PD-ABJ-426
90437

REPUBLIC OF CAMEROON
MINISTRY OF HIGHER EDUCATION, COMPUTER SERVICES AND SCIENTIFIC RESEARCH
(MESIRES)
INSTITUTE OF AGRICULTURAL RESEARCH
(IRA)

# National Cereals Research and Extension Project (NCRE)

## Plan of work 1992

United States Agency for International Development
(USAID)
Insutute of Agricultural Research
(IRA)
International Institute of Tropical Agriculture
(IITA)

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## ACKNOWLEDGEMENTS

The success of the National Cereals Research and Extension (NCRE) Project can be attributed to the contributions of many persons and groups.

The IITA/NCRE technical assistance team is very grateful to the Government of the Republic of Cameroon for its total support of the project activities through its Ministry of Higher Education, Computer Services and Scientific Research (MESIRES) and the Institute of Agricultural Research (IRA).

The team is particularly indebted to the Director of IRA, Dr. Jacob Ayuk-Takem, for his valuable professional guidance, able leadership, constant understanding, patience and intellectual stimulation. His counsel and suggestions have been invaluable.

Equally important has been the support received from all IRA Chiefs of Centers, Stations and Substations and from the scientific administrative and support staff. In particular we would like to acknowledge the important contribution of the national counterparts and technicians who have provided invaluable advice to the technical assistants. Some of the national counterparts and technicians have already taken over the role of the technical assistants. We expect that all of them will carry on the work started by this project. Without their cooperation and receptiveness this project could not have been a success.

The collaborative effort of ICRISAT with regard to the project's sorghum unit is greatly appreciated. The assistance received from CIMMYT and IRRI is also greatly appreciated. We would also like to acknowledge SAFGRAD, MIDEVIV, MIDENO, SODECOTON, WARDA, SODERIM, UNVDA SEMRY and the staff of the Karewa Experimental Farm.

We are thankful to IITA for its administrative and technical support and for its encouragement.

We would also like to express our deepest gratitude to the Government of the United States of America through its Agency for International Development (USAID) whose financial assistance has made this project possible. We cannot talk about the NCRE project and USAID-Cameroon without mentioning the dedication and support of Mission Director Mr. Jay Johnson and his close collaborators. To these people and to the entire USAID-Cameroon Mission we are deeply indebted.

Perhaps the greatest contributions to the success of the NCRE Project have come from the farmers of Cameroon. Without their cooperation and receptiveness, this project could not have been successful. To them we say thank you.

## EXECUTIVE SUMMARY

This is the second Work Plan of NCRE contract III. Since this is the third and final phase of the project, most activities are oriented towards extension and adoption of developed technologies. In addition all programs are moving toward complete takeover by national counterparts.

Project administration has decentralized bookkeeping functions even more so that each researcher handles their program budget and expense reporting. This gives each researcher more control over their individual program expenditures. The established inventory system will be updated to reflect changes and receipt of new equipment and supplies. A backlog of many publications will be reformatted and published locally.

Maize breeding programs will continue at Bambui and Ngaoundere for highland maize and at Nkolbisson for lowland maize. Highland maize breeding will continue to focus on varietal source population improvement and development of inbreds for population improvement, synthetic varieties and hybrids.

The lowland maize breeding program will follow the same system of material advancement as in previous years. In contrast to previous years the program will give greater attention to population improvement and development of inbreds for population improvement, synthetic varieties and hybrids.

All responsibility for rice research has been transferred to the leader of the Rice Program in Garoua. Emphasis has been shifted from the program at Dschang to the station at Garoua. Limited work continues at Mbo and Ndop plains.

The cereals agronomy unit based at Garoua continues to devote its resources to maize with secondary emphasis on sorghum and millet. Research is conducted both on-station and on-farm. Current themes concern soil and water management, seed and soil treatments, modification of cereal systems of production and on-farm trials of new varieties.

The sorghum and millet breeding program continues under the direction of national counterparts. The breeding program gives primary emphasis to rainy season sorghum with less resources directed towards Muskwari sorghum. Control of Striga is a major concern.

The agroforestry program at Bambui continues to refine objectives and start trials. This is the first full year of work planned under the new agroforester.

The four TLUs will continue their primary activities which include farming systems diagnosis, on-farm testing and extension agent training. All TLUs will give greater emphasis on publication and dissemination of results.

The Bambui TLU will concentrate on three programs:

On-farm testing and assessment of new food crop technologies.

Surveys of farming systems and their socio-economic environment.

Research-extension liaison and pre-extension.

Activities include a survey of farmers maize stores, mid and high altitude maize variety trials, rice variety trials, maize-rice cropping systems trials and maize minikits.

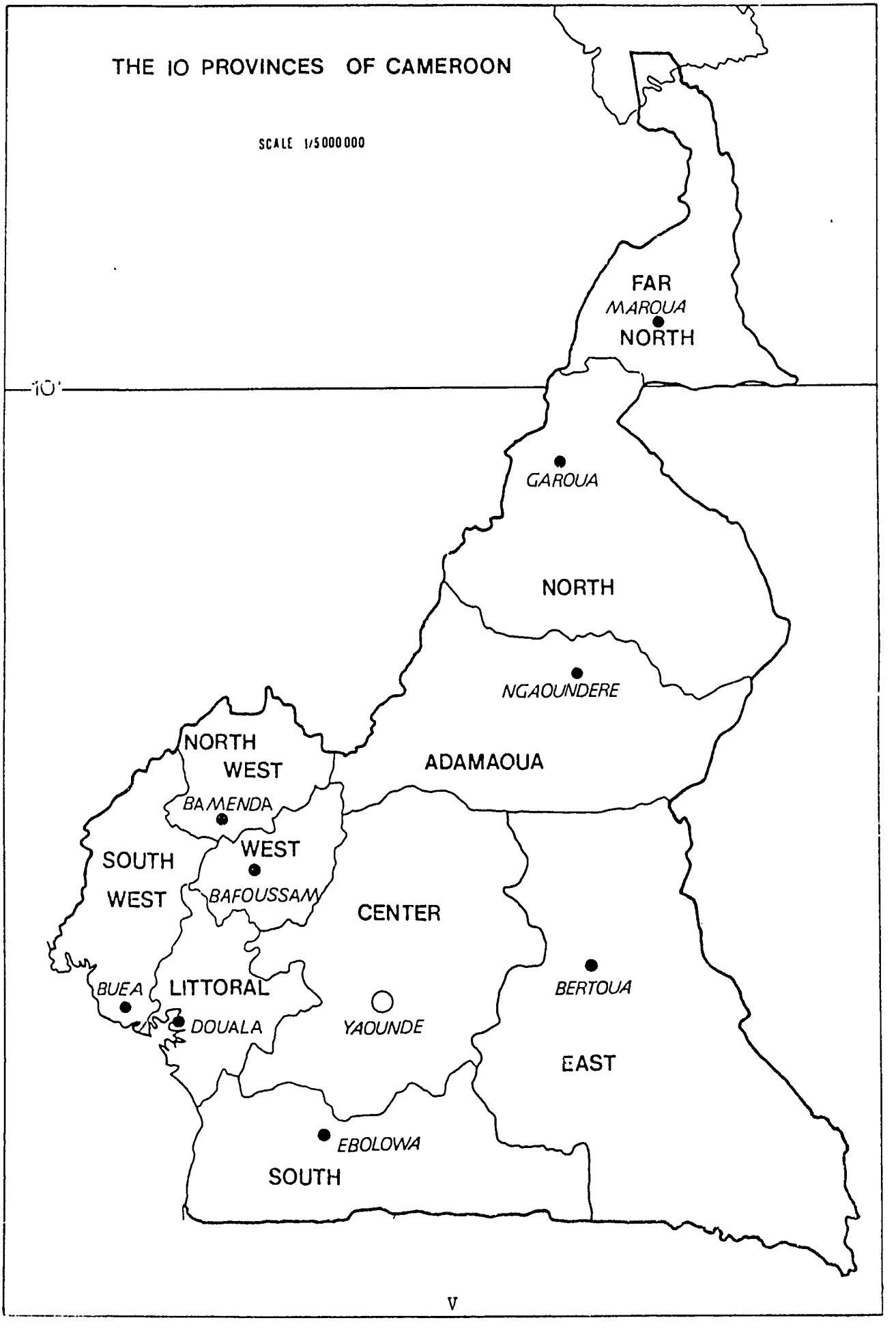
The Ekona TLU will continue to gather feedback information on farmers circumstances and practices, dissemination of IRA developed technology and in-house staff training.

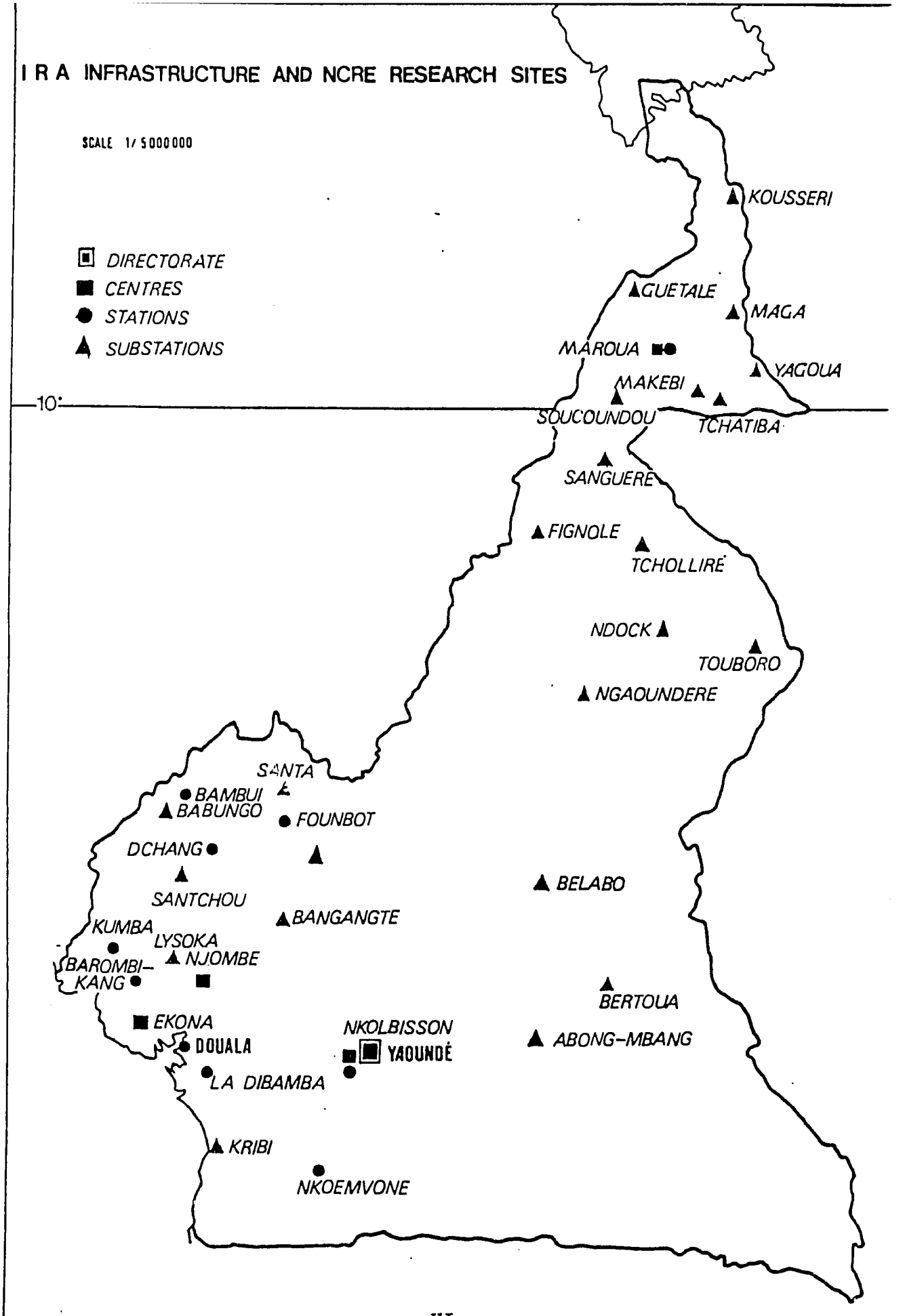
The Maroua TLU will continue to test improved technologies in 4 research villages. Regional tests with SODECOTON and PNVFA will focus on sorghum varieties and peanut varieties.

The Nkolbisson TLU will give primary emphasis to a) identifying appropriate practices for enhancing and sustaining soil fertility and b) increasing farmers' knowledge about IRA varieties and technologies. The TLU will also include on-station research activities for technology development.

The Cereals Entomology unit at Dschang will continue to work on ways to improve on-farm grain storage methods. The Lowland Cereals Entomology unit will continue with study of methods of control.

