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PROCEEDINGS OF
THE PROGRAM PLANNING WORKSHOP
ON
CASSAVA DEPENDENT FOOD SYSTEMS
IN NIGERIA

Held at IITA Ibadan
June 16–18, 1975

Sponsored by the
United States Agency
for International Development
and
Conducted by the
Taximetric Laboratory,
University of Colorado
January, 1976

Foreword

During 1973 and 1974, a research group from the Taximetrics Laboratory, University of Colorado, undertook a pilot study of the cassava dependent food system of Southern Nigeria. Using a systems approach, the group attempted to obtain an overview and describe the entire food system. They felt it inappropriate to generate detailed statistics about system components until a broad mapping of the entire system had been carried out. Therefore, quantitative in-depth information about sub-elements were not included, and efforts were limited to a qualitative appraisal of the cassava dependent food system of the country.

The report of the investigation was made available to Nigerian officials, scientists and USAID Mission in Nigeria in September, 1974. A workshop, attended by representatives of relevant research institutions and other organisations, was then held at Ibadan, Nigeria, to evaluate the study and to consider the proposals as a basis for the implementation and coordination of specific recommendations and action programs arising therefrom.

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INTRODUCTION

The nutritional goals of developing nations are moving to the forefront of their national policy objectives. Nutritional programs, in addition to improving the quality of life, can indeed contribute to economic development and national advancement. While nutritional policy decisions can easily be stated, achieving the stated goals is often difficult because food and nutrition systems are complex. Recently, a Cassava Program Planning Workshop concerned with nutritional policy was held in Ibadan, Nigeria. It focused on the total food system of the cassava dependent people of Southern Nigeria.

This workshop brought together many of those concerned with cassava and its role in the food system of Nigeria. A systems perspective was used to view the problem broadly. Information from persons in various specialities is essential to understand and intervene in the entire food nutrition systems. Thus, persons involved in all aspects of cassava and related food sources were invited to the workshop to discuss production, distribution and consumption within the food nutrition system.

Dr. B.N.Okigbo, Chairman of the Agricultural Research Council of Nigeria, presented the keynote address, urging the participants to direct their efforts to critical policy issues and the necessary actions relevant to the cassava food system. Emphasizing the importance of the systems approach in solving the interdisciplinary problems of the food situation, Dr. Okigbo expressed his desire that .....

> "This workshop will not end with another report to be filed away, but with recommendations on how cooperatively future work should be planned, and executed on problems we identify as requiring priority in cassava production, harvesting, processing, marketing, and storage as a basis for future action, advice and development of policy on nutrition."

The plan for the workshop was based on an earlier project conducted by the University of Colorado Taximetrics Laboratory team and sponsored by the United States Agency for International Development and the Government of Nigeria, with participation by the International Institute of Tropical Agriculture (IITA).

The original project was initiated to develop systems, analytical methods and intervention planning, and to examine food nutrition systems, including the policy, research, and implementation aspects for a given area. Cassava was chosen as the first nutritional dependent crop to be examined. The workshop drew upon certain aspects of that study.

The workshop focused on the formulation of programs to assure the nutritional well-being of cassava dependent people. It was designed for close participant interaction so that the varied experiences and expertise of the participants could be used in studying the total cassava food systems problem.

Following discussions on cassava dependent food systems problems, the workshop divided into task groups to develop a set of proposals outlining research and pilot project schemes for future programs. The aim was to develop a set of recommendations aimed at specific organizational changes, investment/development projects, research programs designed to solve specific critical problems within the cassava food system, and a program for monitoring future cassava program developments.

While the workshop dealt with Nigerian problems, it could serve as a model for many countries dependent on cassava, or any other staple food crop.

FINDINGS AND RECOMMENDATIONS OF THE WORKSHOP

The workshop, held at IITA, Ibadan, Nigeria, provided the participants unusual opportunities to learn first-hand of important technical developments that affect cassava dependent peoples' nutrition. The group toured the facilities at IITA and discussed the cassava, yam, and farming systems work important to cassava farmers.

Cassava breeding work aimed at disease resistance was observed in the field and discussed. The new disease resistant varieties appear to offer production gains of several fold over varieties now used by farmers. The possibilities for immediate utilization of new varieties to significantly increase output in the areas of the country subject to bacterial blight by their effective wide distribution to farmers while work is continuing on improvements in disease resistance and other desirable characteristics was recognized.

