introducing "Train and Visit" programmes. The extension programme is indeed the most effective method of reaching farmers and training them to adopt modern methods of agricultural and forestry resources production. In this respect, forestry has lagged behind compared to the Agriculture Department. Yet wood resources are just as important as agricultural crops, particularly as far as soil and water

conservation and other direct benefits such as energy are concerned.

It is now the appropriate time to ask the question whether forestry research has had its priorities in order, in the face of new challenges. By research, I am not implying just the experimental work in the laboratories and some field trials. I mean research in the wider context which has a connotation of Research and Development. It is usually not borne in mind that extension programmes have failed because, besides staff and financial limitations, the extension officers have failed to do enough research in trying to know social opinions, attitudes and values. They occasionally think they know what is good for a farmer, and a deep knowledge of what farmers know would help such an extension programme greatly. Starting from what is going on creates some confidence among the rural people, and hence better participation by the local people and, by implication, more meaningful development.

A forester has a big problem in convincing a farmer of the need to grow more wood on his limited land, but a positive and well planned approach based on some social studies can transform current agroforestry practice to those which yield more wood and at the same time compete less with agricultural crops, or for that matter into systems which will enhance agricultural crop yields.

Due to limitation of government finance and of the number of qualified people to tackle the issue, the role of non-governmental agencies in national afforestation task is most welcome, and should in fact be assisted because such organizations are close to the people, and quite often may know more about the people they work with than some government officials who are transferred from one place to another in course of their duties. In fact, a paper by J. Burley lists sociological and institutional research as first priority. The main issues are usually:-

- Human society in the forests.
- Perceived roles of trees by local people
- Conflicts of land use.
- Incentives to grow trees
- Extension methods.

Stress is hereby made on agroforestry because it is felt that effective extension programme and many activities of non-governmental organizations in tree planting are essentially directed to the agroforestry systems. It must be pointed out that the system is indeed very old, but research on it is relatively new and, in view of its future inevitable importance, the system should receive the attention it deserves.

Constraints in National Afforestation

There is a tempo of tree planting and indeed government, non-government organizations and individuals all agree that afforestation is the most prudent step we can now take in view of the ever increasing demand for wood products. Yet there are many failures in tree planting. The causes of many failures should be borne in mind before carrying out any research, otherwise national resources will be wasted in unnecessary research work, a common occurrence.

In the book on "Tree Planting in Africa" by the writer, financial problem, lack of enough qualified personnel, shortage of suitable land, land tenure systems, and problems on information flow on what is being researched elsewhere were enumerated as constraints to tree planting. While very little can be done on financial and weather problems, other constraints revolve around well planned extension programmes using the few professional people there might be and the non-governmental agencies as well as the informed lay experts.

Related to the issue of information flow, there is the issue of education and training. It is usual for many

authorities to think of workshops as panacea for all problems. In such workshops some academic papers are presented and debated, but unfortunately the participants are quite often not the practising farmers and the ideas disappear soon after such meetings. Proper training should now be conducted in the layman's language, usually to the practising farmers or people directly involved in directing agricultural and tree planting. A follow up is indeed necessary and this will remove the big problem of unawareness.

Role of Non-governmental Organizations

There are increasing numbers of non-governmental organizations which have taken on the task of afforestation either as a secondary activity or indeed as a full time activity. In the writer's experience, many non-governmental organisations have had a very big impact on rural afforestation. In fact, there is a lot for professional foresters to learn from these lay groups, particularly in the field of extension work. The many tree planting workshops which have been held by the KENGO (Kenya Energy Non-Governmental Organizations) at the Coast, Kitui, Kakamega and Nairobi have clearly demonstrated where Government forest officers have failed, and in discussions with people who are at grassroot level in tree planting many practical and undocumented ideas have come up. Ideas such as using lay experts in tree planting promotion and other information on the required species rather than imposing preselected species, if followed, would lead to successful tree planting.

In reference to extension approaches, it should be stressed that the non-governmental organizations have created some special confidence in farmers by working with them rather against them. They have started by building on what farmers are doing as a point of departure. Using layman's language, many non-governmental organizations have cultivated the understanding of local people, who see them as part of themselves.

As an example of an effective forestry extension programme, the Green Belt Movement has composed a very touching song in praise of tree planting. Such a song is bound to impress the minds of young and old people who can hardly follow an academic argument normally put forward by most professionals who cannot divorce themselves from the indoctrination of their training. The song is reproduced here in the language in which it is sung:

"Mungu aliumba Adam na Hawa
na akawaweka shambani la miti

Wapate Kivuli, wapate matunda
walime undongo, na walime miti

Miaka iliisha, walikata miti
Wakawa na shamba likiwa jangwa

Waliogezeka, wakawa wanyama
Walikata miti, Nchi ikwa uchi

Tumekosa kuni, na vivuli pia
Mchanga umekwenda, chakula kidogo

Sisi Binadamu, Tufuate Nyayo
Za muumbaji wetu, na tupande miti"

Indeed the song was sung at a workshop with some very old people, and despite their age and lack of formal education they could get the message within a few minutes. The message to plant and to care for trees for many fuelwood and environmental benefits was made much more clear than the case would be from several textbooks. The young and the middle-age participants also got the message.