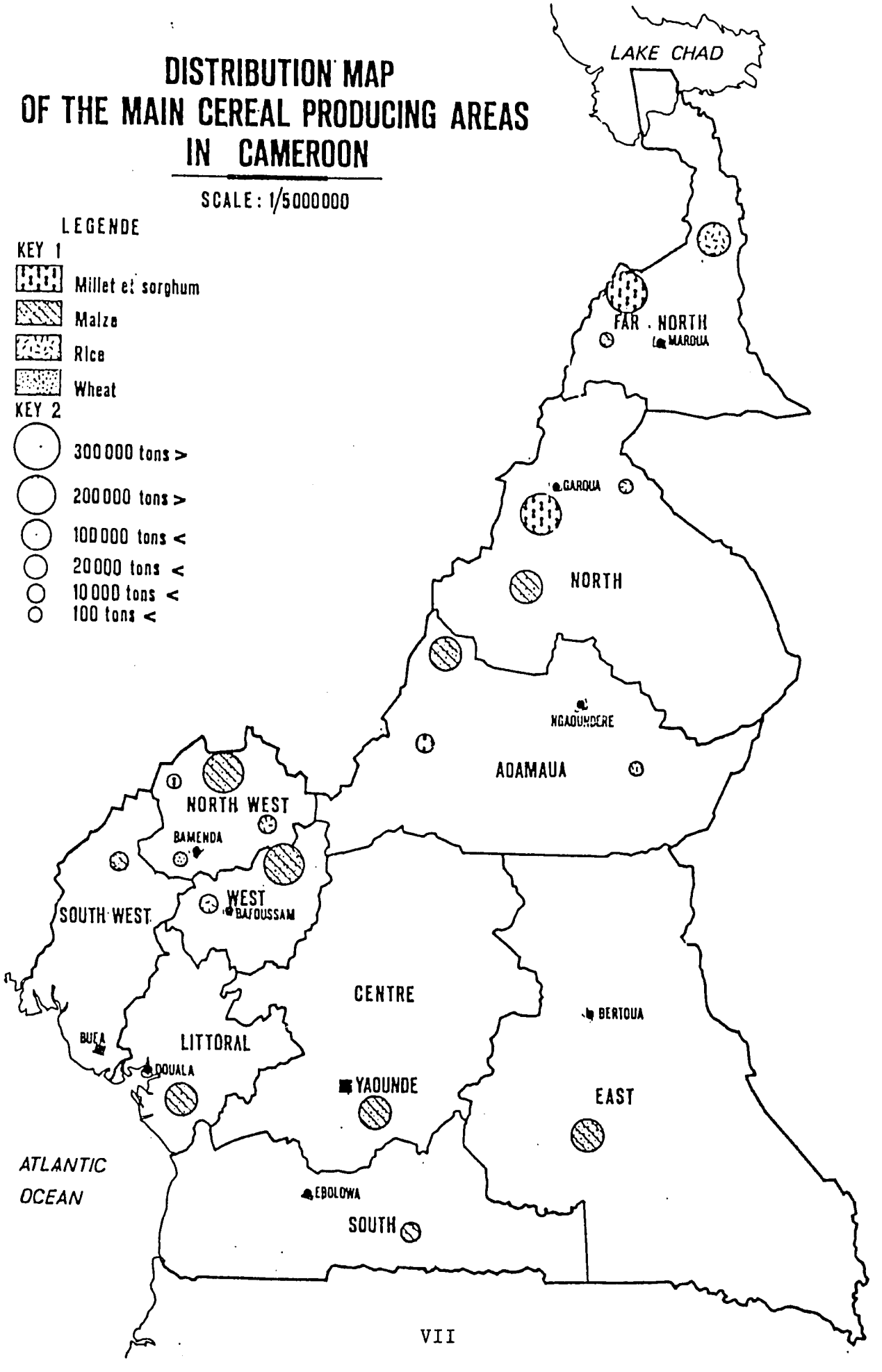
The economic analysis unit will start its first complete year this year. Its goals are to analyze interactions between agricultural research, agricultural policies and national development, to evaluate agricultural research policies and priorities; to monitor and evaluate technology adoption and research impact; and to enhance economic budgeting and analysis skills of IRA researchers.


THE 10 PROVINCES OF CAMEROON
SCALE 1/5000000
FAR
MAROUA
NORTH
10°
GAROUA
NORTH
NGAOUNDERE
ADAMAOUA
NORTH
WEST
BAMENDA
SOUTH
WEST
WEST
BAFOUSSAM
CENTER
BUEA
LITTORAL
DOUALA
YAOUNDE
BERTOUA
EAST
EBOLOWA
SOUTH


I R A INFRASTRUCTURE AND NCRE RESEARCH SITES
SCALE 1/5000000
DIRECTORATE
CENTRES
STATIONS
SUBSTATIONS
10°
KOUSSERI
GUETALE
MAGA
MAROUA
YAGOUA
MAKEBI
SOUCOUNDOU
TCHATIBA
SANGUERE
FIGNOLE
TCHOLLIRE
NDOCK
TOUBORO
NGAOUNDERE
SANTA
BAMBUI
BABUNGO
FOUNBOT
DCHANG
SANTCHOU
BELABO
BANGANGTE
KUMBA
LYSOKA
NJOMBE
BAROMBI-KANG
BERTOUA
EKONA
NKOLBISSON
DOUALA
YAOUNDÉ
ABONG-MBANG
LA DIBAMBA
KRIBI
NKOEMVONE

# DISTRIBUTION MAP OF THE MAIN CEREAL PRODUCING AREAS IN CAMEROON

SCALE: 1/5000000



# 1. ADMINISTRATION

## 1.1 INTRODUCTION

The overall goal of project administration is to assist researchers in their achievement of project goals and objectives. The administration also maintains liaison among the sponsoring organizations; IRA; IITA and USAID. Administration activities can be divided into eight main areas:

- Provide liaison between researchers and IITA, researchers and USAID, and USAID and IITA.
- Provide administrative support to researchers in terms of housing, travel arrangements and necessary formalities with the Government of Cameroon.
- Procure and expedite necessary material support (supplies and equipment for offices, research and vehicles).
- Assist national staff training.
- Hire support personnel and facilitate their integration into IRA.
- Management and disbursement of project funds.
- Ensure timely and proper preparation of project reporting documents.
- Review research work plans, methods and findings in order to ensure consistency with project objectives.

The project administration consists of the Chief of Party, Deputy Chief of Party and Administrative Officer.

## 1.2 CONSTRAINTS

One constraint that will continue to have an effect on project administration is the reduced budget of IRA. With the absence of supplemental funding from USAID, extremely efficient management of project funds will be necessary to ensure meeting project objectives.

## 1.3 WORKPLAN TABLE

| Objectives | Activities |
|---|---|
| **Operation 1: Provide Overall planning and supervision of technical performance of technical assistance team.** | |
| 1. Advice available to researchers. | 1.1 Organize meetings to prepare research work plans. |
| | 1.2 Visit research activities in the field. |
| | 1.3 Organize and participate in field tours. |
| | 1.4 Invite senior scientists from IAC's and universities for consultancies. |
| **Operation 2: Facilitate liaison between USAID, IITA, IRA and other organizations cooperating with the project.** | |
| 2.1 People aware of project activities and accomplishments. | 2.1 Disseminate project reports. |
| 2.2 Activities coordinated | 2.2 Organize and participate in meetings and social events. |
| Operation 3. Provide leadership to technical assistance team in applying research to local problems. | |
| 3.1 Rational Work Plans | 3.1.1 Organize and participate in meetings to discuss work plans. |
| | 3.1.2 Organize annual planning meeting with users of project research results. |
| **Operation 4. Guide and assist deputy chief and administrative officer in providing administrative and logistical support to staff.** | |
| 4.1 Staff able to accomplish research objectives. | 4.1.1 Set priorities for tasks. |
| | 4.1.2 Assist in execution of tasks when necessary. |

| Objectives | Activities |
|---|---|
| **Operation 3: Plan and Coordinate long and short-term training for national counterparts.** | |
| 3.1 Placement of candidates and trainees | 3.1.1 Consult appropriate persons for selection of candidates.<br>3.1.2 Help develop course programs.<br>3.1.3 Advise national counterparts.<br>3.1.4 Visit students and professors at their universities. |
| **Operation 4: Computerize accounting and financial reporting.** | |
| 4.1 Accurate and timely financial reports and analyses. | 4.1.1 Refine and debug accounting software.<br>4.1.2 Write manual for software.<br>4.1.3 Distribute programs and train personnel. |
| **Operation 5: Perform regular inventory and supplies checks.** | |
| 5.1 Accurate and up to date list of equipment and supplies. | 5.1 Annual inventory and supply checks. |
| Operation 6: Initiate project publication system. | |
| 6.1 Series of publications concerning project results. | 6.1.1 Establish formats.<br>6.1.2 Edit and produce final copy.<br>6.1.3 Print copies for distribution.<br>6.1.4 Distribute copies. |

## 1.4 OTHER ACTIVITIES

### Institutional Development

As requested by USAID, input will be provided during contracting and construction of offices, laboratories and housing at IRA/NCRE project locations. Assistance will be provided to the USAID Participant Training Office to follow up and complete the degree programs of national scientists currently in the USA. Close supervision and follow up of additional degree trainees will be initiated with Winrock International. Both technical and secretarial staff will receive further in-service training on use of personal computers.

### Consultancies

The number of paid consultants has been reduced during NCRE Contract III. In compensation the number of technical assistance visits by IITA/Ibadan staff has been increased.

### Conferences and Publications

Plans continue for initiation of a series of research reports and extension information publications. These publications are in addition to the required USAID contract reports. Equipment is now in place to print the required number of copies.

### Home Leave

The Chief of Party is planning to take home leave August 1st through the mid September. The Deputy Chief of Party will take home leave from mid-June through the month of July. The Administrative Officer will take home leave during the month of July.

# 2. MAIZE RESEARCH UNIT

## 2.1 HIGHLAND MAIZE RESEARCH BREEDING

### 2.1.1 INTRODUCTION

The Highland Maize Breeding Unit is responsible for the development of varieties adapted to improved current farming systems between 1000 and 2500 meters altitude. The target zones are found in the Northwest, West and Adamaoua Provinces and include a large range of soil types and farm sizes. The Western Highlands, comprising the North West and West Provinces, covers less than 10% of the land area in Cameroon, but contains 25% of the population, and produces over 60% of the national maize crop.

The goal of the unit is to further develop a comprehensive breeding program which will continuously provide seed of new varieties to the seed multiplication and distribution organizations. Past work by this unit has emphasized the development of a germplasm base, which has been improved to the point of producing open-pollinated, hybrid and synthetic varieties. After confirmation by TLU, the best of these varieties will be available for foundation seed production.

While the unit has, in recent years, put an emphasis on selecting inbred lines for hybrids, we will gradually return the emphasis to population improvement and selection of open-pollinated and synthetic varieties. The proposed installation of a maize streak virus screening facility means an emphasis will be placed on developing streak virus resistant germplasm.

The rapid spread of varieties in farmer fields depends,in large part, on the ability of the seed production system to provide sufficient quantities of good quality seed, and of the extension system to disseminate the seed and the appropriate information on its use. The success of hybrids in Cameroon is likely, in the next four years, to depend on the success of the private seed industry in the country. The success of the streak screening nursery will depend on the ability of national scientists to learn the necessary techniques and to manage the facilities. Guidance for this will be provided by the TA with technical backstopping provided by IITA.

### 2.1.2 CONSTRAINTS

The principal constraints for the highlands largely identified by the Bambui TLU and presented in previous work plans, are:

a) grain storability, requiring flintier grain texture;
b) varietal adaptation to altitudes above 1600m, requiring a new variety for those areas;
c) low yield under acid conditions, requiring improved varietal tolerance to acid soils;
d) leaf disease (blights, rusts and streak virus), requiring more resistance;
e) lack of hybrid varieties required for medium and large scale farming, where high yields, lodging resistance, and uniformity are critical.

## 2.1.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **1. Develop germplasm** | | | |
| 1.1 Introduce and screen early, mid-altitude germplasm. | 1.1 Germplasm sources identified and local germplasm collected. | 50% | 6,000,000 |
| 1.2 Covert open-pollinated and synthetic varieties to streak resistance and differentiate by grain color. | 1.2 Kasai, Coca, ATP, Synthetics 3 and 4 and Early White 5R versions recombined. Early White and synthetic 4 yellow and white lines selected. | | |
| 1.3 Improve acid tolerant, 32, 43 SR and early white source populations by recurrent selection. | 1.3 Line selection and recombination of EMSR, A4, B4, 43SR, 32 and 32 x A4. | | |
| **2. Test varieties and hybrids.** | | | |
| 2.1 Identify open-pollinated varieties for TLU to test in high and mid altitudes. | 2.1 Test existing varieties and synthetics and SR versions of Coca and Kasai. | 35% | 6,000,000 |
| 2.2 Identify hybrids and /or inbreds for pilot production. | 2.2 New hybrids/ inbreds identified from our program, IITA or Pioneer. | | |
| **3. Maintain true-to-type breeder seed of best varieties and inbreds.** | | | |
| 3.1 Maintain seed of existing "released" high-land varieties. | 3.1 Coca, Bacoa, Kasai, Shaba Synthetic 3, Synthetic 4, ATP and Early white breeder seed made available. | 15% | 1,000,000 |
| 3.2 Describe and "release" best new open-pollinated varieties. | 3.2 ATP, Early White and Synthetic 3 performance described. | | |
| 3.3 Produce sufficient seed of new varieties, hybrids and inbreds for TLU testing and variety maintenance. | 3.3 Produce ATP, Early White, Kasai, Synthetic 3, and Synthetic 4. Supply hybrid seed for testing by TLU. | | |

### 2.1.4 OTHER ACTIVITIES

**Institutional Development**

Training of manpower to take over all aspects of the highland maize program will continue to be a priority of the unit. The most senior national breeder in the program has gone to the University of Minnesota for Ph.D. training and another counterpart will be returning this year with a M.S. from the same institution.

In addition, institutional development during the last three years of the maize breeding technical assistance is likely to involve a scaling down of the program to a level which can be expected to be sustained by the national program. In view of this goal, the reduced budget and limited availability of labor, we will limit main season nursery activities to Foumbot and restrict the number of testing sites for varieties and hybrids.

Now that the facilities necessary for screening maize for resistance to streak virus have been constructed at Foumbot, the facility should be made fully operational during 1992. This will require the training of a technician at IITA and should result in all newly developed materials from our program having streak resistance.

Linkages developed between the national highland maize breeders and IITA, CIMMYT-Harare and Pioneer will be strengthened. We will, especially, continue the collaboration with Pioneer scientists in Harare and Cameroon, in order to make hybrids that are well adapted to the Cameroonian highlands available to farmers.

**Consultancies**

At least one consultant from IITA will be required before the streak screening facility becomes fully operational. Backstopping from IITA maize breeders and pathologists will be useful in diagnosing and proposing solutions to specific disease problems.

**Conferences and Publications**

A paper on two years work on the effectiveness of selection of varieties for acid, P-fixing soils will be presented at the American Society of Agronomy Meetings in early November.

**Home Leave**

From early or mid-July to early or mid-August depending on the stage of crop growth.

## 2.2 LOWLAND MAIZE BREEDING

### 2.2.1 INTRODUCTION

In 1991, the lowland breeding unit carried out a total of 243 trials. Trials covered 37 ha distributed in 16 locations. From advanced testing Suwan I white showed in 1991 tremendous yield advantage over the open pollinated varieties.

Acid soil remains one of the major constraint in the forest area. In 1991, 9 varieties were introduced from Madagascar. Those unadapted varieties were crossed to some adapted inbred lines and tested in both acid soil and non acid soil. The selected varieties and their $F_1$ will be self in 1992 along with the ATP varieties introduced from the mid-altitude zones.

From the heterotic pools, 7 new experimental varieties were formed in 1991. These varieties were advanced to $F_2$ and will be tested in 1992. In addition to this, $S_1$ or $S_2$ testcrosses using the opposite pool or tester will be initiated in 1992 for pool improvement.

In 1992, new three-way crosses will be formed by crossing the $F_1$ obtained from 2 lines of different heterotic pattern with a third line of the third pools.

In 1992, selection were made for striga tolerance from material with different genetic background. Those selected lines will be retested in 1992. Furthermore, some striga Pool will be made by recombining the retained lines.