Yam is also an important starch source in cassava growing areas. The new seed-grown yams were also observed. These improved varieties through cross breeding promise to significantly increase yield potential over the present clones. Also, seed-grown yams can increase the genetic diversity. The resultant diversity will facilitate selection for high yields, disease resistance and other characteristics.

Mixed cropping technology using machines and techniques suitable for small farms was also observed. These developments promise significant improvements in total yields of mixed crops on small farms.

Following a keynote address by Dr. Okigbo, the University of Colorado study was summarized in a slide presentation. In the discussion after the presentation, the following list of critical observations was developed:

Critical Observations from the University of Colorado Study

1. Although there is much variability in existing local cassava cultivars in West Africa, it would appear that very few of them are resistant to Cassava Mosaic and, more recently, Cassava Bacterial Blight (CBB).

2. Diseases are now limiting output.

3. As a vegetatively propagated material with low multiplication rates (1 to 15 in twelve months), expansion of production of new varieties of cultivars is exceedingly limited.

4. Inter-cropping cassava with other crops is widespread in West Africa.

5. Cassava, a crop that does not readily deteriorate in the field, is more evenly available all year around, unlike other starchy staples.

6. Price and supply fluctuations in cassava appear to be less than for other staples

7. Cassava is among the most economic of medium and high-rainfall tropical food crops that can be grown on relatively poor soils. It requires little attention during the growing period.

8. Cassava processing is highly labor intensive in almost all processed forms, however the opportunity costs for workers is quite low.

9. There is little evidence to suggest that larger-scale processing and marketing can be cheaper than present small-scale systems, as the opportunity costs of large-scale inputs would likely be higher.

10. Small-scale processing is very fuel intensive. Consequently, changes in availability and prices of fuel will affect the economics of cassava processing.

11. In most areas the accepted processing systems effectively reduce cyanide toxicity. For those areas, breeding to reduce HCN should not be given high priority.

12. Cassava, in various forms, is commonly eaten by people in all income classes in Southern Nigeria.

13. Complementary foods supplying proteins, vitamins, and minerals, are eaten with cassava at most meals.

14. Complementary foods are more income responsive than cassava.

15. Many complementary foods that provide low income people with essential proteins, vitamins and minerals have not received adequate attention with respect to production, processing and marketing.

Problems Faced in Improving Diets of Cassava Dependent People

Until recently, understanding cassava's role has had a low priority in food development programs in many national and international agricultural research centers. In the past, and even recently, suggestions have been made to eliminate cassava as a diet staple. However, as Dr. Albrecht stated in his welcoming remarks,.....

> "Instead of phasing out cassava as a principal staple, it is now recognized that it must be given increasing attention to assure improved diet quality where cassava is important."

Efforts to minimize the role of cassava continue in part because the diet of cassava dependent people is not well understood. Diets of most cassava dependent people contain

complementary foods eaten at most meals in soups and stews along with cassava, but with cassava as the main energy source. This is particularly true in rural areas. In urban areas, the increasing reliance on cassava products, with relatively decreasing quantities of complementary foods in soups, may result in a reduction in the availability and utilization of protein, vitamin and mineral enriched foods in the diet.

A further problem in the efforts to improve the food nutrition system of cassava dependent people has been the development of large-scale cassava processing facilities without considering the supply problems for effective performance. Large-scale plants have been built for starch processing, while evaluation of the necessary supply materials has been inadequate. Large-scale gari (cassava meal) processing factories have been developed without enough concern for the source of supply of cassava tubers, or for the distribution of the final product. These errors in design and planning appear to occur because of inadequate system information and because of inadequate considerations for the complex interdependencies of a traditional food system such as cassava.

Unsatisfactory approaches have been made because the role of cassava in various food nutrition systems is not well understood. This results in setting faulty research priorities. A systems approach to the development of research priorities must be part of determining overall policies on food nutrition goals – thus, the purpose of this workshop.

Many knowledgeable people are conducting extremely useful planning and research work in connection with cassava, but their efforts are not effectively coordinated. Improved varieties of disease resistant plant material have been developed, but have not been disseminated to producers. The ground work for multiplication facilities exists and extension service skills are available; they need to be expanded to equip farmers with improved capacities. Well trained nutritionists are working on elements of the problem, but they lack the financial and technical support to generate necessary information about the consumption system. Organizational constraints prevent adequate information feed-back which would improve the technical work of interested participants in the cassava food system. Statistical information is both difficult to collect and of uncertain quality. Thus, misleading information tends to confuse or limit decision makers in their efforts to promote change in the food system.