The Green Belt Movement, founded by the Kenya National Council of Women, is a young organization and has already started a chain of tree nurseries in the country. People in the rural area knew about the organization because of an effective extension programme in tree planting. Perhaps an examination of their nursery management techniques might realign the course of research within K.A.R.I. and other government institutions.

Besides the Green Belt Movement there are other organizations which are doing commendable work in the tree planting programme. - KENGO has already produced a directory of a number of Non-Governmental Organizations (NGOs) who are engaged on energy issues, mainly tree planting and biomass energy conservations as a whole. There is no intention of reproducing such a list here. Suffice it to say that tree planting has greatly been advanced by such organisations as:-

- National Christian Council of Kenya.
- Kenya Freedom from Hunger
- Maendeleo Ya Wanawake
- Catholic Church of Nakuru Diocese.

KENGO, as an umbrella for many organisations dealing with energy issues, has indeed been compiled a lot of useful information which would form the basis of appropriate research work in Kenya.

Research and Development

One unfortunate thing about the current research practice in Kenya is that one gets an impression that research is being conducted for the sake of research. Researchers should get out of this temptation and concentrate on research which is only directed to development. There is a feeling among some non-researchers that some research is a matter of "inventing the wheel again". There is already a lot of information which is known and not being used. Species of trees which have failed under some circumstances have continued to be tried while new frontiers have been left untackled.

For example, planting of trees in communal land (and we have large communal lands) have very little chance of success due to overgrazing and neglect. Has research on communal lands been conducted and, if so, what are the best approaches? Are researchers neglecting their duties by assuming that the nomads are irrational managers of their natural resources?

The whole national effort is directed to the development of society by improving the standard of living particularly in the rural area where the majority of people live. All other endeavours, including national afforestation, must be seen within this context. The problem of adequate tree planting to meet soaring demand is so large that there is no risk of overdoing it. For this reason, other institutions such as the University and Non-Governmental Organisations as well as individuals should be encouraged to contribute their best.

Conclusion

In conclusion, it is submitted that the workshop, after the necessary brainstorming and free exchange of ideas, should come up with a list of priority research areas in the light of changed circumstances. Research practices which do not meet the current needs should be shelved. The emphasis in outlining research priorities should be towards proper and effective extension programmes by different competent organizations whether governmental or non-governmental. As a possible guide, I believe the following multidisciplinary issues have a lot to do with success or failure of extension programmes in national afforestation tasks:

- 1) Sociology of people in any particular place should be modestly researched on.
- 2) The legal framework, both statutory and customary, may have great influence on the course of forestry programmes.
- 3) Cultural and spiritual inclinations, should be differentiated in each case. Many failures have come up as a result of uniform treatment in situations which call for specialised treatments.
- 4) Mechanism of identification and selection of institutions which should conduct research in the relevant disciplines, For example, training and

education can be handled by the Department of Forestry, University of Nairobi. Extension research can be done by NGOs with the relevant knowledge.

- 5) Finally, professionals should be flexible and be willing to learn something from the lay people. Whatever your profession may be mind the saying, professionalism is conspiracy against the laity"

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PART V
CLOSING REMARKS

A SPEECH BY MR. A. D. MATHER

Mr. Chairman, Ladies and Gentlemen,

Reverting to my status as observer on behalf of F.A.O., I wish to thank you for inviting our organisation to this workshop on Strengthening Forestry Research in Kenya.

My impression is that Workshop, in its serious attempt to examine the problems of Forestry Research in Kenya, has succeeded beyond all expectations. It has succeeded particularly in bringing together high calibre researchers, educationalists, and some users of researched knowledge. It has produced a much needed forum and a platform from which to build up to the next stage. That next stage must be a further Workshop to assist Government in setting National priorities for Forestry Research, so that this subject may, once again, be set on a firmly programmed course.

In the meantime, many recommendations have been put forward. Some may be implemented soon, but it will take time for other to be fulfilled.

The organisation of the Workshop has been outstanding. The Chairman's sense of discipline and his good time-keeping has been tempered by good humour. The work of the Group Chairman and Rapporteurs has been very seriously conducted, and the participants have participated.

The United States Agency for International Development is to be congratulated. It has performed a most useful service to Forestry Research in Kenya. It is hoped and expected that the Agency will continue in this worthwhile support so that the whole problem of Forestry Research in Kenya may be properly solved.

A. D. MATHER
on behalf of Mr. K. E. Kolding
F.A.O. Representative in Kenya

VOTE OF THANKS BY D. M. KAMWETI

On behalf of the participants, I would like to thank the workshop organizers who have indeed worked very hard to see this historic workshop come to a successful conclusion. We are aware of the amount of work which you have put in planning and organizing this workshop. You have even sacrificed yourselves as you worked during the long nights to make sure that the deliberations on research follow the right path.

The standard of both invited and the position papers has been extremely high and so interesting that most of us have never left the hotel gate during these five days. We came in search of knowledge and we got. Our cross exchange of ideas through your guidance, Mr. Chairman has resulted in first ever priority in research needs in our afforestation programme. I sincerely hope that if these priorities are followed, we will have gone along in meeting our national priority of socio-economic development particularly in the rural areas.

In our course of interaction during the meals and at night, I can assure you that many participants have said that this is the most informative and well-organized workshop they have attended so far. I share their feelings.