In 1992, line development will continue for new trait donor sources and for hybrid or synthetic varieties development. In addition, on-farm trial for hybrid will be started with the collaboration of the T.L.U.

In 1992, work on borers will be intensified with the help of the entomologist.

Finally, breeder seed maintenance and foundation seed multiplication will be intensified as the demand is increasing.

### 2.2.2 CONSTRAINTS

The major constraints remain the poor storage and drying facilities. The lack of cool storage has lead to the poor germination of some entries in the 1991 trials in the Savanna zone. Streak and stem borers continue to be of major importance in the Forest area, while striga and drought are causing problems to the savanna farmers.

The breeder should also address the increasing Zinc and Magnesium deficiency experienced in the savanna and some forest locations (ie Nkolbisson).

Besides biological constraints, some logistical problems need to be resolved:
e.g. vehicles, timely availability of inputs etc. There is a need for a trained tractor driver.

## 2.2.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 1: Testing of Introductions** | | | |
| 1.1. To identify new germplasm. | 1.1 Variety trial on 2 to 4 locations. | 15% | 450,000 |
| 1.2 To identify new trait donor source. | 1.2 Inbred lines evaluation planted. | | 450,000 |
| 1.3 To collect data. | 1.3 Data collections. | | 50,000 |
| **Operation 2: Population Improvement** | | | |
| 2.1 To improve plant and ear aspect, disease resistance, stress tolerance | 2.1 Half-sib recurrent selection. | 25% | 800,000 |
| 2.2 To develop new higher yielding and stable varieties. | 2.2 $S_3$ recombination and variety crosses. | | 900,000 |
| 2.3 To increase yield potential. | 2.3 Same as 2.2 | | 900,000 |
| 2.4 To develop drought tolerant varieties. | 2.4 $S_3$ recombination of drought tolerant lines. | | 300,000 |
| 2.3 Refinement of the 3 heterotic pools. | 2.3 Diallel recombination of lines and advancement of F1 to F2. | | 300,000 |
| **Operation 3: Inbred line development** | | | |
| 3.1 Creation of new heterotic and traits donors inbred lines. | 3.1 Selfing, selection and evaluation on artificial environments. | 25% | 500,000 |
| 3.2 Identification of new lines for heterotic pool improvement and variety crosses. | 3.2 Combining ability studies and variety crosses. | | 500,000 |
| 3.3 Development and selection of hybrids which are at least 20% better than the best open pollinated. | 3.3 Single and three-way crosses formation and evaluation. | | 500,000 |
| 3.4 synthetic varieties development. | 3.4 Diallel recombination among lines and advancement to F2. | | 500,000 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| 3.5 Single crosses and three way crosses development. | 3.5 Single crosses among lines from different heterotic groups. | | 3,200,000 |
| **Operation 4: Special Maize** | | | |
| 4.1 To create soft endosperm maize. | 4.1 Backcross improvement. | 10% | 200,000 |
| 4.2 To create variety adapted to intercropping. | 4.2 Selection for erect leave and earliness. | | 200,000 |
| 4.3 To create acid tolerant and drought tolerant pool. | 4.3 Screening of lines under artificial environment. | | 300,000 |
| 4.4 Pop corn and sweet corn development. | 4.4 Pop corn and sweet corn maintenance. S2 lines advanced to S3. | | 50,000 |
| 4.5 Maize for brewery. | 4.5 QPM material | not included this year | |
| 4.6 Maize for feed | 4.6 Evaluation of QPM on chicken with IRZ. | | 100,000 |
| **Operation 5: National Varieties Trials** | | | |
| 5.1 To identify variety for release | 5.1 Variety trials on 16 locations | 15% | 1,500,000 |
| 5.2 To collect data for program evaluation and scientific papers. | 5.2 Same as 5.1 | | 300,000 |
| 5.3 To test stability of new variety. | 5.3 Same as 5.1 and across locations and years data analysis. | | 200,000 |
| **Operation 6: Multiplication and maintenance of breeder seed and foundation on seed.** | | | |
| 6.1 Production of better population. | 6.1 Seed production in Half-sib. | 10% | 400,000 |
| 6.2 Production of seed to supply agronomist, TLU and seed companies. | 6.2 Seed production in isolated randomating blocks. | | 500,000 |
| 6.3 Population and lines maintenance. | 6.3 Sibbing and chain-crosses of inbred lines. | | 100,000 |

## 2.2.4 OTHER ACTIVITIES

### 2.2.4 Institutional Development

On the job training will continue for casual and permanent workers, especially for Striga research.

### 2.2.4 Consultancies

The unit expects a visit from Dr. Kim, Dr. Winslow and Dr. Awa from IITA for Striga field evaluation. CORAF staff and an EEC evaluation team are expected in July 1992.

### 2.2.4 Conferences and Publications

The lowland breeder intends to finish up 3 publications started in 1991.

### 2.2.4 Home Leave

One month leave will be taken in December.

# 3. RICE RESEARCH UNIT

## 3.1 INTRODUCTION

The rice research Unit in Garoua is relatively new. Its creation is based on the recommendations of the NCRE evaluation team of the project's second phase which emphasized that research activities be more intensified in the North and Far North provinces where the bulk of the country's rice production is centered.

The research Unit will lay emphasis on objectives originally defined by the rice research team previously based at Dschang. Activities will be extended to the Far North. Limited operations will be carried out in the West and North West Provinces in collaboration with the parastatals and IRA resident researchers. International operations will jointly be carried out with scientists from IITA, IRRI and WARDA.

## 3.2 CONSTRAINTS

The rice research Unit in Garoua has no means of transportation.

The Unit lacks lower level staff like laborers. The Unit head is forced to use temporal workers as formen for the Unit. The Unit has no technician which makes it difficult for the researcher to take care of some administrative and more technical problems.

The Unit is also facing serious problems of having experimental plots at its disposal. However, efforts are being made to have land prepared for the next cropping season, through negotiations of IRA Chief of Station in Garoua and periodic interventions of the NCRE Chief of Party and the national coordinator.

The rice research unit in Mbo and Ndop plains has several repairs to be done on existing materials. The sub-program needs the inclusion of crop protection (rice pathology and entomology) as an aspect in its research activities. Agronomically, the major constraints for higher yields in rice are:

1) lack of suitable high yielding and stable varieties
2) prevalence of diseases such as leaf and neck blasts (Pyricularia oryzeae, leaf scald (Rhyncosporium oryzeae), brown leaf spot (Helminthosporium oryzeae), sheath rot (Acrocylinderium oryzeae and bacterial leaf blight (Xanthomonas oryzeae).
3) Post-harvest losses (grain shattering) of existing varieties due to harsh weather conditions.
4) Poor plant type of existing varieties
5) Lack of suitable fertilizer and cultural practices.

Objectives of the Unit are formulated to relate to solve problems associated with these constraints in collaboration with the Lagdo project field staff.

## 3.3 WORKPLAN TABLE - Garoua/Maroua

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| Operation 1: Varietal Improvement for high and stable yields in the North and Extreme North Provinces. | | | |
| 1.1. To identify useful germplasm for irrigated conditions at various ecologies. | 1.1 International rice observation nursery (Early, Medium). | 6% | 429,120 |
| 1.2. To assess the yielding ability of some agronomically suitable selections of 1991 tested in similar ecologies. | 1.2. Observational yield trials under irrigated and upland conditions. | 9% | 670,500 |
| 1.3. To compare the performance of some promising genotypes under lowland (rainfed and irrigated) and upland conditions. | 1.3 Preliminary yield trials advanced yield trials | 18% | 1,303,365 |
| 1.4. To compare the suitability and performance of some elite genotype, in large plots both under irrigated and upland conditions. | 1.4 Elite varietal trial. | 10% | 777,780 |
| 1.5. To multiply breeder seed of some elite varieties by ecological zones under irrigated and upland conditions | 1.5 Seed multiplication on large plots of about 2500m$^2$. | 10% | 777,780 |
| 1.6. Assessing acceptability of elite selections | 1.6. On-farm varietal trials | 10% | 775,980 |
| Operation 2: Cultural practices and soil management. | | | |
| 2.1. Introduce a cropping system sequence including the main cash crop (cotton) in rotation with rainfed rice. | 2.1 Cotton-based cropping system with rice in the lowland areas of the Benoue with rice as the alternate crop. | 5% | 388,890 |
| 2.2. To improve soil, water and cultural practices of rice and rice based land use systems for sustainable production in the lowland/floodplain areas. | 2.2. Management of rice straw and green manures as alternatives to applying high cost inorganic fertilizers. | 10% | 777,780 |
| | 2.2.1 Soil test for standard nutrient requirements. | | |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| | 2.2.2 Determination of the optimum seeding rate of Crotalaria caricia as a supplementary source of nitrogen. | | |
| Operation 3: Reduce post harvest losses and transformation of broken grain rice into forms acceptable by local consumers. | | | |
| 3.1. Reduce post harvest losses of existing varieties | 3.1. Determine a methodology for storing unthreshed paddy in the field a prior to completing cutting. | 5% | 388,890 |
| 3.2. Technological transformation of rice and broken rice grains into consumable forms. | 3.2 Determine various use of rice grains and broken rice grains. | 5% | 388,890 |
| Operation 4: Preparation of administrative and financial documents. | | | |
| 4.1. To prepare and submit expense vouchers and also coordinate other matters related to cereal research. | 4.1 Work out time sheets, write reports and assist in minor administrative concerns of the rice research Unit in particular and cereals section in general. | 12% | Not coasted |
| WORKPLAN TABLE (RICE PATHOLOGY) | | | |
| Operation 1: Plant disease control in rice ecologies of Cameroon. | | | |
| 3.1. To study the fluctuation of blast virulence during the growing season of rice in Cameroon. | 3.1 Monitoring of rice blast nurseries established by the breeders. | 8% | 157,500 |
| 3.2 Screening of new introductions for the various diseases of rice. | 3.2 International Rice Cold Tolerance Nurses (IRCTN) put by the breeder. | 56% | 135,000 |
| | 3.2.1 African Irrigated Rice Observation nursery (AIRON). | | 135,000 |
| | 3.2.2 Africa Irrigated Rice Preliminary screening set. | | 162,000 |
| | 3.2.3 Africa Irrigated Rice Advance Yield Trial (AIRAT) | | 90,000 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| | 3.2.4 Africa Upland Rice Preliminary Screening Set. | | 112,500 |
| | 3.2.5 Africa Upland Rice Observation Nursery | | 112,500 |
| | 3.2.6 Elite varietal trial. | | 112,500 |
| 3.3 Screening of Elite varieties for resistance to blast, leaf scald, brown spot, sheath rot, grain discoloration etc. | 3.3 Monitor National coordinated varietal trial | 10% | 247,500 |
| 3.4 Study of the variability of pathogenic strains of Pyricularia oryzae. | 3.4 Isolation of the various pathogenic strains of blast causal agent. | 8% | |
| | 3.4.1 Characterize strains by periods of attack. | 8% | 112,500 |
| 3.5 Compiling results and writing rice pathology reports. | - | 10% | |

WORKPLAN TABLE (RICE BREEDING - MBO/PLAIN AND MENCHUM VALLEY)

Operation 1: Varietal Improvement for high and stable yields in the Western highlands and mid-altitude regions of the West and Northwest Provinces.

| | | | |
|---|---|---|---|
| 1.1 Identify useful germplasm in rainfed and irrigated conditions. | 1.1 Irrigated Africa Rice preliminary screening set (AIRPSS). | 24% | 1,152,525 |
| | 1.1.1 Africa Irrigated rice advanced trial. | | |
| | 1.1.2 Africa Upland Rice Preliminary screening set. | | |
| | 1.1.3 Africa Upland Rice observation nursery. | | |
| | 1.1.4 Africa Upland Rice advanced trial. | | |
| 2.1 Assess the yielding ability of some agronomically suitable selections of 1991 under rainfed and irrigated conditions. | 2.1 Observational yield trial. | 34% | 1,255,500 |
| | 2.1.1 Varietal yield trial. | | |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| | 2.1.2 Coordinated varietal trial. | | |
| | 2.1.3 Elite varietal trial. | | |
| **Operation 2: Screen germplasm of local and exotic sources for release as varieties or as donors in hybridization program and select head lines from segregating populations.** | | | |
| 2.1 Development of new locally created lines. | 2.1 Hybridization program. | 23% | 1,161,000 |
| | 2.1.1 Breeders', seed production (Head-row selection). | | |
| | - Field testing of segregating populations. | | |
| **Operation 3: Screen germplasm from International Cooperators for regional constraints.** | | | |
| 3.1 Screen varieties adapted to low temperature conditions. | 3.1 Observation yield trials of previous selections. | 14% | 450,000 |
| | 3.1.1 International Rice Cold tolerant nursery. | | 225,000 |
| **Operation 4: Preparation of technical write ups** | | | |
| 4.1 Preparation and submission of expense vouchers. | 4.1 Time sheet preparation and writing of technical reports. | 5% | Not coasted. |

## 3.4 OTHER ACTIVITIES

### Institutional Development

- Rice research being introduced in this area will necessitate the training of field observers in various disciplines of plant breeding and Agronomy..

- Organization of a farmers' field day in Lagdo.

### Consultancies

- The Unit will like to consult with the IITA rice breeder (Dr. Singh) and WARDA upland rice breeding task force coordinator (Dr. Monty Jones) to visit and evaluate the nurseries around the months of September and October 1992.

- A specialist in rice-based cropping systems to visit the unit (from WARDA) is needed.

- Also need to consult with Soil Scientist for management and restoration of rice soils (from WARDA).

- A crop protection specialist to monitor our trials for insect pests and diseases (Entomologist and Plant Pathologist).

### Conferences and Publications

1. IRA-North Annual Planning Meeting in April 1992

2. Lowland rice breeding task force Steering Committee Meeting in Bouake during the last week of March 1992.

3. Monitoring tours around october 1992 in West Africa.

4. ASA meetings in Minneapolis (U.S.A) in November 1992.

**B- Publications**

The Unit has a publication entitled Acid Soil Profiles of Central, and West Africa in Plant and Soil Journal.

### Home Leave

Dr. Takow will take part of his annual leave in December.

# 4. CEREALS RESEARCH UNIT

## 4.1 INTRODUCTION

The NCRE Cereals Agronomy Unit devotes 70% of its research efforts to maize agronomy and 30% to sorghum agronomy.

This research work - which started in 1982 - has been conducted in the main maize and sorghum growing regions of the Adamaoua, North and Far North Provinces (6 to 13° latitude N, 160 000 $km^2$). For research purposes, the area is divided into the following main regions (each subdivided into subzones): the highland plateau of Adamaoua, the subhumid lowland savanna, and the semi-arid lowland savanna.