Proposals for Actions

The workshop formed into two task groups, with each assigned a set of topics for consideration as outlined below. Each group developed recommendations which were presented to the plenary session for review and adoption. The resulting recommendations are presented on the following pages as proposals for action programs to be undertaken by appropriate Nigerian Government and other agencies:

Topics for Task Group I	Topics for Task Group II
Cassava Genetic Resources Collection	Consumer Expenditures and Food Intake Study
Plant Material Multiplication, Dissemination, and Adoption	Urban and Rural by Income Class
Impact Analysis of New High-yielding Cassava Material for Farmers, Processors, Distributors and Consumers	General Population and Targets
	Measuring Preference Differences
Quantification and Product Processing Channels for Each Type Cassava Food	Nutrition Differences by Sub-group
	Quantified Market Channel Maps for Cassava and Complementary Foods
Cassava Complementary Foods Production and Marketing Programs (Egusi, Fish, Beans, etc.)	Impact Analysis of Increased Cassava Supply
	Programs for Nutrition Improvement for Target Groups by Fortification, Consumer Education, or Differentiated Foods
	Fortification vs. Complementary Food Development

Four major proposals for action programs emerged from the discussions. The first proposal deals with the problem of cassava genetic materials collection considered by Task Group I. Proposal 2 deals with problems of plant material multiplication, dessimination and adoption, also discussed in Task Group I. Proposal 3 relating to the impact of new high-yielding, high-quality cassava and Proposal 4, relating to distribution, consumption and nutrition, integrated the recommendations of the two task groups on these topics.

Proposal 1 Cassava Genetic Resources Collection

(a) *Problem:* For a continuing program of cassava improvement, it has been recognized that the existing genetic base is too narrow. In particular, new germplasm is required for:

Higher yield

Disease and pest resistance, e.g. to Cassava Bacteria Blight and Mosaic

Improved quality of product

Extending the ecological adaptation, e.g. for low rainfall areas and drought tolerant varieties

Suitability for different farming systems, e.g. modified plant growth habits for mechanization and improved shade tolerance for mixed cropping.

(b) *Background:* Germplasm should be increased by collecting cultivars of the edible cassava (*Manihot esculenta*) and wild species of *Manihot*. There are listed about 130 *Manihot* species which occur in a much wider ecological zone than cultivated cassava and can be readily hybridized with cassava for solving the problems listed above *

These sources of useful genetic variations have not been explored or utilized. Most of the species are to be found in Central and South America and have not been collected.

It is estimated that between 150 and 300 million people throughout the world rely heavily upon cassava for their energy source. In terms of expenditures, at an average minimum of $10 per capita per year market value for cassava, the world gross product value ranges from 1.5 to 3 billion dollars. The cost to develop and maintain cassava genetic resources cannot be estimated at this time, but it would appear to have a very high benefit to cost ratio.

These resources may be lost if not collected and thus the problem is a matter of urgency. Five tasks arise:

(1)	Collection:	A systematic and comprehensive collection of all known cultivars and wild species should be made.
(2)	Maintenance:	These collections must be maintained indefinitely and studies are required on the most appropriate methods.
(3)	Study and Evaluation:	There is a need to evaluate new characteristics discovered in these new germplasm sources.
(4)	Documentation:	Results of the evaluation should be carefully documented and made available to interested research workers.

* Rogers, David J. and S. G. Appan, *Manihot manihotoides*, (Euphorbiaceae) Monograph No. 13, Organization for Flora Neotropica (New York: Hafner Press, 1973).

(5) Experimental Studies: Biosystematic analysis of the genus *Manihot* through extensive hybridization between species with a view to introduce useful traits in cassava.

(6) Distribution: Methods of distribution must be evolved to satisfy plant quarantine regulations.

(c) *Approach:* The listed problems pose extremely complex questions which should be quickly studied by an international team of experts. This will involve maximum cooperation between research workers at IITA, CIAT, National Organizations for Cassava Improvement, as well as the International Board for Plant Genetic Resources (IBPGR) Rome, and their contracted systems center at the University of Colorado. We therefore recommend that a conference be held by the above group as a matter of urgency and that from this a program be undertaken to facilitate the establishment of the resource collection.