Once again, Mr. Chairman we thank you and all of your team very much. Considering the amount of work which has been accomplished and the healthy differences in view which have been resulted, the participants would agree with me that the course organizers could not have chosen a better Chairman.

PART VI
APPENDICES

APPENDIX I : LIST OF PARTICIPANTS

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NAIROBI.

A DIRECTORY OF INSTITUTIONS INVOLVED IN FORESTRY
RESEARCH AND DEVELOPMENT IN KENYA

The Forest Department P.O. Box 30513, NAIROBI. Tel. 722620.

This is the main government agency responsible for all forestry matters. The Forest Department is responsible for the development, conservation and management of all forest resources including the indigenous and plantation forests, to enable the country to sustain a sound wood product industrial base while ensuring protective and conservation roles particularly of water and soil resources. It is envisaged that with careful management and exploitation, both indigenous and plantation forests can meet a greater contribution to export earnings, while ensuring self sufficiency to perpetuity. The Department is currently engaged in rural afforestation extension programmes in the country through special campaigns focussed on popularising tree planting among the rural population, and fostering the establishment and scientific management of farm forestry.

1. The Forestry Research Department, P.O. Box 74, Kikuyu.
Tel: Kikuyu 2173 or 2220.

The Department is based at Muguga, about 24 Km from Nairobi. The research department which is functionally an arm of forest resource management, has four major programmes on research and development, and maintains direct service to management of day to day activities. The first three of these programmes, listed below, are based at the Forest Research Station, Muguga. Tel: 2126 or 2031 Kikuyu.

- (a) Environment and Silviculture:

Undertakes a large programme on species and provenance studies, dry land afforestation systems, forest ecology, forest mensuration, tree improvement, social and agro-forestry systems. The division is based at the national forest research station, Muguga.

- (b) Forest Entomology and Zoology

Undertakes all aspects of research on entomological and related pests of forests and forest products including their biologies,

(ii)

ecologies and control. The division is based at the national forest research station at Muguga.

(c) Forest Pathology and Biodeterioration:

This division carries out investigations on the biology, ecology and possible avenues of control on pernicious forest diseases of fungal, bacterial and viral origin.

(d) Forest Products and Wood Science:

Forest products research serves wood based industries and consumers especially by providing marketing information on timber properties and qualities against an array of end uses, such as plywood, pulp and paper, particles and fibreboard, sawlong, joinery, construction and energy etc. This division is based at Karura, P.O. Box 30513, Nairobi. Tel: 65236 Nairobi.

The forestry research department carries out a wide range of regional studies through its regional research stations, sited in key forest areas in the country as follows:

Coast Forest Research Station, P.O. Box 201, Malindi. Tel: 64
Watamu.

Tana River Research Station, P.O. Box 109, Hola. Tel: 47 Hola.

Turbo Forest Research Station, P.O. Box 5 Turbo. Tel: 6Y6 Turbo.

Londiani Forest Research Station, P.O. Box 1 Londiani. Tel: 28
Londiani.

Ramogi Forest Research Station, P.O. Box Ramogi. Tel: contact
through DFO Siaya, Tel: Siaya 50.

Kibwezi Forest Research Station, P.O. Box 87 Kibwezi. Tel: 50 Kibwezi.

The programme is further twined with the Embu-Meru-Isiolo, ODA project.

2. The Euphorbia Project: P.O. Marigat Via Nakuru.

The Ministry of Environment and Natural Resources, a pilot project developed to determine commercial production of hydrocarbon fuel from Euphorbia tirucalli.

3. Baringo Semi-Arid Area Project: P.O. Marigat Via Nakuru.

This project was designed to demonstrate appropriate land management that sustains woodfuel production. The project is financed by the FAO through the Forest Department.

4. Turkana Development Project: The Forest Department, P.O. Box 175, Lodwar.

The forestry component of the NORAD financed Turkana development project is focussed on conservation of existing forestry resources, forest education and establishment of a limited planting and species trials. The project is implemented in collaboration with the Forest Department.

5. The Ministry of Agriculture: P.O. Box 30028, Nairobi.

The Ministry of Agriculture operates a number of tree nurseries and promotes tree planting for soil conservation and partly to meet woodfuel requirements for domestic and agro-industries.

6. Ministry of Energy: (Energy Development International)
P.O. Box 30582, Nairobi.

Has established six agroforestry centres for research and demonstration, and undertakes training in agroforestry and renewable energy.

7. Kenya Rangeland and Ecological Monitoring Unit (KREMU)

P.O. Box 47146, Nairobi: Tel: 541260, Nairobi

KREMU has established a remote sensing section for use in monitoring various resources of relevance to government planning agencies and the scientific community. KREMU undertakes monitoring and assessment of vegetation changes in forests woodlands and grasslands.

8. The Permanent Presidential Commission on Soil Conservation and Afforestation: P.O. Box 30510, Nairobi, Tel: 21034/5/8

The Commission is mandated to review legislation on soil conservation and afforestation to advise on protection of catchment areas, watershed areas, and to continually evaluate the performance of government agencies responsible for soil conservation, afforestation and flood control programmes.

9. Kenya Industrial Research and Development Institute:

P.O. Box 30650, Nairobi. Tel: 557958

Conducts investigations on the production of power alcohol from various local raw materials.