In Northern Cameroon, the maize area under traditional and intensive cultivation is estimated to be around 70 000 hectares. It has increased significantly in the last five years (partly as a result of the introduction of better varieties and cultural practices), and will continue to increase in the near future, particularly in the subhumid lowland savanna and the highlands of Adamaoua.

The total area under sorghum production (rainy season and off-season) is about 430,000 hectares. The sorghum production is located mainly in the lowland semi-arid and subhumid savanna.

## 4.2 CONSTRAINTS

The following have been identified as major agronomic constraints for increased production of maize and sorghum and cereals based cropping systems in North Cameroon:

- Lack of suitable maize and sorghum varieties in some zones;
- Lack of adequate cropping systems to sustain long-term crop and soil productivity;
- Insufficient rainfall in some parts of the savanna and an erratic rainfall pattern in many areas;
- Water run-off losses, soil erosion and soil degradation particularly in the lowland savanna. The type of intensive and aggressive rainfall is causing serious erosion problems in the fragile soils of the lowland savanna when cultivated. A substantial amount of rain is lost by run-off. Soil fertility problems, deficiency of several nutrient elements (particularly N and P, S, Mg, Zn) and low levels of organic matter occur in many soils. Soil acidity and high P fixation in the ferrallitic soils of the highlands of Adamaoua are common.
- Inadequate knowledge on cultural practices (soil and water management, planting dates, plant densities, intercropping techniques, soil and seed treatment, irrigation);
- Weeds and Striga problems;
- Disease and pests (termites, borers, birds, insects, monkeys, blights, streak etc...);
- Crop lodging;
- Inadequate post harvest technologies and lack of proper storage facilities;
- Marketing problems;
- Lack of appropriate agricultural implements or tools.

In recent years, soil degradation and Striga have become two major constraints for cereals based cropping systems. There is a need to emphasize the development of sustainable production practices and our research on Striga.

The research strategies and priorities summarized in this workplan were developed as a result of suggestions from agricultural agencies, farmers, as well as experience, and knowledge accumulated in the last seven cropping seasons by our team.

## 4.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| Operation 1: On-farm Tests and Demonstrations on - Conservation Farming Technologies | | | |
| 1.1. To develop appropriate and profitable minimum tillage systems in farmers fields in the lowland subhumid savanna of North Cameroon. | 1.1 On-farm tests-demonstration) involving fertilization and weed control alley cropping with maize and cowpea under minimum tillage systems. | 30% | 3,428,571 |
| Operation 2: To Develop Agronomic Practices for Improved and Sustainable Maize and Sorghum Production | | | |
| 2.1 To identify appropriate crop rotations and improved fallow management systems in the subhumid lowland savanna. | 2.1 On-farm research on crop rotation cereals/legume crops (grain and green manure) and forage legume species. | 15% | 1,285,714 |
| 2.2 To evaluate the impact of several interplanted legume/cereals, and alley cropping systems in maize and sorghum yield in the lowland savanna. | 2.2 On-farm research testing several intercropping patterns with and without alley cropping systems. | 15% | 1,285,714 |
| Operation 3: To Develop Agronomic Practices to Alleviate Striga Constraints on Maize and Sorghum | | | |
| 3.1 To evaluate the differential impact of trap crops against Striga on maize and sorghum. | 3.1 On-farm research with 7 trap crops on maize and sorghum. | 15% | 857,143 |
| 3.2. To evaluate different methods of Striga control on maize and sorghum. | 3.2 On- farm research with maize and sorghum. (Urea, intercropping, herbicides, alley cropping etc...). | 15% | 1,714,28 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 4: To help extend tested agronomic technologies to the extension agents and the farmers of the region.** | | | |
| 4.1. To communicate research results and provide technical assistance to the extension agents, farmers and other agricultural agencies. | 4.1 Preparation of production guides on maize (lowlands and highlands), and technical papers on our research results. Conduct training fields day on production and utilization. | 5% | 171,428 |
| 4.2. Provide seeds of improved varieties to extension agents and farmers. | 4.2 Tests with newly available varieties maize, sorghum, ' cowpeas, pigeon peas and seed production of these varieties. | 5% | 257,144 |

## 4.3 OTHER ACTIVITIES

### Institutional Development

We will have the following activities :

- continuous on-the-job training for 15 IRA technicians;
- organization of several training field days on conservation farming technologies for IRA staff as well as the farmers;
- we will help develop the Striga and seeds laboratory at IRA/Garoua and the IRA/IITA Striga Research Antenna at IRZ farm;
- we will help organize some special training courses in computers and technical writing at IRA/Garoua;
- we will organize a series of dialogues between IRA researchers and development agents;
- we will help the maize and sorghum breeding sections in the management of their field experiments
- we will help organize the Monitoring Tour of the Regional Farming Systems Network (IITA/COMBS);
- we will order some agricultural and laboratory equipments for IRA/NCRE/Garoua

### Consultancies

- a specialist in soil management and alley cropping to advise on soil fertility, soil management, improved fallow management, alley cropping and sustainable agriculture. (2 days, July 1992). We suggest Dr. B.T. Kang. (IITA);

- a specialist in Striga and associated weeds to advise on our extensive field research in Striga and laboratory methods for Striga research. (2 days, September 1992). We suggest Dr. Berner from IITA.

- a Statistician to advise on appropriate design and analyses for our Striga experiments and on-farm trials. We suggest Dr. McLaren (IRA Nkolbisson). (2 days, September 1992);

- a specialist in communication and editing to help in the preparation of several technical bulletins for the extension agents and the farmers (2 days any time from March to June 1992) ;

## Conferences and Publications

### A- Conferences

IRA/North annual planning meetings to be held in January 1992 with researchers and development agents (IRA/Garoua 5 days in February 1992).

- International Conference on Alley Farming to be held at IITA, September 1992

- Annual meeting of the American Society of Agronomy (USA, November 1992).

### B- Publications/Presentations

- update 4 "fiches techniques" on maize and sorghum

- update a summary paper on our agronomic research and activities on maize and sorghum.

- prepare 3 technical papers on conservation farming technologies and cereals production

- prepare a technical paper on minimum tillage with maize in farmers' fields

- prepare a technical paper on our research work on Striga.

## Home Leave

The Cereal Agronomist will take home leave in May 1992.

# 5. SORGHUM RESEARCH UNIT

## 5.1 INTRODUCTION

Sorghum and millet are the major cereals cultivated in North Cameroon. Sorghum is grown during the rainy season and in post rainy season. The latter crop, known as "Muskwari", is a transplanted sorghum grown on the residual soil moisture. Millet is grown only in the rainy season. Its production constitutes about 10% of total production and has been decreased sharply.

## 5.2 CONSTRAINTS

### Sorghum Breeding

IRA has not provided adequate vehicles for program use. The project vehicles are now old and well past their normal life expectancy. They are still being used regularly with frequent major repairs.

The major constraints being addressed through sorghum breeding are as follows:

- Lack of suitable varieties or hybrids with desirable agronomic traits which fits into the existing farming systems.
- Low and erratic rainfall lead to drought in some sorghum growing areas.
- Proliferation of Striga, disease and pest.
- Very long cycle of most local cultivars.
- Poor yield potential of most local cultivars.
- No fertilizer application.
- Marketing and price of product.

### Pearl Millet Breeding

Pearl millet is mostly grown in marginal rainfall zone. The production has been decreased over years. The major constraints are:

- Lack of suitable varieties for different ecological zones and planting date (photoperiod sensitive cultivars for early planting and photoperiod insensitive cultivars for late planting).

  Lack of suitable varieties with desirable agronomic traits and resistant to various diseases, particularly ergot, head smut and downy mildew.

## 5.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 1: Development of suitable cultivars of sorghum for different ecological zone.** | | | |
| 1.1. Provide improved varieties to various users. | 1.1. Crossing development and testing (F2's and advanced generation). Screening local varieties and some exotic. Assess their performance for direct and/indirect use in the program.<br>1.1.1. Develop early maturing cultivars of sorghum for low rainfall <800 mm. Develop of high yielding medium duration varieties (100-120 days to mature). | 30% | 2,050,000 |
| 1.2. Increase sorghum productivity. | 1.2.1. Advanced segregating generation will be subjected to various stress (striga, disease, drought).<br><br>1.2. Testing sorghum for high and stable yields with wide adaptation. Preliminary yield trials, multi-location trials and international trials are being conducted. | 20% | 1,700,000 |
| **Operation 2: Development of varieties resistant to Striga** | | | |
| 2.1 Provide range of resistant entries. | 2.1 Identify sorghum source line resistant to Striga hermontica among the collection of local and exotic gersplam available. Transfer the resistance to agroeconomically elite lines through hybridization. | 5% | 850,000 |
| 2.2. Develop and test high level of resistance to striga. | 2.2. Screening of advanced segregating materials. National striga nursery and International striga trial being carried out in different environments. Developing reliable screening techniques. | 10% | 1,275,000 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 3: Maintenance, testing, and evaluate Hybrid parents** | | | |
| 3.1 Maintaining genetic resource for hybrid development. | 3.1 Maintaining a collection of germplasm. Many A/B lines have been evaluated for drought resistant and disease resistant. | 3% | 85,000 |
| 3.2. Select suitable male and female parents. | 3.2. Identify male and female parent which could combine to give the best hybrid. Develop and test elite hybrids for different cropping systems in several environments. | 3% | 170,000 |
| **Operation 4: Development of nucleous/Breeder's seed** | | | |
| 4.1. Produce uniform and pure seed of promising selections. | 4.1. Multiply breeder's seed to meet the requirement of various research program. Small quantity may also be distributed to farmers who can't afford commercial seed. | 4% | 425,000 |
| Operation 5: Muskwari Germplasm collection, maintenance and evaluation. | | | |
| 5.1. Evaluate the various muskwari collections. | 5.1. Characteristics of various accessions available. | 6% | 255,000 |
| 5.2. Multiply seed of promising entries for agronomic study. | 5.2. Some entries have been selected as superior line and are grown by farmers. Adequate agronomic study is needed. Seed should be multiplied for that purpose. | 4% | 170,000 |
| Operation 6: Development of suitable pearl millet cultivars | | | |
| 6.1. Develop cultivars of different maturity cycle. | 6.1. Select photoperiod sensitive cultivars for early planting (May). Select photoperiod insensitive, precoces (80-110 days) cultivars for late sowing. | 5% | 425,000 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| 6.2. Identify agronomically superior lines with stable source of resistance. | 6.2. Screening and resistance identification of local and exotic germ-plasm.<br>- Advanced segregating generation subjected to various stress (drought, striga, pest and diseases).<br>- Preliminary yield trial and multilocation and disease resistance are the main criteria of selection. | 10% | 595,000 |

### 5.1.3 OTHER ACTIVITIES

#### 5.1.3.1 Institutional Development

Institutional development will continue through in-service training of IRA personnel, held the maize breeding section in management of their field experiments. Mr. BAILANGSOU the technician of the program has been proposed to participate in the 3 months course (July-September) organized by the sorghum Network in BAMAKO, Mali.

#### 5.1.3.2 Consultancies

Short backstopping consultancies by ICRISAT specialist or INTSORMIL will be needed in the following areas.

- Striga research in other to provide advice on screening methodology.
- Screening techniques for drought and major biotic constraints.
- Breeding food technology.

#### 5.1.3.3 Conferences and Publications

Both sorghum breeders will participate on the general workshop of the pearl millet research from March 30 to April 3, 1992. Paper will be presented on the pearl millet research activities in Cameroon.

# 6. TESTING AND LIAISON UNIT

## 6.1 BAMBUI TLU

### 6.1.1 INTRODUCTION

The TLU at Bambui is responsible for farming systems research in the Western Highlands, with an emphasis on maize and rice based cropping systems. The Western Highlands, comprising the North West (NWP) and West Provinces (WP), cover less than 10% of the land area in Cameroon, but contain 25% of the population, and produce over 60% of the national maize crop. The zone is mostly derived savannah, ranging in altitude from 400 to 3000 m, with annual rainfall between 1500 and 2500 mm.

The goal of the Bambui TLU is to increase and/or stabilize the productivity of cereal-based farming systems in the NWP & WP through the development, release and adoption by farmers of appropriate agronomic packages. Since 1982, significant progress has been made toward achieving this goal with the generation of farmer recommendations for maize and rice, built around new high yielding varieties that have been released and adopted by large numbers of farmers. In farmer managed trials, these recommended practices yielded marginal rates of return well above levels necessary to compensate farmers for the risk associated with adoption of a new technology.

Criteria for maize and rice variety testing originally emphasized productivity and disease resistance (on-farm trials, 1982-85). A second generation of varieties, that entered on-farm testing in 1989, have incorporated additional characteristics desired by farmers, a result of TLU feedback to the breeders. These included: harder (flinty) grain for longer storage life, earliness, shorter plants, tolerance to low Ph soils, and adaptation to the high altitude zone for maize; and, enhanced grain quality (long, narrow, translucent grains) for rice, to make it more competitive in the market with imported rice from Asia. An ever growing population, leading to higher crop:fallow ratios, combined with increased farming of steeply sloping and marginal lands, has caused considerable soil erosion losses, a general degradation of soil fertility, and steadily declining food crop yields, only partially offset by increasing use of chemical fertilizers. In response, the TLU has initiated a program of researcher-managed on-farm soil conservation (mainly use of contour bunds for erosion control) and soil fertility improvement (Tephrosia fallow) trials in 1991, in collaboration with the Provincial Delegation of Agriculture Adaptive Research Service and the U.S. Peace Corps 10-year Agroforestry Project. TLU farmer surveys in the next 4 years will be less oriented toward diagnosis and systems description, and more toward assessing technology retention, diffusion and impact.

Anticipated constraints in Phase III include: 1) the imminent departure of the national economist counterpart for PhD training in the U.S., with his expected return being too late to overlap with the TA economist, who leaves the project in December 1992; and 2) the departure in mid-phase of the T.A. TLU systems/soils agronomist, after only 2 years, well before an adequate characterization of soils in the highlands can be accomplished.

### 6.1.2 CONSTRAINTS

Logistical constraints (insufficient vehicle and per diem budgets, impossible road conditions during the height of the rains from July-October, problems of communications with village extension staff, etc.) are the constant companions of most farming systems research units; and TLU-Bambui is no exception.