Proposal 2. *Plant Material Multiplication, Dissemination and Adoption*

Problem. If farmers are to receive and utilize planting materials of new varieties with a higher yield potential certain problems in multiplication, dissemination and adoption must be overcome. Currently there is a scanty extension network to deal with numerous widely scattered illiterate small-scale farmers. Further, there is an inadequate supply of necessary planting materials and the distribution organization is poor. The problems in each of the above areas are specified as follows:

(1) Multiplication: The bulky planting material in cassava reqrires at least nine months time to produce even very few mature cuttings. Presently, there is a short supply of the basic breeders' stock. This problem is compounded by the many cuttings required to produce enough plants for even a small acreage.

(2) Dissemination: There are transportation and storage problems associated with the distribution of the cuttings. The cuttings are bulky and somewhat perishable, needing to be planted within a few weeks of harvest. Further, cuttings must be distributed to widely scattered small holders, mostly over non-motorable roads.

(3) Adoption: Cassava is a lower priority crop and production is often restricted to poorer soils. Since it is widely used in traditional cropping systems, improved technology is not commonly adopted.

(b) *Background.* Conditions indicate the importance of a program for planting material multiplication, dissemination and adoption.Cassava is a widely popular major staple. There is a demand for a greater supply of improved material and for a major intervention by the government and other relevant agencies (e.g. the National Accelerated Food Production Project, NAFPP). More breeding stock is becoming available for research and rapid multiplication technology is now shortening the time lag required between development of an improved variety and utilization by farmers. Further, there is evidence that many farmers are receptive to new workable and remunerative technologies, such as decentralized multiplication which is practical in farmers' plots and government centers. Since cassava

is not a seasonal crop, it can be planted almost all the year around. Also, there are established channels in rural areas for reaching groups of farmers.

(c) *Approach.* Three phases to the approach have been identified: research, pilot projects and action programs should be established in rapid multiplication techniques and private industry participation. Government and farmer group cooperatives, as well as private commercial enterprises, should be supported by a strong research program and a certification system.

The research phase of dissemination should investigate packaging for better storage of cuttings. Pilot projects should include a feasibility study for private industry participation and experiments in improved processing and marketing procedures for planting materials. The action programs should establish decentralized multiplication plots for faster and more efficient dissemination.

An adoption research study should be initiated to map the suitability of soils for cassava planting. A pilot project should develop visual aids and other communication techniques to promote the early adoption of newly developed varieties. Finally, a set of action programs should be initiated for training extension workers and setting up an extension network to include:

1. Improvement of the "package" of technology for farmer-level fertilizer and variety trials.

2. Demonstrations to teach and arouse the interest of farmers.

3. Group action endeavors to speed adoption.

4. Adequate supplies of all necessary inputs.

Proposal 3 *Impact Analysis of New High Yielding, High Quality Cassava Material*

(a) *Problem.* This problem is stated in the form of the following questions: What will be the farm level ramifications as new high-yielding cassava varieties and improved production techniques are adopted by farmers? What will be the economic, geographical and nutritional impacts of this increase in production on the supply of cassava, its subsequent processing, distribution and consumption? The answers to such questions are the vital basis for agricultural planning and policy formation for cassava with the National Accelerated Food Production Project.

(b) *Background.* Cassava is a major starchy staple which affects the incomes, nutrition and social well being of the majority of rural people, particularly those people living in the forest and derived savannah zones of Nigeria and many urban dwellers.

The cassava dependent regions of Nigeria are estimated to have populations of 25 to 35 million in 1975. Population growth trends predict a population of 35 to 50 million by 1985. Thus, while there may be short-term dislocations, due to adoption of the high yielding varieties, population growth will make this technical advance welcome.

Several questions must be posed and answered, related to a more productive cassava technology. By way of example, if higher yielding varieties are developed and disseminated to farmers:

1. Will farmers reduce the areas of cassava they cultivate (and substitute other crops)?

2. Will they increase their marketed surplus of cassava?

3. What then will be the future cash resource base of cassava farms?

4. Will the existing processing capacity enable the increased supply of roots to be processed and into what forms? What will be the implied change in the processing industry?.

