

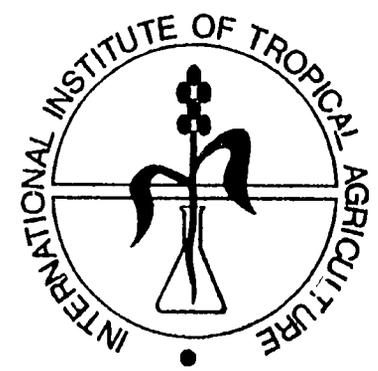
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REPUBLIC OF CAMEROON  
MINISTRY OF SCIENTIFIC AND  
TECHNICAL RESEARCH  
(MRST)  
INSTITUTE OF AGRICULTURAL RESEARCH  
(IRA)

# National Cereals Research and Extension Project (NCRE)

SEMI-ANNUAL REPORT

1992



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

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## Executive Summary

Administration processed the receipt of new vehicles and the depart of long term trainees to the USA and Nigeria. A new NCRE brochure was completed. Computer training was done with the assistance of ODA technicians. The IITA Internal Audit completed review of project activities.

The Highland Maize Breeding Unit planted maize in 1992 at five locations in the Adamawa, West and Northwest Provinces including variety and hybrid trials, nurseries for population improvement and inbred line development and isolated plots of breeder's seed. Successful harvest of this season's crops will largely depend on a resolution of the IRA workers strike.

During the first 7 months of the 1992 cropping season the lowland maize breeding program planted, maintained and harvested 95 evaluation trials in 7 forest locations. In the savanna zone, 117 trials are being maintained. Screening for striga and borer tolerance were intensified.

The Rice Program harvested second season agronomic and breeding experiments in Maga, Yagoua, Lagdo, Santchou and Ndop. Preliminary screening sets, observational nurseries, replicated yield trials and agronomic experiments were conducted at the various locations (Maroua, Garoua, Dschang and Ndop) during the first season of 1992 in conformity with the work plan.

The Cereals Agronomy Unit at Garoua devoted a significant amount of time to develop the IITA/IRA/NCRE Striga Research Farm at Bokle and to make it operational this year. We have prepared and implemented most of our 1992 workplan. The main research themes are related to conservation farming technology, use of soil improving legumes and integrated Striga management. A set of 15 on-farm experiments and 19 tests are being conducted this cropping season. We have helped organize one workshop on computer and statistical software and 3 technical meetings. Two "fiches techniques" on maize were prepared and distributed to many extension agents and farmers.

Sorghum Breeding activities proposed for 1992 cropping season have been implemented. All trials planted have had good establishment because of adequate rains received so far. Four entomology trials have been sown. Emphasis is toward screening for resistance to sorghum midge, *Contarissia sorghicola*. This resistance will be transferred into high yielding varieties and hybrids. ICRISAT has achieved considerable success in breeding improved varieties with high levels of midge resistance. But the improved varieties derive their resistance from only one resistance source, DJ 6515, so that the genetic base of their midge resistance is very narrow. We aim to give emphasis on genetic diversification of sources of midge resistance.

The Bambui TLU carried out an ambitious on-station and on-farm trials and survey program, in spite of conditions that might have warranted a scaling back of operations. A serious IRA workers strike obstructed work for periods of weeks at a time. Nevertheless, most of the planned work was successfully implemented, albeit many results may be lost due to the inability of staff to follow-up in a timely manner.

Ekona TLU activities for 1992 have addressed soil fertility, crop varieties, seeds, labor, technology impact. Component technology evaluation and agroforestry have received particular emphasis. TLU has made its impression in the Littoral Province this year with the just finished agroforestry survey. Data collection and analysis have progressed well and results continue to show superiority of improved technologies over local.

Maroua TLU emphasis on technology transfer is discernable in the 1992 season's relative proportions of diagnostic studies versus on-farm minikit tests and the reduction of the scope of on-station research activities under the responsibility for the systems agronomist. A new area of collaboration has opened up the MINAGRI National Extension and Training Program as 50% of the regional tests are now conducted with the supervision of PNVFA agents. In general progress is good. The station trials, on-farm regional tests and minikits were planted by late August despite a 2 week strike early in June by IRA workers.

The Nkolbisson TLU has continued to emphasize agroforestry and planted fallow research for maintaining and improving soil fertility. Particular attention is being given to determine labor requirements of the newly introduced system (alley cropping) in relation to traditional practices. The TLU has also increased its emphasis on impact studies of NCRE/IRA technologies already diffused in the mandate area. Dissemination of technologies to farmers is expected to improve as the TLU increases interaction between TLU researchers and extension agents.