### 6.1.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| 1. Identify farmers' circumstances and practices. | | | |
| 1.1 Evaluate maize storage losses in farmers' traditional stores. | 1.1 Survey of 40 farmers stores in mid and high altitude zones, to be completed in 1992. | - | completed |
| 1.2 Assess soil fertility over a wide range of sites in the Western Highlands, and quantify soil fertility attributes of the ankara land preparation method. | 1.2.1 Soil and maize ear leaf samples from the major soil groups in the NWP & WP for laboratory analysis. An expansion on previous year's work. | 5% | 2,447,060 |
| | 1.2.2 Two field trials at Mfonta & Babungo comparing "ankara" with "no ankara". Soil & plant analyses to throw light on advantages or otherwise of system. | 5% | 1,668,360 |
| 1.3 Identify factors affecting technology adoption and research impact. | 1.3 Yearly maize and rice recommendation retention surveys beginning in 1991; diffusion surveys 1992-94; base-line survey in agroforestry research villages, for future impact study. | 5% | 76,530 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| 1.4 Produce a map of the Western High-lands based on soil fertility characteristics. | 1.4 Collation of in-formation from publications from previous soil mapping studies in the NWP & WP; with compensatory soil sampling and analysis where necessary. | 5% | |
| 2. Identify improved and well adapted varieties. | | | |
| 2.1 Assess performance of new foodcrop varieties (maize, rice, potato, etc.) | 2.1.1 Joint researcher/farmer managed trials of 2nd generation maize and rice varieties to be completed in 1992; followed by farmer-managed trials in 1993 & 1994; all include farmer assessments. | 15% | 3,817,720 |
| | 2.1.2 On-station Intercropping trial of new maize varieties with grain legumes. | 5% | 1,155,610 |
| | 2.1.3 Researcher managed on-farm trials to evaluate the performance of new hybrid maize varieties. | 5% | 935,200 |
| 2.2 Confirm value and acceptability of IRA/NCRE maize varieties. | 2.2 Continued yearly distribution of 300 maize trial minikits to extension agents. | 5% | 706,375 |
| 3. Identify appropriate technologies for enhancing and sustaining soil fertility. | | | |
| 3.1 Evaluate the effect of improved soil conservation practices. | 3.1 Long term (1991-94) soil erosion control trials (contour bunds and hedgerows) in collaboration with Peace Corps Volunteers in 7 villages in NWP. | 15% | 2,243,410 |
| 3.2 Evaluate the yield benefits from planted fallow. | 3.2 Long term (1991-95) planted fallow trials (relay planted green manure crops and alley cropping) in collaboration with Peace Corps Volunteers in 7 villages in NWP. | - | (covered by 3.1) |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| 3.3 Determine fertilizer recommendations for specific recommendation domains. | 3.3.1 on-station pot, greenhouse and field fertilizer response trials; followed by on-farm adaptive trials. | - | - |
| | 3.3.2 On-station Nitrogen requirement trial for a maize + grain legume intercrop. | 5% | 872,445 |
| | 3.3.3 On-station fertilizer requirement trial for new hybrid maize varieties. | 5% | 971,935 |
| **4. Increase knowledge of improved crop production materials and methods.** | | | |
| 4.1 Developing technical bulletins. | 4.1 Completion of maize technical bulletin in collaboration with UCD, and preparation of other extension bulletins as needed. | 5% | 38,265 |
| 4.2 Training of extension staff. | 4.2 Participation of TLU researchers, in the capacity of subject matter specialists, in training courses for AVV (Agents de Vulgarization de Village) in the West Province, as National Extension and Training Program gets under way (1992-94). | 5% | 153,830 |
| **5. Professional Development.** | | | |
| 5.1 Publication of results and paper presentations at professional meetings. | 5.1 Preparation of articles for Professional Journals, extension bulletins, technical reports, etc.; and attending the ASA and AFSR-E meetings by 2 IITA staff plus 2 national scientists. | 15% | 1,913,260 |

### 6.1.3 OTHER ACTIVITIES

**Institutional Development**

In 1992, Mr Samatana Marc (national economist) will leave for PhD training in the U.S., and Zekeng Pauline (national agronomist) will return, having completed her PhD training at MSU. As the expatriate staff (McHugh and Osiname) prepare to leave at the end of the year, in service training will be stepped up for researchers in the general area of research management (design, implementation, analysis and interpretation), with special emphasis on computer applications. Technicians will continue to receive on-the-job training as before.

**Consultancies**

The TLU continues to depend on IITA/RCMP for backstopping. The TLU also benefits from consultants brought in by the commodity-based units (maize and rice) in this zone. Moreover, specialists abound in several nearby institutions (e.g., University Centre Dschang, IRZ and the Ekona Soil Lab) and projects (e.g., FAO-PFLRP and PAFSAT), that provide much of the information to be obtained from consultants, at a fraction of the cost. Therefore, the TLU-Bambui doesn't envision requesting specific consultancies for 1992.

**Conferences and Publications**

In this last year for the expatriate staff, a special effort will be made to generate publications (journal articles, conference papers, monographs, technical reports, extension publications, etc.). Abstracts will also be submitted for various professional meetings (the AFSR-E Symposium and ASA Meetings).

**Home Leave**

Dr. Osiname will take his home leave in July. Mr. McHugh will take a 2 week home leave in June, to visit Tanzania. The remainder of his accumulated leave time will be taken at the end of his contract, allowing him to leave early (mid-November).

## 6.2 EKONA TLU

### 6.2.1 INTRODUCTION

Ekona TLU is responsible for the Coastal Humid Forest Region of Cameroon. The TLU works to improve food crop production of smallholders in South West Province through diagnosis of agricultural constraints and opportunities, testing of improved varieties and agronomic cultural practices, and informational liaison between the extension service and IRA.

Since its creation in 1986, TLU work at Ekona has focussed on (a) provision of baseline data on smallholder agriculture to guide IRA researchers in food crop and soils, (b) on-farm testing of NCRE maize and IRA/IITA cassava varieties, (c) soil and weed management trials on-station, and (d) post-harvest problems of maize (storage) and other food crops (marketing). Liaison with extension has been effected through annual training-and-planning workshops, collaborative research and minikit distributions.

The basic approach of the TLU-involving a combination of on-station trials, researcher and farmer managed trial in focus villages, and minikit distributions, will continue. However, the operational objectives have been reformulated to more clearly signify TLU priorities. Increased emphasis have been given to biological technologies for enhancing and sustaining farm systems productivity. Agroforestry and fallow management studies will be emphasized in the technology development focus of TLU Ekona.

### 6.2.2.2 CONSTRAINTS

The major technical constraints addressed in 1992 workplan are in TLU Ekona's three focus areas: (Varieties, Soil fertility and Weed Control).

| | |
|---|---|
| Varieties: | - Lack of improved maize, cassava, cocoyam. |
| | - Disease of cocoyam |
| | - Stem borer of maize |
| | - Egusi melon beetle |
| Soil fertility: | - Low fertility |
| Weed control: | - High weed incidence costly to control by hoeing. |

Socioeconomic constraints addressed are:-

| | | |
|---|---|---|
| Technology retention and diffusion | - | Determinants of IRA maize and cassava retention and diffusion by farmers with emphasis on gender. |
| Agroforestry | - | Study of farmers ability to incorporate agroforestry technology in their farming practices. |
| Production costs | - | A move from partial to whole farm budget analysis. |

**Available and unpublished results by TLU, Ekona will be written up for publication.**

## 6.2.4 WORKPLAN TABLE

| | Objectives | Activities | Time | Budget |
|---|---|---|---|---|
| Operation 1: | Diagnosis of farmers' circumstances and practices. | | | |
| 1.1. | Feedback information on farming systems and markets. | 1.1.1 Produce manuscripts for publication of FSR and Market monographs. | 3.0 | 130,593 |
| | | 1.1.2 Resource management survey. | 2.0 | 378,609 |
| | | 1.1.3 Agroforestry potentials of small farmers of SW and Littoral provinces | 6.0 | 1,613,205 |
| 1.2. | Generate price data for use in economic analysis. | 1.2.1. Periodic market monitoring. | 3.0 | 543,222 |
| 1.3. | Generate labor cost data for whole farm budgeting. | 1.3.1. Labor measurement of all field operations in food crop production. | 2.0 | 304,076 |
| 1.4. | | 1.4.1. The contribution of cocoyam (Xanthosoma Spp) to the diets of component ethnic groupings in SW and the determination of its major production, consumption and marketing constraints (collaborative: ROTREP) 1.260.000. | 5 | 731,611 |
| 1.6. | Economic analysis. | 1.6.1. Data analysis using SPSS, Lotus & SYSTAT. Consultation with SPSS specialist at Univ. Centre Dschang and with NCRE Economists in Bambui and Nkolbisson. | 6.0 | 336,542 |
| Operation 2. | Identify biological technologies for improving & sustaining soil fertility. | | | |
| 2.1. | Low cash input weed control and soil fertility improvement. | 2.1. Weed suppression with food crops evaluated using spreading crops. A range of planphile crops intercropped with maize and cassava. | 5 | 483,610 |

| | Objectives | Activities | Time | Budget |
|---|---|---|---|---|
| 2.2 | Assess benefits from short term leguminous fallows. | 2.2 Rotational fallow for soil improvement and weed control. Establishment of Crotalaria, Pigeon pea, Pueraria, Mucumã, and Mimosa in first season followed by second season crop. | 4 | 375,610 |
| 2.3 | Seed lot source for agroforestry trials. | 2.3 Maintenance of Alley Spp. established at Yoke for seedlot. Replant lost stands. | 1.0 | 49,582 |
| 2.4 | Fitting plantain into agroforestry system. | 2.4 Plantain based alley system in collaborative IRA Food crops section, Ekona. Plantain suckers, maize, and cocoyam cormels established in legume alleys. | 3.5 | 273,440 |
| 2.5 | Acquainting farmers with alley system and management. | 2.5 Introduction of agro-forestry system to selected sites in Fako, Meme, and Ndian Divisions (Peace Corps volunteers). | 1.5 | 644,133 |
| 2.6 | N and P management | 2.6.a. Continuation of Yoke agroforestry trial to determine N economy. | 2.0 | 306,560 |
| | | 2.7.b. P. characteristics of selected soils in SW and Littoral provinces using Isotherm method | 1.5 | 1,462,364 |
| Operation 3: | Identify appropriate crop protection practices. | | | |
| 3.1 | Assess the effectiveness of Marshall seed treatment for egusi beetle. | 3.1 Concluded | | |
| 3.2 | Identify locally adapted pest control methods. | 3.2 Input in studies on use of indigenous plant materials for controlling storage pests (Dr. Asanga Dschang). | 0.5 | 91,451 |
| 3.3 | Assess effectiveness of furadan in controlling stem borers. | 3.3 Discontinued, enough information available. | | |

| | Objectives | Activities | Time | Budget |
|---|---|---|---|---|
| 3.4 | Determine cheap control methods of cocoyam root rot (CRRD). | 3.4 Cultural control of CRRD using selected planting materials. ROTREP collaboration. | 2.0 | 154,950 |
| 3.5 | Evaluate low cost cultural weed control measures. | 3.5 See 2.1, 2.2, 4.5. | | |
| Operation 4: | Identify improved and well-adapted crop varieties. | | | |
| 4.1. | Variety Evaluation. | 4.1 On-farm farmer minikit evaluation of maize, cassava, sweet potatoes. Extend evaluation to Littoral Province. | 3.0 | 362,295 |
| 4.2. | Identify high yielding maize. | 4.2 NVT maize trial (The established at two sites using Breeders maize lines. | 2.0 | 293,757 |
| 4.3. | Identify high yielding cocoyam. | 4.3 On-farm cocoyam clonal evaluation for resistance to CRRD, collaborative with ROTREP (300.000). | 2.0 | 239,420 |
| 4.4. | Ascertain starch contents of several root crops. | 4.4.1 Rapid quality determination for root and tuber crops by specific gravity. | 1.5 | 165,271 |
| 4.5. | Determine importance of components of improved package. | 4.5.1 Component technology evaluation. Improved cassava and maize varieties, fertilizer and weed control evaluated in incremental steps at 2 sites (LV and SDS). 7 172914 | | |
| | | 4.5.2 Component TLU technologies in packages, on-farm studies at Meme, Ndian, Fako and Manyu Divisions (4 villages/Div); and at 2 sites in Littoral province. | 15 | 3,241,305 |
| 4.6 | Evaluate maize and cassava variety retention rates and determinants of retention. | 4.6 Maize and Cassava retention surveys. | 5 | 845,012 |

| | Objectives | Activities | Time | Budget |
|---|---|---|---|---|
| Operation 5. | Increase knowledge of IRA technologies. | | | |
| 5.1. | Communicate TLU findings to extension agents and farmers. | 5.1 Focus village meetings each year. TLU annual workshop. Technical information bulletin. | 9.5 | 735,871 |
| 5.2. | Train MINAGRI chiefs of Posts in regional testing and demonstration methods (South West and Littoral). | 5.2 Annual training of MINAGRI chiefs of posts. | 5.0 | 969,386 |
| 5.3. | | 5.3. Acquisition and provision of improved planting materials to farmers and extension agents in S.W. & Littoral Provinces. | 2.0 | 539,564 |
| Operation 6: | Collect Data for classifying Research zones in SWP | | | |
| 6.1 | Confirm Research zone characterization. | 6.1 (Continuation:) Soil profile dug and described. Classification by horizon, physical and chemical properties as well as soil reaction and texture; (collab. IRA Ekona Soils section). | 3.5 | 1,728,561 |

### 6.2.3 OTHER ACTIVITIES

**Institutional Development**

The unit badly needs some relevant softwares (SPSS and updated MSTATC). The hard disk capacity to install these is needed.

**Consultancies**

Consultancy on weed control, (particularly Imperata) will be sought from the Project (Dr. Poku).

In view of the problems of maize grain storage in the humid environment of the coastal region and the increasing importance of green maize compared with grain, data is needed to decide on our inclination to focus on green maize. We seek advise on this.

## Conferences and Publications

The Systems Agronomist and the Extension Agronomist will attend the American Society of Agronomy meeting which comes closely behind the 1992 Farming systems meeting which they also plan to attend.

The Economist will attend the Farming Systems meeting.

The Economist, and the Systems Agronomist will attend the alley cropping conference at IITA in November.

Publications: Technical manual of Ekona TLU Research results will be prepared. Articles on "Yam production in Leucaena alleys, "Maize Nitrogen economy in gliricidia and leucaena alley system", and "The use of specific gravity to assess quality of some root and tuber crops" will be prepared as manuscripst during 1992.

## Home Leave

The Systems Agronomist plans to take his annual leave in July, 1992.

## 6.3 MAROUA TLU

### 6.3.1 INTRODUCTION

The global objectives of Maroua TLU are (1) to increase knowledge of the farming systems of north Cameroon through diagnostic studies and (2) to contribute to the development, evaluation and dissemination of technologies proven under farmers conditions. The aim is to increase, stabilize, and diversify food crop production, maintain soil productivity and increase small farmers' incomes.