10. The International Council for Research in Agroforestry

P.O. Box 30677, Nairobi

A council with a global mandate to promote, initiate and support research for the development of agroforestry in developing countries.

11. Kenya Energy Non-Governmental Organization (KENGO)

P.O. Box 48197, Nairobi, Tel: 26244

National network of 40 NGOs.

Provides Technical assistance to NGO tree planting projects.

Organisers training workshops at District level on Agroforestry Procures and supplies tree seed and material input to rural NGOs. Publishes education material on agroforestry and tree planting. Carrying out research on indigenous tree species.

12. The Department of Forestry, Faculty of Agriculture, University of Nairobi: P.O. Box 30197, Nairobi. Tel: 592037/592175 Ext. 17

Carries out research on dryland afforestation, mensuration and nitrogen fixation.

13. B.A.T. Kenya Woodlot Project:

BAT is an attempt to enable farmer self-sufficiency in woodfuel for curing tobacco instituted as afforestation project within the company from 1977. The following activities are undertaken:

Controlled supply of seedlings to tobacco growers;

An annual supply of seedlings from the company tree nurseries for planting by the public at a subsidized price.

The company leases council and public land for tree growing.

14. CARE/KENYA, P.O. Box 43864, Nairobi, Tel: 3333849

Provides assistance to community development extension training and sponsorship of agroforestry systems and the development of social forestry. Large scale agroforestry programme for Siaya District.

15. Baobab Quarry Woodlots:

The Baobab cement factory has devised an impressive system of rehabilitating quarries after deep ripping to obtain material for cement manufacture. A number of tree species including Casuarina equisetifolia, Gonocarpus and Prosopis are successfully cultivated.

16. The Beijir Institute: P.O. Box 56212, Nairobi

Engaged in woodfuel research and development in Western Kenya, under the Ministry of Energy.

17. East Pokot Agricultural Project: Kositei CM Nginyang,
P.O. Box Marigat Nakuru.

This is an integrated development project. The tree growing component concentrates on species trials, and an appraisal of tree planting methods appropriate to the semi-arid land areas of Pokot, to provide a source of tree seed, and to develop viable tree planting methods.

18. National Christian Council of Kenya: P.O. Box 45009, Nairobi

Tel: 338211

Undertakes afforestation and desert rehabilitation in such areas as Turkana, Marsabit and Mandera etc.

19. Council for Human Ecology-Kenya (CHEK) P.O. Box 20300 Nairobi
Tel: 22564
An international organisation with chapters in each commonwealth country. The Kenyan chapter is involved in tree planting at Enkarau, Habaswain and Kibwezi.
20. Brooke Bond Liebig (K) Ltd. P.O. Box 42011, Nairobi
Energy woodlots for factory furnaces.
21. Kenya Catholic Secretariat: P.O. Box 48062, Nairobi
Tel: 74302/3,4
Supports tree planting among other activities.
22. Kenya Freedom from Hunger Council P.O. Box 30762, Nairobi
Tel: 338713/24023
Supports tree planting among other things.
23. Mazingira Institute P.O. Box 14550, Nairobi
Tel: 47066
The major focuss is on environment and development including education, training and agroforestry. Joint research project on agroforestry with ICRAF.
24. National Council of Women of Kenya P.O. Box 43741, Nairobi
Tel: 24634
Undertakes tree planting and establishment of green belts among other things.
25. Kenya Jaycees P.O. Box 86842, Nairobi,
Tel: 27024/540
Promotes tree planting.
26. Limuru Boys Centre P.O. Box 30496, Nairobi
Trains young men in practical agriculture including forestry and undertakes planting of demonstration plots in different part of the country.

27. Mandeleo ya Wanawake P.O. Box 444125, Nairobi
Tel: 22095

Tree planting, jiko stoves

28. Men of the Trees P.O. Box 29045, Nairobi
Tel: 592251

An international society concerned with conservation of forests and tree planting. The society further sponsors community tree planting in different parts of the republic.

29. World Muslim Congress P.O. Box 43789, Nairobi

In the field of Renewable Energy, World Muslim Congress has been concerned with the conservation of forests and the efficiency of fuelwood. It advocates reducing the use of forests as a source of energy until a sustainable yield harvest can be achieved, and promotes tree planting. Each Muslim child in the Quoran Schools is encouraged to plant a tree and care for it.

30. Partnership for Productivity (PFP) P.O. Box 52800, Nairobi

Promoting community woodfuel projects in Western Kenya through women's groups.

31. Mennonite Central Committee (MCC)

An international relief and development organisation sponsored by North American Mennonite Churches. In Kenya they have been focussing on various aspects of tree planting and the small scale farm setting. The chief effort has focussed on establishing seed collection and distribution of indigenous and exotic trees.

MAP OF THE REPUBLIC OF KENYA SHOWING DISTRICT BOUNDARIES



THE PERMANENT PRESIDENTIAL COMMISSION ON SOIL CONSERVATION
AND AFFORESTATION

During the 1980 Madaraka Day Speech, His Excellency the President called for greater attention on land use, soil and livestock productivity and reafforestation, and intimated to establish a Permanent Presidential Commission on Soil Conservation and Afforestation to deal with the problem. In the President's words.....