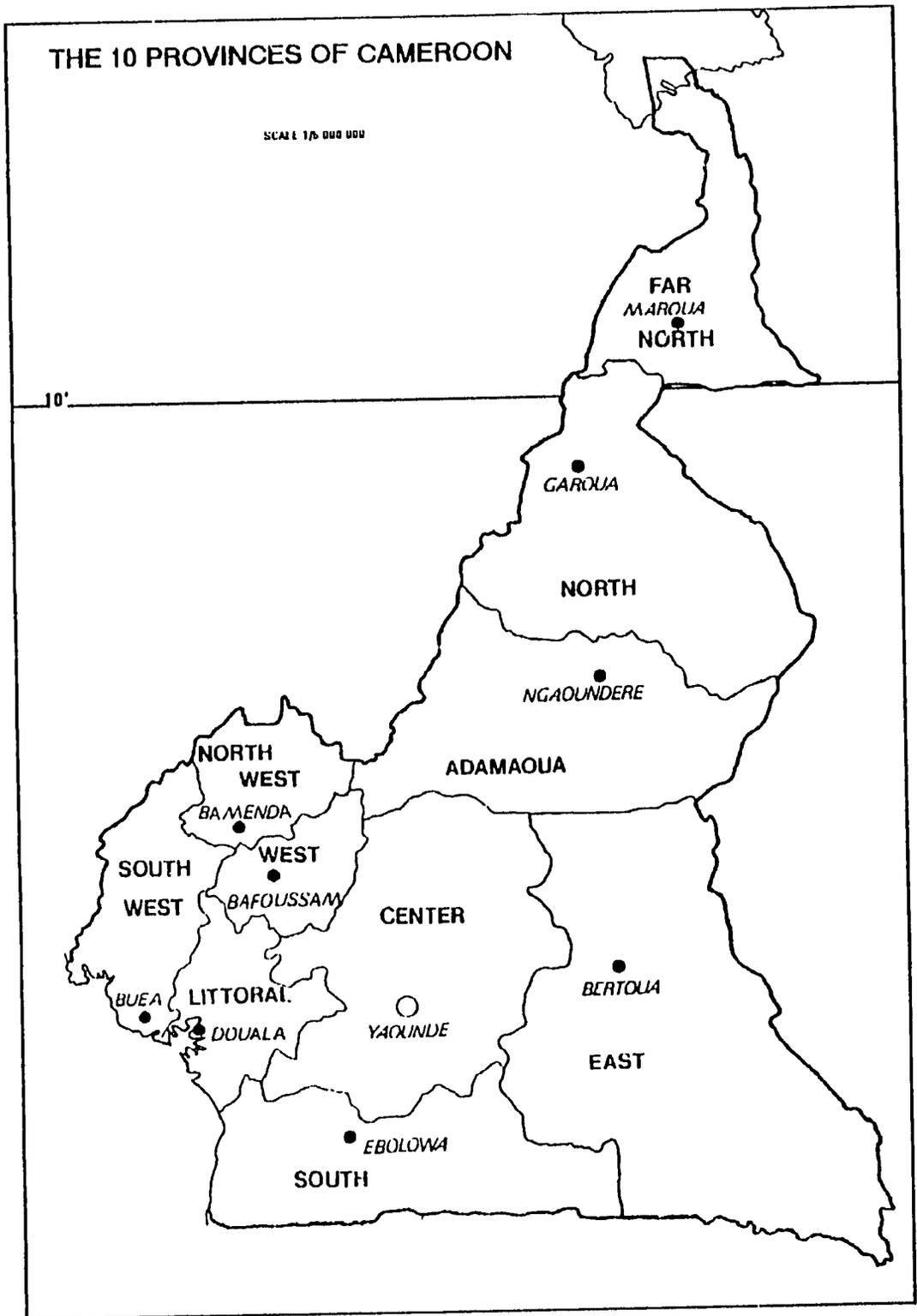
The Economic Analysis Unit has now been created with an office in the Directorate. The main research activity this year is a country-wide resource management survey. Field work was completed and data analysis is underway. In support of IRA Research Services, the EAU helped revise research priority rankings and budgets, prepare a new Performance Contract, and define objectives and performance indicators for all of IRA's programs. Design work was done on a scoring model approach for priority setting and on a management information system, with implementation of these activities hopefully to start later this year. Implementation of some activities, such as the TLU rates of return study, has not yet started and undoubtedly will have to continue into 1993.

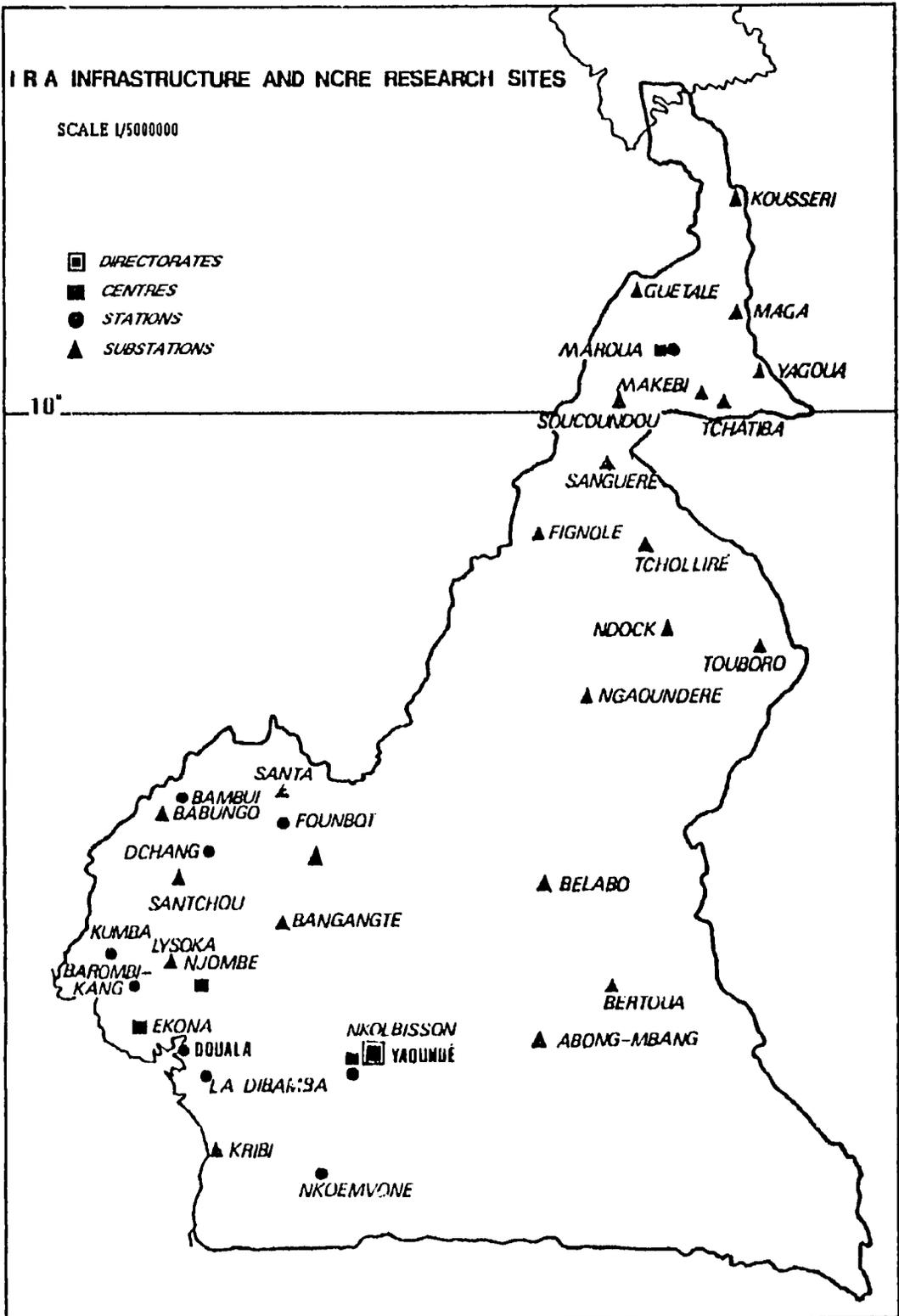
The Soils/Agroforestry Unit has an active research program in place. The site characterization identified P and N deficiencies as major setbacks to sustained crop production especially at the higher elevations. It is pleasing to note that the above mentioned limitations could be overcome with the use of high quality organic manures (high in N and low in lignin/polyphenols), moderate amounts of lime and purchased fertilizer especially P. Our research in the up-coming years will be to examine the sustainability of the proposed interventions.