The zone of action of Maroua TLU is the Far North Province and the Division of Mayo Louti in the North Province, an area known as the zone "Centre-Nord" of the SODECOTON. It essentially comprises the cotton growing area, the Mandara Mountains and associated plateau.

Until 1988, TLU concentrated exclusively on on-farm testing of varieties and improved cultural practices. Beginning with 1989, the scope of TLU research activities has broadened to include (1) the diagnosis of existing farming systems, (2) identification of constraints as weil as areas of flexibility in the system which may allow intervention and change, (3) delineation of farming systems zones which require different technologies and research approaches. Economic analysis of on-farm tests has also become an integral part of the evaluation of improved technologies.

In 1992 Maroua TLU will continue to test peanut and sorghum varieties at the regional level in collaboration with SODECOTON and MINAGRI. These trials are expected to provide necessary feedback to breeding programs which developed these varieties. A retention survey for peanut varieties will be conducted at harvest time among collaborating farmers from past tests. Sorghum/cowpea intercropping and improved cowpea storage will be tested for the first time at the regional level after being proven useful in representative research villages. Soil preparation will be studied again in research villages with increased attention paid to quantifying critical aspects of labor use and soil parameters. Minikits (compound maize and sorghum seed treatment) will be limited to the areas which have not benefitted as much in past years from exposure to these technologies. Retention surveys will also be initiated in Mayo Sava and Mayo Tsanaga to assess adoption of minikit themes.

On-station technology generation will continue with trials to study long- and short-term control of striga on sorghum, improved soil protection and soil moisture availability with cover crops and agroforestry, and improved soil moisture availability for muskwari.

### 6.3.2 CONSTRAINTS

Formal study and prioritization of constraints in the farming systems was begun in 1989 and to a great extent confirmed what had been suspected concerning the more important constraints.

- The chief agro-ecological constraint in the Extreme North is a short growing season characterized by limited and very erratic rainfall.
- Poor and decreasing soil productivity, aggravated by appreciable erosion also limits production and threatens the sustainability of the systems.
- Striga, a parasitic weed of cereals, causes serious, though unquantified, losses of sorghum, millet, maize, and perhaps cowpeas.
- Birds cause considerable loss to cereal crops, especially shorter cycle improved varieties developed to mature early for drought avoidance.
- Major insect pests and diseases include: grain mold, leaf diseases, Spodoptera spp., and head bugs in sorghum; millipedes, rosette, rust, and leaf spots in peanut; thrips and post-harvest pests such as bruchids in cowpea. Only the last two are thought to merit control measures other than development of resistant varieties.
- Access to credit for seasonal inputs and animal traction is limited.
- Fluctuation of grain prices affect both farmers' income and reduce their ability to purchase grain during the hungry season.

### 6.3.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| Operation 1: Improve knowledge of farmers' circumstances, practices and institutional framework. | | | |
| 1.1 Provide baseline data on farming systems of EN for evaluation of impact of improved technologies and setting of research priority. | 1.1.1 Millet appraisal survey and monitoring food crop prices. | 2 | 600,000 |
| | 1.1.2 Survey of storage practices for sorghum, peanut, millet. Marketing survey for sorghum. | 4 | 225,000 |
| | 1.1.3 Resource management survey for Far North Province (IITA/IRA). | 4 | 245,000 |
| 1.2 Identify farmers' strategy against drought and long term approach to sustainable agriculture. | 1.2 Analysis of 3 years agric.practice survey data; analysis of farmers' attitudes toward agroforestry, soil protection, use of manure. | 3 | 200,000 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 2: Generate technology to stabilize yields of sorghum** | | | |
| 2.1 Identify practices to reduce striga populations in rainfed sorghum. | 2.1 Long term trials and crop association trials. | 5 | 1,520,000 |
| 2.2 Identify viable practices to conserve soil moisture and fertility in rainfed sorghum. | 2.2 Cover crop screening and sorghum intercrop trials and alley cropping trial. | 8 | 1,920,000 |
| 2.3 Identify viable practices to conserve soil moisture in Mouskwari. | 2.3 Trials of mulch and plowing for moisture conservation. | 2 | 680,000 |
| Operation 3: Identify improved varieties, cropping patterns and soil moisture conservation techniques. | | | |
| 3.1 Assess yields, acceptability, and profitability of new sorghum, cowpea, peanut varieties under farmers' conditions. | 3.1 Regional tests of sorghum, and peanut varieties in E.N. and Mayo Louti. | 24 | 4,580,000 |
| 3.2 Assess yields acceptability and profitability of sorghum/ cowpea intercrops under farmers' conditions. | 3.2 Regional test of sorghum/cowpea association to increase grain production and combat striga. | 14 | 2.710,000 |
| 3.3 Assess performance and acceptability of improved land preparation techniques under farmers' conditions. | 3.3 Soil prep.methods traditional and improved systems; researcher/ farmer managed tests in TLU research villages. | 10 | 2.650,000 |
| 3.4 Monitor farmers preferences and utilization of IRA varieties. | 3.4 Retention survey of peanut varieties and minikit themes. | 2 | 300,000 |
| Operation 4: Identify low cost, practicable post harvest technologies for reducing grain losses. | | | |
| 4.1 Determine and assess profitability of improved storage techniques. | 4.1. Regional experiment on improved cowpea storage techniques in collaboration with IRA/ CRSP, SODECOTON and PNVFA. | 7 | 630,000 |
| **Operation 5: Disseminate knowledge of improved crop production** | | | |
| 5.1. Communicate findings to extension agents and farmers. | 5.1 Writing and disseminating working papers and extension leaflets, minikits tests. | 15 | 740,000 |

### 6.3.4 OTHER ACTIVITIES

**Institutional Development**

From 1991, TLU has arranged for the counterpart agronomist and economist to take more responsibility and play a major role in the planning, design, analysis, interpretation and reporting of research activities. They are assisted by the NCRE agricultural economist and systems agronomist who devote about 40% of his time to on-station technology development. The counterpart economist has gone for long term training (MSc) in the U.S. and one counterpart agronomist continues MSc training in Nigeria throughout 1992, leaving one counterpart agronomist on the team.

Training of extension personnel will continue through collaboration in on-farm tests and minikits. With SODECOTON, increasing numbers of AVA (Associations Villageoises Autogerees) will be involved. Training of PNVFA/MINAGRI subject matter specialists will continue on a monthly basis during the cropping season. Field days will be conducted by our PNVFA collaborators showing TLU tests.

**Consultancies**

IITA striga biologist is expected to visit on his own expense. Systems agronomist is planning interaction with IITA agroclimatologist for establishment of a geographically referenced set of climate and soils data.

**Conferences and Publications**

Counterpart agronomist planning on reporting results of past minikit themes at ASA conference. NCRE economist expects to attend Farming Systems conference.

Working papers on agricultural practices and adoption of improved technologies to be ready by May, 1992. Syntheses of past on-farm and on-station work on striga control (sorghum variety, herbicides, and cowpea association), and on improvement of moisture availability for rainfed and dry season sorghum will be prepared for scientific journals and for IRA technical bulletins. Minikit themes will be synthesized for IRA technical bulletins.

**Home Leave**

Systems agronomist in mid-July to mid-August; agricultural economist in early June to early July; and counterpart agronomist in August.

## 6.4 NKOLBISSON TLU

### 6.4.1 INTRODUCTION

The TLU's research goal and operations remain essentially unchanged for 1992. Among operations, however, there will be a substantial shift in emphasis. Primary emphasis will be given to: (a) identifying appropriate practices for enhancing and sustaining soil fertility, and (b) increasing farmers' knowledge about IRA varieties and technologies. Relatively minor investments will be made in screening additional new varieties. Generating information on farmer circumstances will be a middle level priority.

Differences in TLU operations will be reflected in a structural reorientation of TLU activities. Relative to previous years, the time and resources invested in research village testing will be reduced. Instead, there will be a substantial expansion of two new TLU activities.

The first will be on-station research, building on the former Lowland Maize Agronomy program. From now on, the TLU will closely integrate on-farm and on-station research, using on-station research for technology development and technical assessment, while best bet options are tested with farmers on their fields in order to evaluate adaptability and acceptability.

The second will be a regional testing and demonstration program in collaboration with MINAGRI. The TLU will work with 30 agricultural delegations throughout Center and South provinces, with approximately 16 test and demonstration plots being implemented in each delegation. Through this activity, hundreds of extension agents and thousands of farmers will be exposed to IRA maize, cassava and sweet potato varieties, as well as the TLU's tentative maize fertilization recommendation of 60 kg N/ha.

Farming systems diagnosis will focus on retention studies for measuring impact of improved maize varieties at the village level, and construct enterprise budgets for various crops at the household level.

### 6.4.2 CONSTRAINTS

As in previous years, TLU testing will address two primary food crop production constraints, namely, lack of improved cultivars adapted to farmer's conditions, soils with low nutrients. Both constraints relate to underlying problems of declining fallow and increased forest exploitation due to growing human population density. Efforts to identify solutions to the various technical production constraints are hampered by a poorly developed input distribution system and governmental budgetary problems.

## 6.4.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 1: Farming systems** | | | |
| 1.1. Provide information and identify research needs. | 1.1.1 Village-level resource management survey. | 5% | 500,000 |
| | 1.1.2 Farm input-output study | 10% | 2,000,000 |
| 1.2. Evaluate technology adoption and impact. | 1.2 Retention survey on improved maize nd cassava | 10% | 2,000,000 |
| **Operation 2: On-farm technology evaluation.** | | | |
| 2.1. Identify well-adapted and acceptable varieties. | 2.1.1 Farmer maize variety tests. | 2% | 350,000 |
| | 2.1.2 Farmer assessment surveys. | 3% | 350,000 |
| 2.2. Testing support for IRA researchers. | 2.2 Hybrid versus open-pollinated maize trial. | 5% | 700,000 |
| Operation 3: Technologies for sustainable Soil Improvement | | | |
| 3.1. Evaluate benefits from leguminous hedgerows. | 3.1.1 Cassia/food crop trial (on-station) | 2% | 1,000,000 |
| | 3.1.2 Establishment of Calliandra hedgerows | 5% | 850,000 |
| | 3.1.3 Monitoring of socio-economic aspects of agroforestry trials | 10% | 900,000 |
| 3.2. Identify species and practices for legume fallow. | 3.2.1 Sesbania and Mimosa fallow management | 2% | 1,000,000 |
| | 3.2.2 Maize-Cajanus cajan fallow test | 5% | 350,000 |
| | 3.2.3 Groundnut-Crotalaria-Desmodium fallow test. | 1% | 250,000 |
| 3.3. Finalize maize fertilization recommendation | 3.3 Regional maize fertilization tests for urea and 20-10-10 | 10% | 2,000,000 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 4. Dissemination and extension Liaison** | | | |
| 4.1. Validate on-farm test results | 4.1.1 Regional varietal testing program. | 10% | 2,000,000 |
| | 4.1.2 Harvest cassava from 1991 regional varietal testing program. | 7% | 800,000 |
| 4.3. Provide materials to farmers. | 4.3.1 Regional adoption plots. | 5% | 800,000 |
| | 4.3.2 Pilot village-level Calliandra and Lueaena seedlings multiplication. | 3% | 350,000 |
| 4.4. Train MINAGRI personnel | 4.4. Training sessions for regional tests and demonstrations. | 5% | 800,000 |

### 6.4.4 OTHER ACTIVITIES

**Institutional Development**

Institutional development will continue through in-service training of IRA scientists and technicians. One or two TLU counterparts will participate in short term training courses at IITA, Ibadan. Close collaboration will be maintained with IRA/Nkolbisson Center's Maize Program, Roots & Tubers Program and ICRAF project. The TLU will provide technical support to TLUs at IRA/Bertoua and IRA/Ngaoundere funded by World Bank.

The primary TLU coordination activity will be organization of a third TLU workshop. The main theme for the workshop will be "Measuring Research Impact". The coordinator will travel to each TLU site to review research progress and methodology, and develop research priorities for the final two years of NCRE's third phase.

**Conferences and Publications**

Drs. Poku and Moussie are planning to attend the AFSRE Symposium in which they will present papers. Dr. Poku will summarize and publish TLU's past research results. Dr. Moussie will travel to the U.S. with NCRE's Chief of Party to present a paper on NCRE/TLU's experience in pre-extension activities at the "Extension & Communication Symposium", Ohio State University.

**Home Leave**

Drs. Poku and Moussie will take home leave in June and July, respectively.

# 7. ECONOMIC ANALYSIS UNIT

## 7.1 INTRODUCTION

The function of the Economic Analysis Unit (EAU) is to provide IRA with a capacity for economic analysis relative to its research and development mandate. Project support is being given for establishment and operation of an Economic Analysis Unit in recognition of the challenges being faced by IRA as a result of Cameroon's on-going economic crisis and structural adjustment.

The goal of the Economic Analysis Unit is to increase IRA's research efficiency, productivity and impact. The top priority of the unit is carrying out economic studies for institute-level priority setting and programming and for measuring research benefits. To complement its own studies, the EAU assists IRA researchers through research collaboration, advisory services and training.

## 7.2 CONSTRAINTS

Revitalization, diversification and expansion of the agricultural sector is essential for Cameroon's economic recovery. IRA has a crucial role to play in stimulating agricultural productivity growth, as is outlined in its Performance Contract with the Government. Unfortunately, IRA does not have an institute-level economic analysis capacity for evaluating policy-research linkages, assessing research priorities, or measuring research benefits. The Economic Analysis Unit was created to alleviate this critical constraint on IRA's institutional performance and sustainability.

## 7.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| Operation 1: Analyze economics of IRA research. | | | |
| 1.1. Evaluate policy and other factors affecting technology demand. | 1.1.1 Resource management survey. | 13 | 2.270,000 |
| | 1.1.2 CAPP collaborative studies.[c] | 8 | 420,000 |
| 1.2. Determine research priorities. | 1.2.1 IRA priority setting study. | 10 | 1.695,000 |
| 1.3. Appraise research benefits. | 1.3.1 TLU rates of return study. | 12 | 845,000 |
| | 1.3.2 Research evaluation workshop. | 5 | 1.195,000 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 2: Institute economic analysis support services.** | | | |
| 2.1. Help IRA researchers with research budgeting and analysis. | 2.1.1 Design and analysis advisory service. | 2 | 320,000 |
| | 2.1.2 Research budgeting guidelines. | 2 | 195,000 |
| | 2.1.3 Statistics workshops. | 4 | 295,000 |
| 2.2. Provide support to IRA Research Services. | 2.2.1 IRAMIS implementation. | 9 | 1.545,000 |
| | 2.2.2 IRA contract requirements. | 8 | 145,000 |

Provisionally to include: (a) general equilibrium analysis of relationships between structural adjustment, technology demand, technical change on food security and household income; and (b) sub-sector studies linkage policy reform, technological change and commodity comparative advantage.