"We cannot afford to go on losing top soil and forest cover at the rate experienced in recent years. Two things must be basically understood. One is that any tract of forest or rangeland, like any river system or wildlife habitat, is not just a lifeless resource which can be casually exploited. It is instead a living system capable of improving its own productivity and having vital influence upon the productivity of commercial land use and human settlement in the surrounding areas. The other main point is that all of us must recognize the dangers, to our own interest and to future generations, of entering a phase in which very rapidly increasing numbers coincide with the erosion of natural resources and functions on which human life depends.

..... Now we must move into a new era of planned restoration and scientific conservation so that our inheritance of natural resources can provide a sustained yield, while positive contribution to the health of surrounding systems and the productivity of basic enterprises.

..... This is an issue of such importance that I have decided to establish a Permanent Presidential Commission to co-ordinate the necessary national programmes in the general field of soil conservation and re-afforestation ... I urge all of you in every corner of our Republic to look upon this work as a new and exciting crusade in which everyone can play a part and from which everyone must equally benefit".

(ii)

The Commission was therefore established on 21st January, 1981, and was given broad terms of reference and specific functions:-

Broad Terms of Reference

1. To review the present legislation on Soil Conservation, Afforestation and Flood Control, and to advise on its adequacy and effectiveness.
2. To advise, in consultation with other relevant agencies, on areas that should be declared "Protection Catchment areas", and to recommend on the measures to be taken to regulate the management of such protected areas.
3. To advise on the measures to be taken to protect water courses with a view to preventing river silting.
4. To submit specific recommendations at every stage after deliberating on specific items.
5. To continually evaluate the performance of the Government agencies with the responsibility of implementing soil conservation, afforestation and flood control programmes, and advise on the adequacy or otherwise of government machinery for planning and implementation of programmes in the area.

Specific Functions of the Commission

The Commission has the following functions:-

1. To co-ordinate and monitor government planning efforts and projects in the areas of soil and water conservation and afforestation.

(iii)

2. To review, evaluate and identify gaps in performance of government ministries, and to encourage private and voluntary efforts in carrying out conservation and afforestation programmes and projects.
3. To promote effective liaison between government bodies and private sector, and to encourage private and voluntary efforts in carrying out conservation and afforestation programmes and projects.
4. To establish criteria for the design and implementation of conservation and afforestation programmes and projects.
5. To co-ordinate donor efforts to provide financial and technical assistance to the nation's conservation and afforestation efforts, particularly those which the Commission identifies as high priority.
6. To review existing conservation and flood control legislation, identifying gaps, overlaps, enforcement and other problems, and to initiate new legislation or amendments as appropriate.
7. To identify farming, livestock and other commercial activities that are incompatible with sound conservation practices and to initiate corrective measures.
8. To initiate and review such scientific and social research and studies as are necessary for the efficient promotion of the conservation of the nation's natural resource base and setting up research priorities.
9. To prepare and disseminate scientific and popular publications and to promote educational efforts that reach all levels of the population and all regions of the country, particularly as regards their environment.

10. To co-ordinate government efforts as well as voluntary efforts in liaison with the District Development Committees to ensure that they give proper attention to conservation and afforestation problems and activities.
11. To ensure that all dams are designed, constructed and operated in conformity with sound conservation practices.
12. To review the various settlement and irrigation programmes and projects to ensure land use designs and practices follow sound conservation principles.
13. To promote protection of forests, particularly in important water catchment areas, and to effect forest fire control activities.
14. To promote the rehabilitation of all degraded forests and eroded lands, including the restoration of land ruined by mining, siltation and flooding.

The Structure of the Commission

The Commission consists of 10 members plus the Chairman appointed by His Excellency the President from all corners of the Republic. They represent the whole cross section of the population. The Commission has its own secretariat headed by the Chief Executive which basically consists of a core of professionals drawn from various relevant disciplines. The professionals continually monitor and analyse the details of those problems identified on the ground.

4. ACTIVITIES AND ACHIEVEMENTS OF THE COMMISSION

The Commission's activities did not start until the beginning of 1982. The Commission's approach was to create awareness of the problems of soil erosion and deforestation as much as

possible in all sections of the community. The awareness, however, could not be propagated before root causes of the problems were properly analysed and understood. It has been the Commission's conviction that every member of the population must be aware of the problem to be able to join hands in implementing various conservation measures to combat the problem. To gauge the community's environmental awareness, the Commission has visited in depth all the districts in the republic, and has been discussing the teething problems of erosion and deforestation at the grassroot level with the field officers and the population at large. The problems of national magnitude are taken up on Commission's full sitting sessions.

The Commission has also been entering into discussion with various relevant Ministries and organizations concerned with conservation of environmental factors at a national level, with a view to formulating policies on how to hasten implementation of various programmes designed for rural afforestation and soil and water conservation. The Commission has strived to influence government ministries and institutions to work as a team instead of individually for the latter practice at times results in the destruction of each others effort.

Through this strategy, the Commission has managed to generate enough awareness which can only be detected on the ground. It can be mentioned here that increased activities on stabilizing of soils by use of bench terraces, cut-off drains and check dams are evident all around the country. Tree seedlings demand by general public, and indeed seedling stock, has increased year after year, and so has the number of tree fruit nurseries.

The Commission has annually spearheaded the activities of the "National Soil and Water Conservation Week" event which take place before the long rains around February/March. National tree planting week is always declared soon after, when sufficient rain has fallen.