During the first half of the 1992 cropping season the research activities of the Legume Improvement Unit concerned completion of the annual report for local distribution (in French) for the cowpea section for 1991 research activities. Preparation and planting of trials for varieties, germplasm evaluation, minimum insecticide application, varietal purification, evaluation of F2 populations were done at Guiring. Regional trials 1, 2, and 3 have been planted at Sanguere and Guetale. Field data and various observations are being performed.

The major activity of the Highland Entomology research unit was a survey of the use of natural plant materials by farmers for stored grain protection against storage pests. Hundreds of names and addresses of users spread over all the divisions of the West and North West Provinces were recorded in the first phase and some 80 questionnaires completed. More detailed studies to identify post harvest losses associated with various storage methods and agro-ecological zones was started with maize in the Western Highlands and the South West Province. Support funds and vehicle are expected from the Regional Research Project for Maize and Cassava (RRPMC) since the limited budget from NCRE is insufficient to carry out the operation. Under the RRPMC, one hectare each of four varieties of maize has been grown in Dschang and Foumbot for storage studies.

The Lowland Entomology Unit did a total of eight trials in Yaounde and Ntui during the first cropping season. Results have to be analyzed. The lack of vehicle remains the major problem of the unit but this is being addressed.





# DISTRIBUTION MAP OF THE MAIN CEREAL PRODUCING AREAS IN CAMEROON

SCALE : 1/5000000

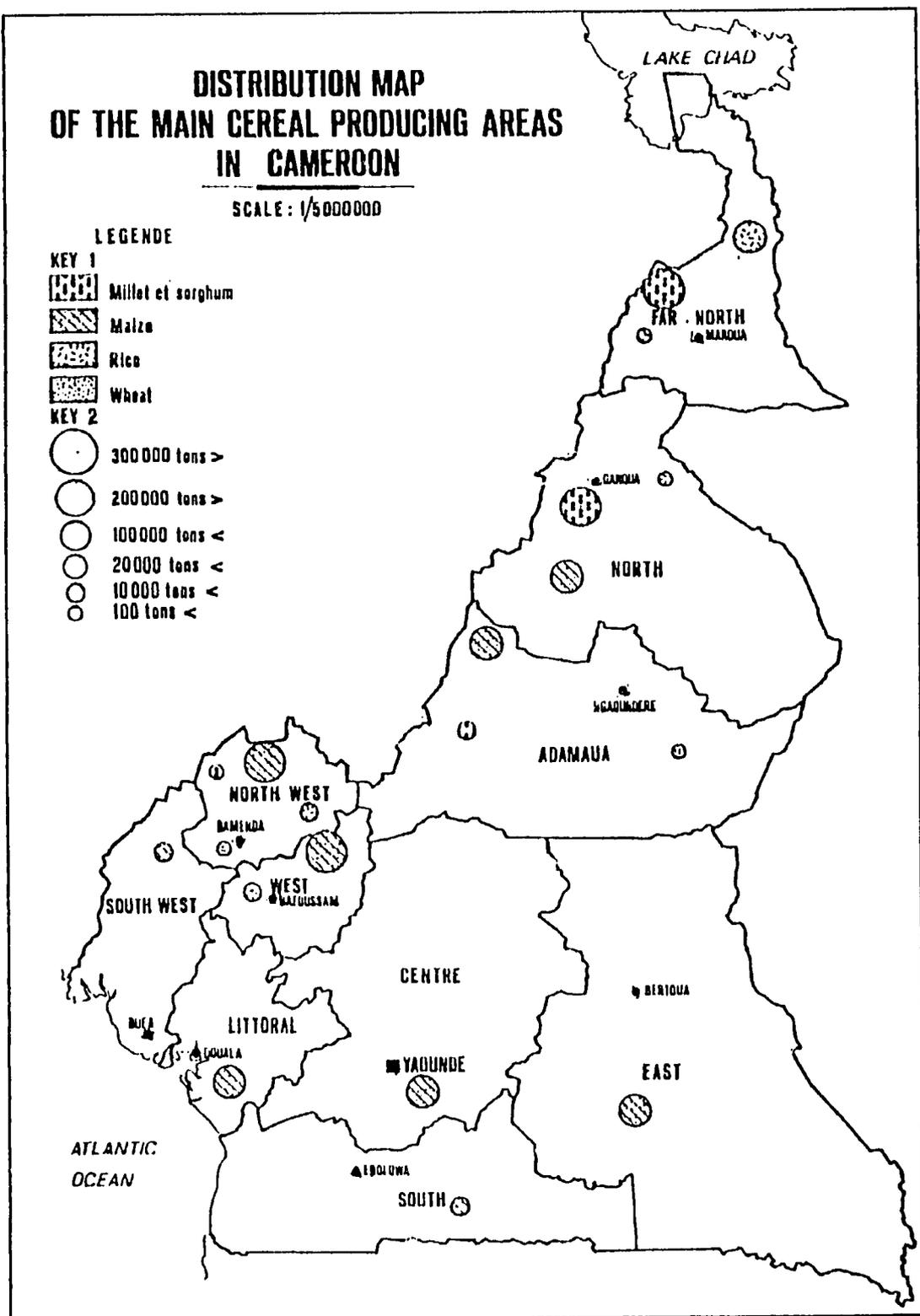
**LEGENDE**

**KEY 1**

-  Millet et sorghum
-  Maize
-  Rice
-  Wheat

**KEY 2**

-  300000 tons >
-  200000 tons >
-  100000 tons <
-  20000 tons <
-  10000 tons <
-  100 tons <



# **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, Administrative Officer and Administrative Assistant.

## **1.2 SUMMARY OF PROGRAM ACTIVITIES**

During this period field staff received several visits from the Chief of Party. He visited Bamibui and Foubot with the USAID Project Manager. He also visited Ekona, Maroua and Garoua to review project activities.

A locally produced NCRE information bulletin was distributed at the Chief of Parties meeting in May. A professionally composed information brochure was completed and printed in the USA.

Equipment was received and distributed including project vehicles. Old project vehicles are being prepared for transfer of title to IRA. A shipment of spare parts for office equipment was also received. Collaboration was initiated with ENSET to permit repair of broken equipment as part of their teaching program. The Winrock Purchasing Officer, Mr. Ron Hubbard, and Matrix International Shipping Manager, Mr. Paul Smith, visited NCRE to arrange future purchases and shipments. New purchase orders were sent for several research programs with remaining equipment budget funds.

Project financial and inventory procedures were reviewed by the IITA Internal Auditor, Mr. G. McIntosh. The project moved to change imprest accounts to a fixed balance system.