## 7.3 OTHER ACTIVITIES

### Institutional Development

The EAU is organizationally located in the Research Division of IRA's Directorate, and essentially all of the unit's activities are focused on institutional development. Some of the most important activities in 1992 will be an institute-level priority setting study, work on revision of IRA's Performance Contract, completion of a management information system (IRAMIS) for research programming, and assistance in designing phase two of the World Bank research project.

### Consultancies

The unit has no budget for an in-country consultancy. However, it would be extremely useful to consult with ISNAR specialists in The Hague on priority setting, research programming and impact measurement methods for Cameroon. This consultancy could be arranged to coincide with other international travel in order to reduce cost.

### Conferences and Publications

Two conference papers are planned. One is a paper on economic models and assumptions underlying on-farm adaptive research, to be presented by (Michigan State University) co-author at a CIRAD conference in Mexico. The second paper will address research policy-development linkages, to be presented at the AFSRE symposium.

Five publications stemming from TLU work are in various stages of completion. Two papers written last year are being revised for journal publication. A third article, on fertilizer research, is at first draft stage. In addition, two monographs are planned for the RCMD series, one covering Nkolbisson TLU's maize and cassava research, 1986-1991, and the other on the NCRE/TLU experience in creating a national farming systems program.

If time allows, an effort will be made to initiate and edit a farming systems monograph series for IRA. There are already 20 TLU monographs which should be edited, printed and distributed.

## Home Leave

Home leave is tentatively scheduled for 27 June through 8 August.

# 8. SOIL/AGROFORESTRY

## 8.1 INTRODUCTION

The purpose of this program is to use agroforestry and improved fallow techniques to conserve soil fertility for sustained crop production. In collaboration with project staff and other researchers in-country, the following activities will be undertaken:

1) Evaluation of selected woody leguminous species for soil fertility management in agroforestry systems.

   1.a. Stimulation of growth and productivity of Leucaena leucephala with manure.

   1.b. Response of selected species to repeated pruning.

   1.c. Alley cropping for soil fertility management.

   1.d. Comparison of simultaneous fallow with calliandra and Tephrosia.

   1.e. Decomposition and nutrient release patterns from biomass of shrub legumes.

   1.f. Agroforestry for soil conservation: prototype trials at MIDENO TDC's and farm fields.

2) Evaluation of herbaceous legumes for use as sources of nitrogen in improved fallow systems.

   2.a. Screening of indigenous species for soil fertility improvement.

   2.b. Nitrogen contribution of Tephrosia and Crotalaria.

   2.c. Crop response to P fertilization under improved fallow management.

   2.d. Examination of residual effect of screening trial begun in 1991.

   2.e. Comparative studies on short and long term fallow with Cajanus cajan; begun in 1991.

## 8.2 CONSTRAINTS

Socio-political uncertainties make planning difficult.

## 8.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| 1. Shrub Evaluation. | | | |
| 1.1 Stimulation of growth and productivity and of leucaena with manure. | 1.1 Identify method of Leucaena establishment on poor soils. | 7.5% | 955,212 |
| 1.2 Response of selected species to repeated pruning. | 1.2 Information of coppicing ability of shrubs. | 5% | 569,737 |
| 1.3 Alley cropping for soil fertility management. | 1.3 Yield sustainability with Alley cropping. | 15% | 1,909,424 |
| 1.4 Comparison of simultaneous fallow with Calliandra and Tephrosia. | 1.4 Suitable fallow management with perennial and bi-annuals. | 7.5% | 754,000 |
| 1.5 Decomposition and nutrient release pattern from biomass. | 1.5 Information on proper management of agroforestry species. | 10% | 1,189,475 |
| 1.6 Agroforestry for soil conservation a prototype trials at TDC's and farm fields. | 1.6 Exposure of agroforestry technologies to extension agents and farmers. | 15% | 1,509,000 |
| 2. Evaluation of herbaceous legumes | | | |
| 2.1 Screening of indigenous species for soil fertility improvement. | 2.1 Identification of suitable local species for different eco-zones. | 10% | 1,089,475 |
| 2.2. N contribution of Tephrosia and Crotalaria. | 2.2 Management option for Tephrosia and Crotalaria improved fallow. | 10% | 1,178,950 |
| 2.3 Crop response to P fertilization under improved fallow management. | 2.3 Reduced fertilizer requirement with green manuring. | 10% | 1,100,000 |
| 2.4 Examination of residual effect of screen trial begun in 1991. | 2.3 Reduced fertilizer N requirement with green manuring. | %5 | 639,474 |
| 2.5 Comparative studies on short and longterm fallow with Cajanus, begun 1991. | 2.4 Management systems for Cajanus used as improved fallow. | 5% | 500,000 |

## 8.4 OTHER ACTIVITIES

### Institutional Development

Research linkages will be established between the agroforestry unit and IRZ, ICRAF, ILCA, NFTA, MIDENO and PASAT.

### Consultancies

The agroforestry unit will need the expertise of the IITA Microbiologist, Dr. K. Mulongoy

### Conferences and Publications

Agronomy Meetings in the USA with a counterpart. A paper will be presented on the Characterization of Soils in the North-West Province.

### Home Leave:

Dr. Yamoah will take home leave around the third week of December.

# 9. GRAIN LEGUME

## 9.1 INTRODUCTION

Grain Legume (Cowpeas) are important crops in northern Cameroon. They are grown by small farmers and mostly in intercropping with cereals. Cowpea is a cheap source of protein and is consumed in various ways (dry seed, green leaves, green pod), for human consumption and fodder for animal feed. During the early stages of cowpea research in Cameroon, emphasis has been put on pest management, and yield losses have been established, effective storage methods recommended, resistant varieties to storage insects pests developed.

The new approach of the Grain Legume Unit of the NCRE is to develop a broad base system of research on cowpea and minor activity on other legumes. In addition to breeding for storage insect pests resistance, emphasis will be put on other aspect such as:

- Diseases (virus) and parasitic weed (striga)
- Dual purposes (grain + fodder)
- Seed quality (color, size)
- Field insect pests

## 9.2 CONSTRAINTS

The major cowpea production constraints can be summarized as follows:

Insect pests during vegetation and storage, Lack of improved and adapted varieties, Diseases, Inconsistent rainfall, Low soil fertility in some areas, Poor crop management, Parasitic weed (striga) in some areas, Inadequate marketing system.

## 9.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| Operation 1. Identify high yielding and adapted varieties | | | |
| 1. Identification of good performing varieties of cowpea and soybeans | 1.1 On-station testing of different varieties of cowpea and soybean | 8.6% | 904,210 |
| | 1.2 Multilocation testing of best per-forming varieties of cowpea previously identified. | | |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 2. Evaluation of germplasm and varietal development** | | | |
| 2.1 Maintain a working collection for selection of parents for varietal trial or hybridization. | 2.1 Testing of new introductions along with the best per-forming lines of the previous test. | 14.2% | 1,479,028 |
| 2.2 Develop new varieties. | 2.2. Crossing of improved lines with selected locally adapted lines and advancing generations. | | |
| 2.3. Assess the importance of other legumes in Northern Cameroon. | 2.3. Survey in few villages during the cropping season in collaboration with TLU and development agents. | | |
| Operation 3. Evaluation of cowpea genotype under different cropping systems. | | | |
| 3.1 Identification of good performing genotype under low insecticide application. | 3.1. Testing of genotype in combination with chemical treatment. | 20% | 2,068,852 |
| Operation 4. Evaluation of cowpea line for resistance to Striga and virus. | | | |
| 4.1. Identify sources of resistance under natural infestation. | 4.1. Field testing of selected lines on striga sick plot. | 25.4% | 2,650,700 |
| | 4.2. Field screening of selected lines under natural virus infestation at a known virus hot spot. | | |
| **Operation 5. Varietal purification and seed multiplication.** | | | |
| 5.1. Purify the released varieties. | 5.1. Plant to row evaluation of the selected planted in 1991. | 31.8% | 3,297,210 |
| 5.2. Make seed available for multilocation test or on-farm test. | 5.2. On-station seed multiplication of selected varieties. | | |

## 9.3 OTHER ACTIVITIES

### Institutional Development

- On the job training of field technicians and counterparts
- One technician will be identified to participate in IITA/GLIP training course.
- Continue collaboration with development agents through TLU
- Continue collaboration with other IRA researchers.
- Collaborate with regional research Network (e.g. RENACO).

### Consultancies

Backstopping from IITA will be needed in the following areas:

- Breeding, in order to provide advice on selection of adapted varieties of cowpea and soybean.
- Pathology and virology, in order to provide advice on the identification of the major diseases.
- Entomology in order to provide advice on the assessment of insect pests especially in the management of minimum insecticide trials.

### Conferences and Publications

In 1992 we are planning to participate in the following activities.

- IRA/North annual planning meeting
- IITA Wide Work planning week for 1992
- Meetings of the crop improvement working group
- Prepare technical note on the varietal characteristic of two cowpea varieties VYA and BR1 within the crop improvement group

### Home Leave

Dr. J. Detongnon will take home leave from mid July to mid August.

# 10. ADDITIONAL RESEARCH SUPPORT ACTIVITIES

## 10.1 MAIZE PATHOLOGY

### 10.1.1 INTRODUCTION

The Plant Pathology Unit at Bambui (PPB) has responsibilities to identify maize, sorghum and millet diseases in their growing zones, and to assess the importance of these diseases in collaboration with the maize, sorghum and millet improvement teams and develop varieties and/or cultural practices to control disease in collaboration with the agronomy teams. The unit is based at Bambui and covers all the agroecological zones where these three commodities are grown.

The goal of PPB is to enhance production of maize, sorghum, and millet in Cameroon by reducing yield losses due to diseases through development of resistant/tolerant genotypes and or appropriate cultural practices. Source of resistance to some of the main diseases have been identified, through adequate field screening techniques and incorporated into selected genotypes or elite lines.

**Strategic Approach**

The Pathology Unit research activities is targeted towards main agro-ecological zones in which maize sorghum, and millet are grown. After setting priorities in term of diseases incidence and severity in each agro-ecological zones, the PPB, as from 1987, started screening varieties/lines for resistance to major diseases such as blights and rusts. Research was concentrated on the search for sources of resistance and severity of new diseases.

Activities in 1991-1994 will be focussed on the development of resistant varieties to blights, leaf sports, and stalk and ear rots. The understanding of the biology of rusts will be emphasized. Epidemiology of smuts, downy mildew, and dead heart will be initiated for both maize and sorghum.

### 10.1.2 CONSTRAINTS:

As the previous years, one of our major problems is personnel shortage and restricted budget. For 1992 the Unit will be made up a Pathologist, a technician and a laboratory attendant. The laboratory is also operating without green house.

### 10.1.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| 1. Population improvement and development of resistant varieties. | | | |
| 1.1 Appropriate generation for selection to rusts and blights. | 1. Reactions of entries to major diseases. | 50% | 3,000,000 |
| 1.2 Contribution of locals to resistance in improved varieties. | | | |
| 2. Monitoring new diseases and study of diseases and pathogens biology. | | | |
| 2.1 Survival of pathogens. | | 50% | 2,500,000 |
| 2.2 Design of control strategies. | | | |

### 10.1.4 OTHER ACTIVITIES

#### Institutional Development

We hope that on-the-job-training of project staff will continue. We would like to send our technicians to short term training at IITA or ICRISAT to get acquainted with some laboratory techniques on sorghum and maize pathology. There is also a need to train more cereals pathologists at the Ph.D. level for lowland and for the soudano-Sahelian zones.

#### Consultancies

Dr. L. Mughogho, the principal Plant Pathologist at ICRISAT, India, and Dr. Kitty Codwell the IITA Maize Program Pathologist are willing to visit the NCRE pathology unit. This visit will provide a backstop for the pathology assessments and maintain the collaboration between IRA/NCRE and other International Institutions.

#### Conferences and Publications

The pathologist intend to attend the APS annual meeting in the USA, the CBS conference in Douala. We would also like to visit the sorghum and millet improvement at ICRISAT, INDIA in July this year.

## 10.2 HIGHLAND CEREALS ENTOMOLOGY

### 10.2.1 INTRODUCTION

During 1992, the cereals entomology unit based in Dschang will continue to conduct storage experiments aimed at recommending storage methods that reduce grain storage losses to the barest minimum. The efficacies of the use of grain storage insecticides on maize stored in peasant farmers popular storage methods will be tested. Monitoring of maize storage losses over the storage period in randomly selected peasant farmers' stores in some areas of North West and West Provinces will be carried out in collaboration with the TLU research team of NCRE/IRA Bambui and the Provincial Delegation of Agriculture in Bafoussam.

Screening of natural plant materials for use as insecticides proposed since 1987 will be started and screening of rice varieties for resistance to stem borers will be continued.

### 10.2.2 CONSTRAINTS

Several researchers (in NCRE and Dschang University Center) and some foreign aided organizations (such as UNDP Food loss assessment and Prevention Project in Bamenda, PAFSAT in Bamenda and RTC Mfonta) are interested in various aspects of post harvest grains systems and have budgets for some operations on the subject but there is not enough coordination of efforts. It is necessary for all the above mentioned to meet with the IRA cereals entomologists and agree on a program of work (Research and Extension) on the subject. The researchers (the cereals entomologist) need more technical staff and a vehicle attached to the section for effective execution of the proposed work plan. Several essential laboratory equipment requested since 1986 have not been received. This makes laboratory work difficult and certain aspects of grain analyses cannot be done.