The Commission publishes an annual booklet, "Kenya's Efforts to Conserve Soil Water and Forests" which is normally circulated to many government departments, to those organisation involved in conservation activities and to the public at large, as appropriate.

5. FUTURE PLANS

The Commission plans, among other activities, to undertake the following within the immediate future:-

1. To review and revise or modify, where necessary, the existing land use/soil conservation rules of the Agriculture Act, Water Act and Forestry Acts in the light of the extensive ongoing National Soil and Water Conservation and afforestation programmes.
2. To institute closer and stricter supervision of all the government and donor aided projects in conservation areas of soil, water and reafforestation, achievements on the ground and avoid constraints between the area based projects.
3. To see to the immediate establishment of soil and water conservation and afforestation committees in all the administrative units, and to speed up the implementation of a National Soil and Water Conservation and Afforestation competition programme which has already been finalised and distributed to the field officers to enable them initiate grassroot competitions.
4. To establish and strengthen a National Soil and Water Conservation and Afforestation data base; and streamline data collection and reporting procedures from the field. The Commission intends to assess the afforestation success through the use of environmental conservation guides.

(vii)

5. To see to a greater participation of all schools, co-operative societies and other private and public institutions in soil and water conservation and afforestation activities and competitions.
6. To see that all soil conservation service nurseries engage in intensive production of various fruit tree seedlings; and bulking of soil conservation vegetative materials.
7. To identify fast eroding gullies which might be a danger to the ecosystems requiring urgent steps to stop further advancement, and to rehabilitate them by soil conservation measures like building gabion check-dams across such gullies, and by providing cut-off drains and afforestation in the upstream areas of such gully-formations.
8. To improvise soil conservation measures in the main catchments and sub-catchments of large earth dams which are designed for multi-purpose uses, so as to protect the dam-reservoirs from getting silted up by the silt-soil loads that would be carried with the run-off from the barren, de-forested catchments, if such measures were not implemented.
9. To co-ordinate conservation measures to stop soil erosion problems caused by run-off from the national roads, and to ensure such measures are implemented to lead the road run-off to natural water-ways as against leaving the run-off to flow into farm lands from road drains and culvert.
10. To identify vital water catchment areas for preservation of water resources that are being endangered by overgrazing, by charcoal burners and destruction by forest squatters, and to initiate measures to protect such catchment areas by gazetting them as

protected areas and later afforesting them to ensure permanent water resources vital for human beings and the fauna and flora.

11. The Commission intends to comprehensively review all applied and fundamental policy oriented research, with a view to identifying gaps in the existing research and thereby establish priorities for a national afforestation, soil and water conservation research programme.
12. To continue intensifying the campaign of conservation activities with a view to ensuring that everybody is aware of the problem and how to play one's part in the whole national exercise. This will be done through all methods of communication including mass media.

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CHIEF EXECUTIVE

COMMUNITY FORESTRY ACTIVITIES IN KENYA

By H. Matiru

1. INTRODUCTION: Tree planting has been practised by many people in most parts of the country for a long time. This is proved by the present tree cover one sees around the countryside particularly in the high potential Districts.

The main tree species planted have been eucalypts for provision of fuelwood and building poles. More recently, other species of indigenous and exotic tree species have been planted for a variety of purposes.

2. THE ADVENT OF RURAL AFFORESTATION EXTENSION SCHEME (R.A.E.S.) IN KENYA

The practice of community forestry referred to above was the result of the people themselves responding to the need to grow their own wood for domestic requirements as well as for sale.

Community Forestry took a new turn in 1971 when the Kenya Government established Rural Afforestation Extension Scheme (RAES) as a new entity to run alongside the Industrial Plantations Programme. The objectives of establishing RAES were as follows:

- (i) To make more rural populations aware of the values of trees and the need to plant them to provide fuelwood and building poles as well as for soil and water conservation purposes.
- (ii) To establish RAES nurseries to raise seedlings for rural afforestation purposes.
- (iii) The target was to open one RAES office in every district to co-ordinate rural afforestation activities in the district. Coupled to this was the establishment of one tree nursery in every administrative division.

3. THE ACTIVITIES OF RURAL AFFORESTATION AND THE ACHIEVEMENTS

3.1 Opening of R.A.E.S. offices

Since the inception of RAES in 1971, 39 offices have been opened. Only two districts have no offices and these are Nairobi and Mombasa. Further details are given in the table below:

Table 1: TABLE SHOWING OPENING OF RAES OFFICES IN THE DISTRICTS

| YEAR | NO. OF DISTRICTS | NAMES OF DISTRICTS |
|------|------------------|--|
| 1971 | 4 | Meru, Narok, South Nyanza, Bungoma. |
| 1972 | 1 | Isiolo |
| 1973 | 10 | Kericho, Machakos, Samburu, Wajir, Baringo, Kajiado, Busia, Laikipia, Garissa. |
| 1974 | 7 | Murang'a, Turkana, West Pokot, Nyeri, Kitui, Siaya, Nakuru. |
| 1975 | 2 | Marsabit, Kiambu |
| 1976 | 2 | Kisumu, Tran Nzoia |
| 1977 | 1 | Lamu |
| YEAR | NO. OF DISTRICTS | NAMES OF DISTRICTS |
| 1978 | 7 | Tana River, Nandi, Embu, Kakamega, Kilifi, Kwale, Mandera. |
| 1979 | 3 | Kisii, Kirinyaga, Elgeyo Marakwet |
| 1980 | 1 | Uasin Gishu |
| 1981 | 1 | Taita Taveta |

One of the objectives of starting RAES was to open nurseries to raise seedlings for rural afforestation purposes. The target was to open 180 nurseries and to date, 145 such nurseries have been established.