Mrs. L. Enyong started her in-country research activities for her PhD program at Virginia Polytech. Mr. Mbassa Ndioro returned from a successful completion of his Msc program in Maize Breeding at Minnesota State University. He has resumed duties at Bambui station. Mr. Mboussi à Messia left for Msc training at Arkansas State University. The PhD training program of Mr. M. Samatana was suspended since he would not be able to complete the program before the end of the project. Computer training courses were held at Garoua, Ekona and Nkolbisson on the use of WordPerfect and SYSTAT/MSTAT. These courses were held with the assistance of Mr. C. Mouang and ODA technicians Mr. G. McLaren, Mr. H. Hockey and Mr. D. Parker. Mr. G. Manners of ODA also gave a scientific writing course during the course at Ekona.

### 1.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1: Provide Overall planning and supervision of technical performance of technical assistance team.</b>		
1. Advice available to researchers.	1.1 Organize meetings to prepare research work plans.	1.1 Work plans were reviewed individually
	1.2 Visit research activities in the field.	1.2 COP visited all locations.
	1.3 Organize and participate in field tours.	1.3 Done by individual technicians.
	1.4 Invite senior scientists from IAC's and universities for consultancies.	1.4 NCRE brochure written.
<b>Operation 2: Facilitate liaison between USAID, IITA, IRA and other organizations cooperating with the project.</b>		
2.1 People aware of project activities and accomplishments.	2.1 Disseminate project reports.	2.1 Attended regular USAID COP meetings.
2.2 Activities coordinated	2.2 Organize and participate in meetings and social events.	2.2 Various meetings attended.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 3. Provide leadership to technical assistance team in applying research to local problems.</b>		
3.1 Rational Work Plans	3.1.1 Organize and participate in meetings to discuss work plans.	3.1.1 During visits to each Station.
	3.1.2 Organize annual planning meeting with users of project research results.	3.1.2 Tentative date set for December.
<b>Operation 4. Guide and assist deputy chief and administrative officer in providing administrative and logistical support to staff.</b>		
4.1 Staff able to accomplish research objectives.	4.1.1 Set priorities for tasks.	4.1.1 Regular weekly meetings.
	4.1.2 Assist in execution of tasks when necessary.	4.1.2 Daily interaction.
<b>Operation 5: Plan and Coordinate long and short-term training for national counterparts.</b>		
5.1 Placement of candidates and trainees	5.1.1 Consult appropriate persons for selection of candidates.	5.1.1 Selection finished.
	5.1.2 Help develop course programs.	5.1.2 Mr. Mboussi placed at Arkansas State Univ.
	5.1.3 Advise national counterparts.	5.1.3 Various meetings.
	5.1.4 Visit students and professors at their universities.	5.1.4 None during this period.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 6:</b>	<b>Computerize accounting and financial reporting.</b>	
6.1 Accurate and timely financial reports and analyses.	6.1.1 Refine and debug accounting software.	6.1.1 Version 3 in field use.
	6.1.2 Write manual for software.	6.1.2 No progress during this period.
	6.1.3 Distribute programs and train personnel.	6.1.3 None during this period.
<b>Operation 7:</b>	<b>Perform regular inventory and supplies checks.</b>	
7.1 Accurate and up to date list of equipment and supplies.	7.1 Annual inventory and supply checks.	7.1 Yearly check completed.
<b>Operation 8:</b>	<b>Initiate project publication system.</b>	
8.1 Series of publications concerning project results.	8.1.1 Establish formats.	8.1 No progress during this period.
	8.1.2 Edit and produce final copy.	
	8.1.3 Print copies for distribution.	
	8.1.4 Distribute copies.	