5. What alternative uses (both human and industrial) may be developed for cassava?

(c) *Approach.* To answer the above questions, information must be obtained from primary sources. Essentially, the process should be carried out in the following sequences:

1. Positive data collection phase.... what are the present characteristics of the system?

2. Analysis of the relationships of cassava production at the village to regional levels.

3. A normative policy phase in which operating rules for "the revised" cassava system are identified.

4. A testing, modification and shaping of these rules in a pilot phase.

5. Implementation of rules at regional and national levels.

Phase I. The data collection phase could be a continuation of the field studies being conducted by such institutions as government agencies, universities, Nigerian Institute for Social and Economic Research (NISER), and IITA. Limited surveys at a number of sites, stratified in (i) agroclimatic zones, (ii) relation to markets, and (iii) income classes, would generate information on the existing state of the industry and provide a benchmark from which to assess the impact of the program. The surveys would last twelve months.

Phase II. Finalizing the analysis of the surveys and defining the operating rules for the cassava production and processing industry would be completed in six months.

Phase III. Based on the findings of Phase I and Phase II, a number of pilot sites would be selected to test and modify the selected production, processing and marketing strategies for the high yielding cassava technology. The duration would be eighteen months.

Phase IV. Implementation of the tested cassava system on a regional to national basis, cost and duration to be estimated later.

Proposal 4 *Distribution, Consumption and Nutrition Proposals*

(a) *Problem.* The lack of an accurate description of the distribution, consumption and nutritional status of the diverse socio-economic groups in Nigeria results in an inadequate basis for agricultural and social policy. The problem is therefore to measure consumption, distribution of food, and nutritional status of a cross section of Nigerian society.

(b) *Background.* The information available is lacking in coverage and is variable in its quality, although much of the technical capability needed for collection of useful information is available. There is need for increased coordination and budgetary focus on the tasks of nutrition assessment. Some of the agencies capable of making significant contributions include:

(1) National Council of Science and Technology (NCST)

(2) Agricultural Research Council of Nigeria (ARCN)

(3) Federal Office of Statistics

(4) Ministries of Agriculture and Natural Resources (especially in relation to NAFPP), Health, Education and Economic Development and Reconstruction

(5) Universities, including University of Ibadan, University of Ife, Ahmadu Bello University and University of Nigeria, Nsukka. These are centers of technical skill in nutrition, economics, agriculture, rural sociology and other needed capabilities.

(6) Research Institutes, e.g. National Root Crops Research Institute (NRCRI), and the Federal Institute for Industrial Research (FIIR).

(7) Nigerian Institute of Social and Economic Research (NISER).

(8) International Institute of Tropical Agriculture (IITA).

(9) Institute of Child Health, Lagos

Even with this capability, the last large-scale study of nutrition occurred in 1965–67 during the ICNND survey. This benchmark study is now out of date. Further, the focus now needs to include distributive issues and to link with a production study as well as consumption information. Smaller-scale studies do not provide the basis for evaluating such development questions as:

(1) Is nutrition adequate?

(2) Should Nigeria undertake large-scale food fortification?

(3) Should Nigeria undertake school feeding along with the universal primary education scheme?

(4) Are baby foods adequate in supply, quality and acceptance?

(5) Can marketing channels, and regulations be improved by better knowledge of prices, costs and sources of product?

(6) Are staple dependent groups (i.e.,cassava or other foods staple groups) adequately nourished?

(7) Should large-scale food processing displace village processing?

Another set of related issues concerns the relationship of cassava production to substitute and complementary foods. There is a great need to collect accurate data on cassava production characteristics as related to other staple food crops such as yams, rice, and maize, and complementary foods such as beans, egusi, animal protein, etc. Attention should be paid to the

nutritional role of complementary foods at various levels of cassava dependency. There is also a need to compile information on cassava derived products such as gari, flour, etc. Their utilization pattern and nutritive values need to be known as a basis for guidance on (i) improvement programs, (ii) processing projects, and (iii) marketing development.

These and other issues confront public and private planners, but the needed data are either not available or lacking in dependability. Moreover, emergency conditions may demand quick, accurate and economical feeding of target groups. Therefore, a system is needed to establish periodic bench mark studies and to continually monitor performance of the food system.