### 10.2.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| Operation 1: Identify the use of natural plant materials by farmers for grain storage pest control. | | | |
| 1.1. Document plants and their products presently used by farmers for stored grain pest control. | 1.1. Design farmer's questionnaires, contact TLU's and Agric. Extension agents to help in completing the information. | 10% | 790.000 |
| 1.2. Identify the plants and parts used. | 1.2. Visit the farmers who use the plant materials and collect specimens for laboratory identification. | 20% | 1,627,272 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 2 : Identify grain post harvest losses associated with each storage method and agro-ecological zone.** | | | |
| 2.1. Document the major grain storage methods in the various areas | 2.1 Collaborate with TLUs and extension agents to visit and describe various barns. | 7% | 610,909 |
| 2.2. Quantify losses associated with each storage method and recommend improvements. | 2.2. Monitor barns of stratified random samples of farmers over the traditional storage period. | 10% | 687,273 |
| 2.3. Document stored grain insect species and their intensities. | 2.3. Identify insect species present in each barn sample. | 3% | 152,727 |
| Operation 3: Identify sources of stored grain insect pest resistance from the major grains at various ecological zones. | | | |
| 3.1 Identify maize varieties which show resistance to mevils and other storage grain pests. | 3.1. Some 200 maize breeders' lines will be stored in Bambui, Mfonta and Foumbot for 3 monthly evaluations. | 15% | 866,364 |
| 3.2. Conduct laboratory screening of Rice and Sorghum varieties for meevil resistance. | 3.2. Raise cultures of Rice meevils in lab and collect Rice and Sorghum varieties from breeders for screening. | 5% | 305,455 |
| Operation 4: Survey rice field insects and identify rice varieties resistant to rice stem borers. | | | |
| 4.1. Document insects present in rice fields in different rice ecologies. | 4.1. Organize sweepnet and light trap collections from various fields for identification. | 10% | 610,909 |
| 4.2. Identify rice varieties resistant to stem borers. | 4.2. Establish rice stem borer nurseries at various ecological zones. | 10% | 610,909 |
| Operation 5: Test the efficacy of stored grain insecticides on maize under major traditional storage methods and suitability of plastic cans for storage of high and low moisture maize. | | | |
| 5.1. Test the efficacy of popular grain storage insecticides on maize under two different methods. | 5.1. Four maize varieties stored with and without husks were treated with SOMICOMBI and SOFAGRAIN to be evaluated at 3 monthly intervals. | 7% | 22,909 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| 5.2. Test the suitability of plastic cans with tightfitting lids for high and low moisture maize storage. | 5.2. Threshed maize of 3 moisture contents (20.3% , 17.4% and 13.9%) was stored in 25 liter plastic cans on the 12/11/90 for the 1st 2mcs and on 11/01/91 for the 3rd mc respectively. | 3% | 15,273 |

### 10.2.4 OTHER ACTIVITIES

**Institutional Development**

Its highly expected that a new 4 WD vehicle and more technical staff will be assigned to the unit to enable the nation wide survey planned. The essential equipment ordered since 1990 will facilitate the required observations of the various research operations.

Construction of several compartmented metallic cages for choice test' method of grain screening for insect resistance and the purchase of several jars for 'No choice test method will be necessary.

**Conferences and Publications**

Under the Regional Research Project for Maize and Cassava (RRPMC) one or two exchange visits will be made to some of the participating countries and also attend conferences planned by IITA for the project. It is hoped that the Rice Bulletin and Maize growers' Handbook will be published during 1992'.

**Home Leave** : 30 days late March to Mid April, 1992.

## 10.3 LOWLAND CEREALS ENTOMOLOGY

### 10.3.1 INTRODUCTION

The major objective of the unit will continue to be the search for an integrated approach to control of Lepidopterous field maize borers, the number one constraint to maize production in the lowland forest ecology.

Extensive monitoring (both on-station and on-farm) during the past two years in the Nkolbisson TLU mandated area has given an insight into the relationship between incidence and losses, distribution and species composition across some locations. Because of the wide variability in the intensity of these pests problems across locations even within same agroecology, there will be a change in the methodology to develop control measures. Rather than work in one location, population surveillance especially in farmers' fields will be used to tailor research activities to suit the needs of farmers in each ecological zone.

After on-farm assessment (for quickest impact) of some chemical control options, tentative recommendations are; marshall seed treatment for the transition zone and carbofuran for the forest zone. Emphases will now be placed on two components of sound and sustainable approach to borer control: namely the search for resistant varieties as well as biological control using natural enemies. Ms. Ndemah will take the lead in biological control using natural enemies together with monitoring (Operations 1 and 2) while Mrs. Aroga will be incharge of developing sources of resistance and cultural practices (operation 3 and 4).

### 10.3.2 CONSTRAINTS

The two greatest constraints facing the unit are lack of personnel and equipment (laboratory and vehicle). The unit is mandated to cater for the entomology needs of the lowland ecology of which in 5 provinces Lepidopterous borers are the number one constraints to maize cultivation especially during the second cropping season. Paradoxically it is during this season that forest zone farmers have the sole advantage of growing an additional crop over their savanna counterpacts and the price of fresh maize is higher. There are two intermediate level (M.Sc) entomologists; Mrs. Aroga and Ms. Ndemah, with one technician attached to Mrs. Aroga.

The second constraint is the lack of facilities for mass rearing of insects needed for effectively screening varieties for resistance and studying pest/natural enemy relationships. The monitoring activities in particular need frequent and extensive travelling but at the moment, the unit has not got a vehicle of its own.

## 10.3.3 WORKPLAN TABLE

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| **Operation 1: Maize-borer Monitoring** | | | |
| 1.1 Provide baseline information on incidence, severity and losses. | 1.1 Extensive sampling in farmers fields in Ekona and Nkolbisson TLU mandated area (2nd season 1992 only). | 20% | 591,608 |
| 1.2 Develop decision tools to be used by farmers as basis for applying control measures. | 1.2 & 1.3 Intensive samplings to characterize the relationship between yield and borer infestation (both 1st and 2nd seasons in 5 locations). | 30% | 525,874 |
| 1.3 Find out which crop growth stage is most vulnerable in each ecological zone. | | | |
| 1.4 Diagnose factors affecting incidence of Musidia in the transition zone. | 1.4 Sampling in farmers' fields as from anthesis | 5% | 164,336 |
| Operation 2: Biological Control using natural enemies | | | |
| 2.1 Diagnose the role of natural enemies in suppression of pest populations. | 1.2 Monitor and document incidence of natural enemies on maize across locations. | 15% | 328,671 |
| 2.2 Develop a list of alternate host plants to establish their role as sources of infestation and refuge for natural enemies. | 2.2 Sampling and identification of various native grass hosts of borers. | 15% | 558,742 |
| 2.3 Assess the selectivity of insecticides vis-a-vis natural enemies in farmer's fields. | 2.3 Samplings in treated and untreated plots. | 10% | 230,070 |
| Operation 3: Developing sources of resistance | | | |
| 3.1 Studies on pest biology. | 3.1 Study of the life cycle of B. fusca, S. calamistis and E. saccharima. | 20% | 295,804 |
| | 3.2 Study of distribution of species in different localities. | 10% | 262,937 |
| | 3.3 Study of yield loss due to attacks of borers. | 10% | 246,506 |

| Objectives | Activities | Time | Budget |
|---|---|---|---|
| 3.2 Identification of some resistance varieties. | 3.2 Test of varieties with respect to attacks under natural and probably artificial infestation. | 25% | 525,874 |
| Operation 4: Cultural practices | | | |
| 4.1 Identify and compare impact of various field management practices on stem. borers population dynamic. | 4.1 Study the influence of intercropping maize and groundnut or cassava on stem borers attacks. | 25% | 525,870 |
| | 4.2 Trials on the influence of soil fertilization on attack. | 10% | 246,505 |
| Operation 5 : Chemical control | | | |
| 5.1 Identify cost-effective rates for quickest impact. | 5.1 Repeat the on-farm marshall seed treatment trial carried out in 1991. | | 197,203 |
| 5.2 Carbofuran residue analysis in harvested crop from insecticide treated plots. | 5.2 Send samples for chromatography. | | |

## 10.3.4 OTHER ACTIVITIES

### Institutional Development

- Ms Ndemah intends to spend 2 weeks at the IITA Biological Control Programme in Cotonou (Benin).

### Consultancies

- Ms Ndemah is requesting the IITA maize entomologist (Dr. N.A. Bosque Perez) to attend the NCRE planning meeting in May, during which she will review the activities of the unit

- Mrs. Aroga is requesting a consultant from Prof. Z. T. Dabrowski (ICIPE) preferably.

### Conferences and Publications

Ms Ndemah is planning to publish an article on the Importance of Leidopterous borers to maize production in Southern Cameroon.

Mrs. Aroga is planning to publish three articles and one "fiche technique".

## 11. LIST OF NCRE RESEARCHERS

### 11.1 International Staff

| Name | Title | Unit |
|---|---|---|
| 1. Dr. Emmanuel A. Atayi | Chief of Party | NCRE-Nkolbisson |
| 2. Dr. Thomas C. Stilwell | Deputy Chief of Party | NCRE-Nkolbisson |
| 3. Mr. Gregory Servant | Administrative Officer | NCRE-Nkolbisson |
| 4. Dr. John Poku | Systems Agronomist | NCRE-Nkolbisson |
| 5. Dr. Doyle Baker | Agricultural Economist | NCRE-Nkolbisson |
| 6. Dr. Menwuyellet Moussie | Agricultural Economist/ TLU Coordinator | NCRE-Nkolbisson |
| 7. Dr. Noel Beninati | Maize Breeder | NCRE-Bambui |
| 8. Mr. Dermot McHugh | Agricultural Economist | NCRE-Bambui |
| 9. Dr. Charles Yamoah | Soils/Agroforestry Specialist | NCRE-Bambui |
| 10. Dr. Olumuyiwa Osiname | Systems Agronomist | NCRE-Bambui |
| 11. Dr. Henri Talleyrand | Cereals Agronomist | NCRE-Garoua |
| 12. Dr. Humphrey Ezumah | Systems Agronomist | NCRE-Ekona |
| 13. Dr. Robert Carsky | Systems Agronomist | NCRE-Maroua |
| 14. Dr. Mulumba Kamuanga | Agricultural Economist | NCRE-Maroua |
| 15. Dr. Jean Detongnon | Legume Specialist | NCRE-Maroua |

### 11.2 National Counterparts
#### 11.2.1 In Country

| Name | Title | Unit |
|---|---|---|
| 1. Dr. Jacob Ayuk-Takem | Maize Breeder/Director | IRA-Nkolbisson |
| 2. Mr. Michel Ndoumbe | Systems Agronomist | TLU-Nkolbisson |
| 3. Mr. Kaho Francois | Systems Agronomist | TLU-Nkolbisson |
| 4. Mr. Augustin Fouaguegue | Agricultural Economist | TLU-Nkolbisson |
| 5. Dr. Charles Thé | Maize Breeder | Maize Breeding-Nkolbisson |
| 6. Mr. Celicard Zonkeng | Maize Breeder | Maize Breeding-Nkolbisson |
| 7. Mr. Jean-Bosco Zangue | Maize Breeder | Maize Breeding-Nkolbisson |
| 8. Mr. Roger Nkoa | Maize Breeder | Maize Breeding-Nkolbisson |
| 9. Mrs. Regine Aroga | Entomologist | Entomology-Nkolbisson |
| 10. Miss Ndemah Rose | Entomologist | Entomology-Nkolbisson |
| 11. Dr. Edward Ngong-Nassah | Systems Agronomist | IRA Foumbot |
| 12. Mr. Marc Samatana | Agricultural Economist | TLU-Bambui |
| 13. Mr. Francois Meppe | Systems Agronomist | TLU-Bambui |
| 14. Mr. Jean Enam | Agricultural Economist | TLU-Bambui |
| 15. Mr. Christopher Ngong | Agronomist | Agroforestry-Bambui |
| 16. Mr. Martin Nguegum | Agronomist | Agroforestry-Bambui |
| 17. Dr. Pierre Tchamo | Maize Breeder | Maize Breeding-Bambui |
| 18. Mr. Isidore Tabi | Maize Breeder | Maize Breeding-Bambui |
| 19. Mr. Zachee Ngoko | Plant Pathologist | Plant Pathology-Bambui |

| Name | Title | Unit |
|---|---|---|
| 20. Mr. Pascal Ngninbeyie | Rice Breeder | Rice Program-Dschang |
| 21. Mr. Cletus Asanga | Entomologist | Entomology-Dschang |
| 22. Dr. Manfred Besong | Agricultural Economist | TLU-Ekona |
| 23. Mrs Christine Poubom | Systems Agronomist | TLU-Ekona |
| 24. Mr. Mboussi A.Messia | Systems Agronomist | TLU-Ekona |
| 25. Mr. Martin Fobasso | Systems Agronomist | TLU-Maroua |
| 26. Mr. Endondo Chevalier | Legume Agronomist | Grain Legumes-Maroua |
| 27. Mr. Fokou Joseph | Rice Agronomist | Rice Program-Maroua |
| 28. Mr. Richard Kenga | Sorghum Breeder | Sorghum Breeding-Maroua |
| 29. Mr. Jacques Beyo | Sorghum Breeder/Entomol. | Sorghum Breeding-Maroua |
| 30. Mr. Andre Djonnewa | Sorghum Breeder | Sorghum Breeding-Maroua |
| 31. Mr. Blaise Mongmong | Maize Breeder | Maize Breeding-Garoua |
| 32. Dr. Julius Takow | Soil Scientist/Rice Agron. | Rice Program-Garoua |

### 11.2.2 National Counterparts In Training

| Name | Title | Unit |
|---|---|---|
| Miss Pauline Zekeng | Systems Agronomist | TLU-Nkolbisson/Michigan State |
| Mrs. L.A. Enyong | Systems Agronomist | TLU-Nkolbisson/Virginia Poly |
| Mr. Georges Dimithe | Agricultural Economist | TLU-Nkolbisson/Michigan State |
| Miss Mankolo Regine | Systems Agronomist | TLU-Nkolbisson/Virginia Poly |
| Mr. Pierre Boumtje I. | Agricultural Economist | TLU-Nkolbisson/Univ. Illinois |
| Mr. Blaise Aubin Nguimgo | Systems Agronomist | TLU-Nkolbisson/Univ. Nebraska |
| Mr. Jacob Eta-Ndu | Maize Breeder | Maize Breeding-Bambui/U.Minesota |
| Mr. Mbassa Ndioro | Maize Breeder | Maize Breeding-Bambui/U.Minn. |
| Mr. Claude Nankam | Plant Pathologist | Plant Pathology-Bambui/Univ. Ill. |
| Mr. Fabien Jeutong | Rice Breeder | Rice Program-Dschang/Univ. Nebraska |
| Mr. Birang a Madong | Rice Breeder | Rice Program-Dschang/Univ. Arkansas |
| Mrs. Comfort Ateh | Systems Agronomist | TLU-Ekona/Wisconsin State Univ. |
| Mr. Ranava Ndikawa | Systems Agronomist | TLU-Maroua/Ahmado Bello Univ. |
| Mr. Charles Njomaha | Agricultural Economist | TLU-Maroua/Oklahoma State Univ. |
| Mr. Titus Ngoumou | Cereals Agronomist | Cereals Agronomy-Garoua/Cor. Univ. |
| Mr. Anatole Ebete | Cereals Agronomist | Cereals Agronomy-Garoua/Mississipi |