#### 1.4 FOLLOW-UP ACTIVITIES

During the last part of 1992 the last purchase orders will be submitted to Winrock International for processing. Preparations will be made for departure of 5 TA staff in December. Preparations will be made for a meeting of the IITA staff in September. COP and Director of IRA will visit some Students and Professors in US in December.

#### 1.5 VISITORS

A total of 40 visitors from Cameroon, Nigeria, Togo, France, USA, Equatorial Guinea, Belgium and Benin were received during the first half of 1992.

## **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 and current farming systems between 1000 and 2500 meters altitude. The target zones are found in the Northwest, West and Adamawa Provinces and include a large range of soil types and farm sizes. The Western Highlands, comprising the North West and West Provinces, 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 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 open-pollinated varieties will be available for foundation seed production. Inbred lines for potential use in hybrid seed production have been released to a commercial seed company operating in Cameroon.

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 installation of a maize streak virus screening facility means that emphasis will also 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 from IITA Head Quarters

#### **2.1.2 SUMMARY OF PROGRAM ACTIVITIES**

Since the IRA Bambui workers strike has intensified in late July and August, our decision in January to limit nursery activities to Foubot was fortunate. To date we have managed to harvest, at Foubot, the earliest maturing trial, nursery and seed multiplication. However, if the IRA technicians and drivers in our unit do not return to work in the second fortnight of August, a significant part (up to 50%) of this year's data will be in jeopardy. If the strikers continue to prevent IRA and NCRE scientists from working with hired labor, the loss could be even greater.

The cropping season has followed the 1992 work plan, and in spite of excessively low rainfall at Babungo in April and May, growth in all trials in the West and Northwest provinces is very good. Our program at Ngaoundere was limited due to failure to obtain funding from Project Garoua, and we have reports of limited plant stands in some trials due to damage at the time of germination by soil insects.

With the planned departure of the T.A. breeder at the end of 1992, a more rapid integration of the returning national, M.S. level breeder into program activities and management would be desirable. Also, the delay in the planned relocation of the Ingenieur level breeder to Foubot has held up the beginning of field screening for resistance to streak virus.

We have had three backstopping visits from the IITA Ibadan Maize Program; in the areas of mass rearing of *Cicadulina* for streak virus screening, pathology, and general crop improvement. The reports of the first two visit mentioned above have allowed us to improve our insect rearing facility, and have helped the breeders and pathologist to determine the diseases that should be priority for further study and resistance breeding. The report of the recent trip by the maize program director makes concrete suggestions for the continuation of the program and for the assessment of future impact of NCRE technologies. In addition, two technicians from our unit have undergone short course training at IITA during the year.

Activities of our germplasm development and variety maintenance program include the following sowings: 1) Local farmer variety collection trials at Mbiyeh (high altitude) and Babungo (mid-altitude). 2) CIMMYT - Mexico EVT-17 international high altitude trial at Mbiyeh, and CIMMYT - Zimbabwe MPET trial at Babungo. 3) ATP and Coca streak resistant multiplications at Bambui; Kasai, Early White and Synthetic 3 streak resistant multiplications at Foubot; and Synthetic 4 streak resistant multiplication at Babungo. 4) All other items under activities 1.2 and 1.3 in the following table of accomplishments.

Our hybrid testing program consists of two advanced and one Pioneer trial at Foubot, Nfonta, Babungo and Mbang Mbirni; four preliminary hybrid trials at Foubot, Nfonta and Babungo; and an inbred performance trial at Foubot, Nfonta, Babungo and Mbang Mbirni. Variety testing consists of NVT mid-altitude early and late trials at Foubot, Nfonta, Babungo and Mbang Mbirni, and the NVT high altitude trial at Mbiyeh.

Finally, two trials to study the effectiveness of our methodology to select for tolerance to acid soils are sown at Nfonta. Soils samples are being analyzed at IITA Nkolbisson and the results will be presented at the ASA Meeting in November.

### 2.1.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>1. Develop germplasm</b>		
1.1 Introduce and screen early, mid-altitude germplasm.	1.1 Germplasm sources identified and local germplasm collected.	1. Two CIMMYT and two farmer variety trials sown.
1.2 Convert 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 SR versions recombined. Early White and synthetic 4 yellow and white lines selected.	2. All varieties sown and pollinations made.
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.	3. All lines sown and selections and pollination made.
<b>2. Test varieties and hybrids.</b>		
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.	1. Trials sown and disease and agronomic characteristics noted.
2.2 Identify hybrids and /or inbreds for pilot production.	2.2 New hybrids/ inbreds identified from our program, IITA or Pioneer.	2. Trials sown and disease and agronomic characteristics noted.
<b>3. Maintain true-to-type breeder seed of best varieties and inbreds.</b>		
3.1 Maintain seed of existing "released" highland varieties.	3.1 Coca, Bacoa, Kasai, Shaba Synthetic 3, Synthetic 4, ATP and Early white breeder seed made available.	1. Isolation sown and detassled for all except Bacoa (Bacoa is in storage).

<b>OBJECTIVES</b>	<b>ACTIVITIES</b>	<b>ACCOMPLISHMENTS</b>
3.2 Describe and "release" best new open-pollinated varieties.	3.2 ATP, Early White and Synthetic 3 performance described.	2. Additional data being collected.
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.	3. Open-pollinated variety multiplications sown. Hybrids being produced now, and planned for off-season.

#### **2.1.4 FOLLOW-UP ACTIVITIES**

Final observations, harvest and data collection are the main activities for the months of August and September. This will be followed by rapid turnover of seed, and planting of the irrigated off-season nursery in October, at Foubot. Pollinations will be made in this nursery starting in December. Simultaneous with off-season field activities will be data analysis and interpretation. All these activities depend on the IRA strike ending. Field screening for streak resistance will be begin soon after a breeder moves to Foubot. T.A. will write a handing over report.