(c) *Approach.* The information needed involves several survey programs. These surveys will require continuing refinement to lower the cost and to improve accuracy.

1. One such program would be a household survey program covering purchasing behavior, including the outlet, or farm source supply; prices paid; frequency of shopping or acquisition; as well as quantity by type and nutritional composition of foods. Income, by source, should be measured. Nutritional status, including anthropomorphic measures, should be determined. Sanitation facilities and practices and water sources should be surveyed. This survey program will require pilot steps to develop appropriate instruments, training, sampling and analytical procedures.

2. Food composition studies should be updated.

3. Food distribution channels should be mapped to ascertain quantities, prices, margins, sources and risks, as well as special marketing problems.

   This research should assist in improving technical assistance for private sector marketeers, regulations and price controls for administrators and services for consumers. The three results sought are:

   (i) To provide the information needed to assure lower prices to consumers.

   (ii) To assure producers of a more dependable outlet.

   (iii) To foster a more stable marketing system.

4. Improvement of child feeding programs. Pilot projects now exist for soya-enriched maize pap (soyogi). This work needs supplementary support to get answers to questions conceming supply of inputs, production methods and scale, distribution, and consumer education.

   In the first year only pilot surveys would be developed, thus, enumerators would be retained only for a part of the first year for training and orientation. The program should become a continuing effort. Periodic bench mark studies should be supplemented by continuous monitoring by sampling and special studies of problem areas.

   The development of a trained rural and urban enumerator force is a major infrastructural investment. The same field force could be used on other surveys of agriculture, housing and health, as well as serving as field supervisors for periodic regional or national census studies. In short, while the cost of a statistical field force can be justified by this program, the enumerators could assist in other work as well.

IMPLEMENTATION OF THE PROPOSALS

Successful implementation of the recommended program requires support of government policy makers and various research and production agencies. This report is being distributed widely to the various offices and agencies concerned with cassava production, processing and marketing. The workshop considered the merits of establishing a nutritional advisory board to coordinate the various aspects of the proposed program. While this may not be feasible at this time, it was agreed that the NAFPP, which has responsibility for coordinating activities for accelerating production of major food crops, including cassava, would be the appropriate program for introducing the coordinated systems approach. This report suggests specific activities which could be included in the NAFPP cassava program. This type of dynamic process of field study, workshop and action projects, could also serve as a useful model for other crops, and for other regions.

LIST OF PARTICIPANTS

The interests represented included: breeding, plant genetics, physiology, entomology, farming systems, agricultural economics, agricultural extension, nutrition, education, agricultural research policy and overall agricultural policy from both national and international perspectives.

Rapporteurs:

Dr. Jay E. April	University of Colorado, Taximetrics Laboratory
Dr. Charles C. Slater	University of Colorado, Taximetrics Laboratory

Key note Speaker:

Dr. B. N. Okigbo	Chairman, Agricultural Research Council of Nigeria

Delegates:

Dr. H. R. Albrecht	Director General, IITA
Mrs. I. O. Amenechi	Nutritionist, Federal Ministry of Health
Dr. C. C. Anojulu	Assistant Cassava Coordinator, NAFPP
Dr. S. O. Ene	Plant Breeder, Federal Agriculture Research and Training Station
Mr. W. N. O. Ezeilo	Cassava Coordinator, NAFPP
Dr. F. B. Fashakin	Professor of Food Technology, University of Ife.
Dr. J. Flinn	Agricultural Economist, IITA
Dr. S. K. Hahn	Assistant Director, Roots and Tubers Program, IITA
Dr. I. Hornstein	Deputy Director, Office of Nutrition, AID/W
Mr. E. O. Idusagie	Agricultural Research Council of Nigeria
Dr. D. L. Jennings	Plant Breeder, IITA
Dr. K. Leuschner	Entomologist, IITA
Dr. J. O. Ogunniyi	Agricultural Officer; Western State, Nigeria
Dr. R. O. Olson	Food and Agriculture Officer, USAID/Nigeria
Dr. A. O. Omololu	Director, Food Science and Applied Nutrition Unit, University of Ibadan
Mr. James Otieno	Planning Officer, Ministry of Finance and Planning, Kenya
Dr. K. Rawal	Botanist, IITA
Mr. Ugwu	Officer, Federal Institute of Industrial Research, Nigeria
Mrs. O. Wali	Education Officer, Ministry of Education