The table below shows the number of nurseries per province.

Table 2 : TABLE SHOWING NUMBER OF NURSERIES IN EVERY PROVINCE

| PROVINCE | NO. OF NURSERIES |
|------------------------|------------------|
| Central Province | 20 |
| Eastern Province | 27 |
| Rift Valley Province | 47 |
| Western Province | 14 |
| Nyanza Province | 19 |
| Coast Province | 12 |
| North Eastern Province | 6 |

4. SEEDLING PRODUCTION

Since inception of RAES in the country, demand for tree seedlings for rural afforestation has been growing steadily. There has been a corresponding increase in seedling production through opening of new nurseries and expansion of existing nurseries.

The total number of seedlings raised in RAES nurseries between 1971 and 1982 is about 120 million. Further details are given in the table below:

Table 3: TABLE SHOWING NUMBER OF SEEDLINGS PRODUCED IN RAES NURSERIES BY YEAR

| YEAR | NO. OF SEEDLINGS ('000) |
|-------|-------------------------|
| 1971 | 78 |
| 1972 | 323 |
| 1973 | 672 |
| 1974 | 1,914 |
| 1975 | 2,922 |
| 1976 | 4,190 |
| 1977 | 5,064 |
| 1978 | 7,954 |
| 1979 | 7,821 |
| 1980 | 12,935 |
| 1981 | 16,149 |
| 1982 | 60,022 |
| Total | 120,045 |

Seedlings raised for rural afforestation purposes are disposed of through selling and free issue. Sale of seedlings goes on all through the year although the climax is during the long rains season. Seedlings are sold at greatly subsidized prices of 25 cts. per seedling or Kshs.7/50 per 100 when bought in bulk. Tree planting outside gazetted forest areas has assumed very great importance and every year, the President has launched this important event by planting a commemorative tree on the National Tree Planting Day.

On the occasion of the National Tree Planting Day, seedlings are issued free to individuals, groups and institutions to plant. Rural communities which are mainly poor peasants depend largely on free issue of seedlings for their planting. Because of the awareness which has been created in people on the need to plant trees, the demand for seedlings has outstripped supply. There is therefore urgent need to take measures to increase seedling production to meet the rising demand.

In 1982 and for the first time, the National Tree Planting period was extended to one week. As in the past, tree seedlings were issued free to individuals, groups and institutions. In addition, there was organized communal planting of trees on hills, along roads and in market places. Although the official period for free issue of seedlings was one week, free issuing continued after the period as long as there seedlings in the nurseries.

5. ESTABLISHMENT OF WOODLOTS

Tree seedlings bought or acquired free by individuals are planted on individual plots. This is due to the fact that in most districts, land has been surveyed, registered and that individual have title deeds for their plots. It is observed that woodlots established by individuals have better success due to the commitment the individuals have and the care extended to the woodlots.

In districts where land is still owned communally, establishment of communal forests is encouraged. This is however a new practice in Kenya. In addition groups particularly Women groups are encouraged to use available means to acquire some of the public lands with a view to establishing communal forests on such lands.

6. ESTABLISHMENT OF COMMUNITY NURSERIES

6.1 Locational (Chief's) Nurseries

A new feature in the rural afforestation programme in Kenya is the establishment of locational or chiefs' nurseries as they are commonly referred to.

Due to the fact that the demand for tree seedlings is far greater than supply and due to the inability of government nurseries to produce enough seedlings to meet the demand, in 1980, the President of the Republic of Kenya directed all the chiefs to establish locational nurseries on self-help basis with technical assistance from Forest Department staff.

As there are about 850 locations in the country, the target is therefore to establish 850 nurseries. The objectives of establishing these nurseries are:

- (i) To increase tree seedling production for rural afforestation.
- (ii) To bring tree seedlings nearer to the people which in itself would serve as an encouragement for more people to plant trees.
- (iii) To involve local people in the raising of tree seedlings thus removing part of the financial burden from the Government.

The response by local people towards the call on the establishment of community nurseries has been very promising. As these nurseries are run by the local people purely on self-help basis, the success achieved in every district has depended on the following factors:

- (i) The degree of awareness on the need to plant trees.
- (ii) The spirit of self-help in the locality.

The self-help, a total of 368 community nurseries have been established. Further details are given in the table below:

Table 4: TABLE SHOWING NUMBER OF LOCATIONAL NURSERIES ESTABLISHED PER PROVINCE AS AT APRIL 1983

| PROVINCE | NO. OF NURSERIES |
|------------------------|------------------|
| Central Province | 75 |
| Eastern Province | 59 |
| Rift Valley Province | 89 |
| Western Province | 38 |
| Nyanza Province | 56 |
| Coast Province | 44 |
| North-Eastern Province | 18 |
| | 368 |

During the 1982 planting season, locational nurseries which were operational raised over 2 million seedlings for planting. Most of these seedlings were distributed free to the local people. A smaller proportion of the seedlings was issued to institutions whereas others were planted along road sides and other public lands. As more new nurseries are being opened and old ones expanded, it is anticipated that many more seedlings will be raised for 1983 planting.