#### **2.1.5 VISITORS**

Dr. Mark Winslow, Director IITA Maize Program.  
 Dr. Kitty Cardwell, Maize Pathologist, IITA  
 Mr. Sunday Olojeday, Maize Entomology, IITA  
 USAID Mission Director, A.D.O., C.O.P. and Agriculture Office Project Officers.

## 2.2 LOWLAND MAIZE BREEDING

### 2.2.1 INTRODUCTION

In 1992, the lowland breeding unit has conducted 212 evaluation trials. Trials covered 40 ha distributed in 15 locations.

Acid soil remains one of the major constraints 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  $F_1$  were selfed 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 tested in 1992. In addition to this,  $S_1$  or  $S_2$  testcrosses using the opposite pool or tester were initiated in 1992 for pool improvement.

In 1992, new three-way crosses were formed by crossing the  $F_1$  obtained from 2 lines of different heterotic pattern with a third line of the third pools. The  $F_1$  will be evaluated during 1992 second cropping season and in 1993.

In 1992, selections were made for striga tolerance from material with different genetic background. Those selected lines were retested in 1992. Furthermore, some striga pools were made by recombining the retained lines. Those pools are being evaluated under artificial striga infestation.

In 1992, line development was continued for new trait donor sources and for hybrid or synthetic varieties development. In addition, on-farm trials for hybrid were started with the collaboration of the T.L.U.

In 1992, work on borers were intensified with the help of the entomologist. Finally, breeder seed maintenance and foundation seed multiplication were intensified as the demand was higher than in 1991.

### 2.2.2 SUMMARY OF PROGRAM ACTIVITIES

During the first 6 months of 1992, the program has been involved in the following activities.

#### i) Trials preparation

During the 1991 off season, more than 4000 crosses were made for testing during the 1992 first growing season. These crosses involved:

- Control pollination of major varieties
- Testcrosses development of lines from Suwan I SR, TZB SR, pop 28 SR, laposta SR and variety crosses
- Single crosses from the 3 heterotic NCRE pools

- Three way crosses with inbred lines from the 3 heterotic pools
- Three way crosses of advanced lines.

In addition, screening for borer tolerance was conducted.

## **ii) Land Preparation and planting of Trials**

So far the unit has planted about 212 evaluation trials in 15 sites. All first season trials except for some seed multiplication have been harvested in the forest area. In the savanna zone, the plant aspect selection and data collection are the main activities being conducted by the unit.

Some new variety crosses were made during the first growing season. Those new varieties will be advanced to F2 during the second season for testing in 1993.

The constraints encountered are:

- \* Logistical problems. No reliable driver is available to the unit which covers 15 locations and have about 40 ha of trials
- \* Zinc and magnesium problems were once again experienced at Nkolbisson, Finklowa, Sanguere and Mayo-Galke
- \* Failure of the irrigation unit was a major set-back in the breeding nursery
- \* Unpredictable climate and IRA workers strikes forced the unit to be late in most of its activities.

## **iii) Trial Maintenance and Harvesting**

Up to September 1992, the unit maintained and harvested 95 evaluation trials planted in 7 forest locations.

In the Nkolbisson breeding nursery, the genetic material from 12 populations was advanced to a higher generation. In addition, new three way crosses were made using inbred lines of the 3 different heterotic pools. Those materials are being processed for replanting during the second season.

In the savanna, the unit will be busy with data collection and selection for striga tolerance.

## **iv) Consultancies and Institutional Development**

Mr. Hounwa Anatole was sent to IITA for short course in hybrid seed production. Unfortunately for the unit, he has been promoted to the chief of Sanguere antenna position. Dr. Chabouche visited Maize research activities in 4 countries: Senegal, Nigeria, Burkina-Faso and CIRAD Montpellier. The program was visited by the Director of USAID Cameroon and by the EEC monitoring tour team.

### 2.2.3 WORKPLAN TABLE

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1: Testing of Introductions</b>		
1.1. To identify new germplasm.	1.1 Variety trials on 2 to 4 locations.	1.1 Trials from CORAF, SAFGRAD, IITA and Pioneer are being evaluated.
1.2 To identify new trait donor source.	1.2 Inbred lines evaluation planted.	1.2 About 1500 lines being evaluated for striga tolerance about 80 lines evaluated for borer tolerance.
1.3 To collect data.	1.3 Data collections.	1.3 Data collected
<b>Operation 2: Population Improvement</b>		
2.1 To improve plant and ear aspect, disease resistance, stress tolerance	2.1 Half-sib recurrent selection.	2.1 Improvement in half-sib of CMS 8501, CMS 8704, Pool 16 DR (CMS 9015) mass selection on BSR 81, BSR Syn I, TZB SR SE, CMS 8503, CMS 8710, Suwan I white
2.2 To develop new higher yielding and stable varieties.	2.2 S <sub>3</sub> recombination and variety crosses.	2.2 S <sub>3</sub> recombination of lines from TZB SR, Suwan I to form synthetic varieties.
2.3 To increase yield potential.	2.3 Same as 2.2	2.3 Top crosses made
2.4 To develop drought tolerant varieties.	2.4 S <sub>3</sub> recombination of drought tolerant lines.	2.4 Not yet done
2.5 Refinement of the 3 heterotic pools.	2.5 Diallel recombination of lines and advancement of F1 to F2.	2.5 Not yet done

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 3: Inbred line development</b>		
3.1 Creation of new heterotic and traits donors inbred lines.	3.1 Selfing, selection and evaluation on artificial environments.	3.1 Lines from 12 population advanced to higher generation lines evaluated for striga and borer tolerance.
3.2 Identification of new lines for heterotic pool improvement and variety crosses.	3.2 Combining ability studies and variety crosses.	3.2 Not yet done
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.	3.1 Single crosses, three way crosses from 3 population evaluated
3.4 synthetic varieties development.	3.4 Diallel recombination among lines and advancement to F2.	3.2 New synthetics varieties created from TZB SR and Suwan I S <sub>4</sub> lines
3.5 Single crosses and three way crosses development.	3.5 Single crosses among lines from different heterotic groups.	3.3 New three way and four way crosses made
<b>Operation 4: Special Maize</b>		
4.1 To create soft endosperm maize.	4.1 Backcross improvement.	4.1 Not yet done
4.2 To create variety adapted to intercropping.	4.2 Selection for erect leave and earliness.	4.2 New erect leave Pool created
4.3 To create acid tolerant and drought tolerant pool.	4.3 Screening of lines under artificial environment.	4.3 Soil analysis done
4.4 Pop corn and sweet corn development.	4.4 Pop corn and sweet corn maintenance. S2 lines advanced to S3.	4.4 Pop corn lines advanced to S <sub>4</sub>

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
4.5 Maize for brewery.	4.5 QPM material	4.5 Not yet done
4.6 Maize for feed	4.6 Evaluation of QPM on chicken with IRZV.	4.6 Not yet done
<b>Operation 5: National Varieties Trials</b>		
5.1 To identify variety for release	5.1 Variety trials on 16 locations	5.1 Planting, maintenance and data collection
5.2 To collect data for program evaluation and scientific papers.	5.2 Same as 5.1	5.2 In progress.
5.3 To test stability of new variety.	5.3 Same as 5.1 and across locations and years	5.3 30% data collected data analysis.
<b>Operation 6: Multiplication and maintenance of breeder seed and foundation seed.</b>		
6.1 Production of better population.	6.1 Seed production in Half-sib.	6.1 Seed production of CMS 8704 (3 ha), CMS 8501 (1.5 ha) CMS 8806
6.2 Production of seed to supply agronomist, TLU and seed companies.	6.2 Seed production in isolated randomizing blocks.	6.2 Same as 6.1
6.3 Population and lines maintenance.	6.3 Sibbing and chain-crosses of inbred lines.	6.3 Self and bulk-sibbing of 200 inbred lines.

#### **2.2.4 FOLLOW-UP ACTIVITIES**

During the next six months, the unit will be involved in the following activities.

1. Harvesting of forest first season trials
2. Trial preparation for second season maize
3. Plant selection in savanna zone
4. Harvesting of savanna trials
5. Pollination in Nkolbisson breeding nursery
6. Harvesting of second season maize
7. Planting of off-season breeding nursery of 1993 trials
8. Data analysis (about 250 trials)
9. Report writing
10. Visit some African country programs

#### **2.2.5 VISITORS**

The program was visited by USAID director, Student from Lycee Bilingue and EEC monitoring team members.

## **3 RICE RESEARCH UNIT**

### **3.1 INTRODUCTION**

The rice research Unit in Garoua is relatively new. Its creation was 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 SUMMARY OF PROGRAM ACTIVITIES**

The Sub-program activities involved harvesting of the 1991/1992 second season experiments in Maga/Yagoua, Santchou and Lagdo. In Maroua, phosphate amendment trial was harvested. Preliminary screening sets, observational trials and replicated yield trials were conducted in Yagoua for the 1992 first season. In Garoua, second season (1991/1992) trials notably, post-harvest processing of rice, nitrogen response of ITA 300, soil regeneration on a scrapped soil were harvested and results will be included in the annual report. The 1992 first season in Garoua was very busy for the Sub-Program. Upland, lowland rainfed, and irrigated experiments were conducted in Bokle and Lagdo in conformity with the 1992 Workplan (Breeding and Agronomy). On-farm trials in collaboration with EEC/IITA and North East Benoue Project (NEB) were conducted at 3 sites involving a total of 26 farmers. The trial is breeding oriented and involved full participation of the farmers. A similar trial was conducted in Lagdo during the second season of 1991/1992. For some uncontrollable circumstances, this has not been fully repeated in Lagdo. In Santchou, with limited means, most of the Program activities have been carried out. The researcher in charge also did extend to Ndop where activities have been cut down to less than 15% of the previous year. Other activities involved, surveying sites for possible establishment of crop protection experiments (entomology and pathology) in the North and Far North Provinces. In summary, the 1992 plan of work is strictly being followed with substantial difficulties due to budgetary cuts.

### 3.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1: Varietal Improvement for high and stable yields in the North and Extreme North Provinces.</b>		
1.1. To identify useful germplasm for irrigated conditions at various ecologies.	1.1 International rice observation nursery (Early, Medium).	1.1 In progress
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.	1.2 In progress
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	1.3 In progress
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.	1.4 In progress
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 <sup>2</sup>	1.5 In progress
1.6. Assessing acceptability of elite selections	1.6. On-farm varietal trials	1.6 In progress

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
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**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.	2.1 Not conducted
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.	2.2 Not conducted
	2.2.1 Soil test for standard nutrient requirements.	2.2.1 Samples have been collected
	2.2.2 Determination of the optimum seeding rate of <i>Crotalaria caricia</i> as a supplementary source of nitrogen.	2.2.2 This will be done in the second season of 1992.

**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 prior to completing cutting.	3.1 Trials are still in the field. We expect to have results in October 1992.
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.	

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
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**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.	4.1 Done monthly.
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**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.	3.1 Most of the activities for this operation are being done by the plant breeder. For some uncontrolled circumstances, the pathologist has not been able to fully participate in the exercise.
3.2 Screening of new introductions for the various diseases of rice.	3.2 International Rice Cold Tolerance Nurseries (IRCTN) put by the breeder.	
	3.2.1 African Irrigated Rice Observation nursery (AIRON).	
	3.2.2 Africa Irrigated Rice Preliminary screening set.	
	3.2.3 Africa Irrigated Rice Advance Yield Trial (AIRAT)	
	3.2.4 Africa Upland Rice Preliminary Screening Set.	
	3.2.5 Africa Upland Rice Observation Nursery	
	3.2.6 Elite varietal trial.	