6.2 Other Nurseries

In a move to increase seedling production, establishment of private nurseries by individuals, institutions and groups is very much encouraged by the Forest Department. Forest Extension staff provide the necessary technical assistance.

The response in this campaign is very promising. Nurseries have been started in schools in cooperation with teachers. Individuals and groups like cooperative societies and women groups have also responded by starting their own nurseries. By the end of April 1983, the following number of nurseries had been established:

200 in primary and secondary schools

189 by individuals and groups.

(vii)

Accurate information on number of nurseries established in schools and by individuals and groups is not yet all available. Assembly of the information is therefore still going on.

7. THE ROLE OF NON-GOVERNMENTAL ORGANIZATIONS IN COMMUNITY FORESTRY

Raising of tree seedlings in government and community nurseries to meet the current demand and the promotion of rural afforestation are two tasks which the government cannot accomplish alone due to financial constraints. Several organizations have therefore come forward to assist in this very important task. There are many non-governmental organizations in the country which have made tree planting as one of their activities and are at the moment actively involved in the promotion of rural afforestation. The promotion is in the following form:

- (i) Development of nurseries and raising of tree seedlings for tree distribution to the local people.
- (ii) Acquisition of tree seedlings through buying and later distribution to people.
- (iii) Organization of tree planting campaigns to create more awareness in people on the need to plant trees.

Some of the non-governmental organizations in Kenya which have distinguished themselves in the promotion of community forestry are listed below:

- (i) National Council of Women of Kenya
- (ii) Maendeleo ya Wanawake Organization
- (iii) National Christian Council of Kenya.

8. CONSTRAINTS IN THE DEVELOPMENT OF COMMUNITY FORESTRY IN KENYA

Although there has been remarkable development in the promotion of community forestry in Kenya, faster development has been hampered by the

following constraints:

8.1 Manpower Shortage

Since its inception, the Forest Extension Service has suffered from lack of adequate staff in the field. This has resulted in the service not being as effective as it should have been. The result is that some people who need the extension services very much have missed it.

8.2 Inadequate financial resources

This is perhaps the most important constraint which at the moment hampers faster development of community forestry in the country. The direct results of inadequate financial resources are:

- (i) Inability to open more new nurseries and expand old ones to raise more tree seedlings to meet the ever rising demand.
- (ii) Inability to buy adequate working tools and other nursery materials like polythene tubes.
- (iii) Lack of adequate transport and funds to run the available transport.

8.3 Inappropriately designed training curricula

As community forestry deals essentially with people, there is a need for extension staff to receive training in communication methods. This type of training is lacking and it constitutes a serious constraint in the development of community forestry in the country.

9. FUTURE STRATEGY AND PROGRAMMES

The Kenya Government is in the process of preparing the next 5-year Development Plan (1983-1988) and the following community forestry programmes will feature prominently in the plan.

9.1 Bias on arid and semi-arid lands

The success in the creation of awareness on the values of tree and the need to plant more has not been realised in all areas of the country

As mentioned earlier on, success has been recorded only in the high potential districts which constitute only 25% of the total area of the country. The rest of the area constitutes arid and semi-arid lands. During the next 5 years, more attention will be turned to these lands where the need to plant trees is most urgent.

A great deal of work has already been done in the arid and semi-arid lands in the development of nurseries and species trials followed with large scale field planting where suitable tree species have been identified. A great deal of attention will be paid to local species in this exercise.

9.2 Increase in seedling production

It has already been stated that demand for tree seedlings for rural afforestation exceeds supply. The following programmes are therefore aimed at increasing seedling production.

- (i) Development of New RAES Nurseries - The number of new RAES nurseries to be established during the next five years is 35 to bring the total to 180. These are nurseries to be financed fully by Government.
- (ii) Development of more community nurseries - The target for community nurseries is to have at least one nursery in every location. During the next five years, 358 new nurseries will be established on self-help basis. It is hoped that Government will be able to contribute a few inputs in the form of working tools and nursery materials.
- (iii) Expansion of existing nurseries - The existing nurseries vary in seedling capacities. There is room for expansion of most of these nurseries to produce more seedlings. Expansion programmes for most of the nurseries have already been drawn up for implementation starting in 1982.

- (iv) Development of more private nurseries - From the response which has been realised, it shows that there is great potential in the development of more private nurseries in schools, colleges, by individuals and organised groups. More effort will therefore be made in this direction by the forest extension staff to encourage opening of more nurseries by these groups.

9.3 Training and re-training

For community forestry to be developed effectively and faster than is the case today, there is a need to have more staff to implement forest extension programmes. Training programmes aimed at producing more foresters and forest assistants have already been drawn up and implementation started in 1982. Equally important is the re-training of the serving extension staff. All these staff have been trained in classical forestry. There is therefore a need to re-train them in extension forestry. It is anticipated that re-training will commence in 1983.

9.4 Increased participation of local people

Raising of seedlings by the Government is a very expensive undertaking. In future, this responsibility will gradually be shifted from the government to the local people with the Government playing only the advisory role.