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
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	3.3 Yet to be screened
3.4 Study of the variability of pathogenic strains of <i>Pyricularia oryzae</i> .	3.4 Isolation of the various pathogenic strains of blast causal agent.	3.4 Not conducted
	3.4.1 Characterize strains by periods of attack.	3.4.1 Not conducted
3.5 Compiling results and writing rice pathology reports.		

**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).	1.1 Not conducted in Santchou but in Bokle and Maroua.
	1.1.1 Africa Irrigated rice advanced trial.	1.1.1 Not conducted in Santchou but in Bokle and Maroua
	1.1.2 Africa Upland Rice Preliminary screening set.	1.1.2 Not conducted in Santchou but in Bokle and Maroua.
	1.1.3 Africa Upland Rice observation nursery.	1.1.3 Not conducted in Santchou but in Bokle and Maroua.
	1.1.4 Africa Upland Rice advanced trial.	1.1.4 Not conducted in Santchou but in Bokle and Maroua.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
2.1 Assess the yielding ability of some agronomically suitable selections of 1991 under rainfed and irrigated conditions.	2.1 Observational yield trial.	2.1 In progress
	2.1.1 Varietal yield trial.	2.1.1 In progress
	2.1.2 Coordinated varietal trial.	2.1.2 In progress
	2.1.3 Elite varietal trial.	
<b>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.</b>		
2.1 Development of new locally created lines.	2.1 Hybridization program.	2.1 Trials have been conducted and results are being awaited.
	2.1.1 Breeders', seed production (Head-row selection).	
	- Field testing of segregating populations.	
<b>Operation 3: Screen germplasm from International Cooperators for regional constraints.</b>		
3.1 Screen varieties adapted to low temperature conditions.	3.1 Observation yield trials of previous selections.	3.1 Fully accomplished
	3.1.1 International Rice Cold tolerant nursery.	3.1.1 Not conducted
<b>Operation 4: Preparation of technical write ups</b>		
4.1 Preparation and submission of expense vouchers.	4.1 Time sheet preparation and writing of technical reports.	

### **3.4 FOLLOW-UP ACTIVITIES**

The Sub-Program in Garoua is preparing land for off-season crops (rice agronomy Unit). The unit intends to put in vegetables as part of a cropping sequence with a view to making recommendation to farmers in possession of irrigation facilities especially around the Lagdo area. The Sub-Program also intends to follow up the rehabilitation Karewa site recently acquired from "Mission d'Etude" negotiated by the Hon Minister of Scientific and Technical Research, the Chief of Centre (IRA-Maroua), and the Chief of Station (IRA-Garoua). Other follow-up activities involve field observations of trials in the various locations (Maga, Yagoua, Bokle, Lagdo, Santchou and Ndup).

### **3.5 VISITORS**

The Sub-Program had the NCRE Chief of Party (Dr. Atayi), Mr. Benhow and Dr. Crawford of USAID Yaounde, visit its trials at Lagdo in February 1992. Mr Asanga Cletus (Cereals Post-harvest entomologist) from IRA Dschang visited from June 21 to June 26 1992.

## 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<sup>2</sup>). For research purposes, the area is divided into the following main regions : the highlands 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 SUMMARY OF PROGRAM ACTIVITIES

#### (A) Research Activities

A major accomplishment of our Unit in the 1992 cropping season is the development of the IITA/IRA-NCRE Striga Research Farm (at the request of IITA Maize Research Program and IRA/NCRE Maize Breeding Research Program) at IRZV Bokle. This is a 12 hectare farm with contour bands and pigeon peas alleys. Although most of the farm is devoted to Striga maize breeding, part is used to conduct experiments on conservation farming technologies. This research farm has been quite functional this cropping seasons. IITA Maize Research Program and IRA Maize Breeding Program are conducting a series of trials on striga in this farm.

We have prepared a research workplan for 1992 and have implemented 80% of this in spite of the erratic and insufficient rainfall during the months of May, June and July. Most of the main research themes are related to conservation farming technology, testing of soil improving legumes, and Striga. Most of the experiments are doing well.

At the request of the Director of IRA, we have set up a series of 28 trials in farmers' fields (SAFGRAD trials) in the Far North province. So far most of these trials are looking well.

The operation "maïs de case" for hunger period (periode de soudure) involves minikits of maize, cowpea and pigeon peas. They were distributed to more than 1500 farmers and extension agents of the 3 provinces. This operation has been quite successful.

## **(B) Other Activities**

We helped organize a workshop on computer use, and statistical software at IRA/Garoua. The participants included staff from IRA Garoua, IRA Maroua, IRZV and IRGM. The workshop was held in March for two weeks and was sponsored by the NCRE Project and the IRA Statistics Section.

We have received a new Ingénieur as counterpart Mr. Youri Alphonse. He is an Ingénieur des travaux Agricoles recently graduated.

We have organized 3 technical meetings for the research groups on cereals and legumes of IRA/North.

As Chief of the Cereals Section at IRA/Garoua, we have helped in the administration of the three subsections. As there is tremendous interest on maize production in this area. We have spent considerable amount of time to provide technical information to farmers.

### **4.3 ACCOMPLISHMENTS**

<b>OBJECTIVES</b>	<b>ACTIVITIES</b>	<b>ACCOMPLISHMENTS</b>
<b>Operation 1: On-farm Tests and Demonstrations on - Conservation Farming Technologies</b>		
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 interplanting and alley cropping with maize and cowpea under minimum tillage systems.	1.1 A set of 19 tests are being conducted in farmers' fields in 5 villages of the West Benoue region.
<b>Operation 2: To Develop Agronomic Practices for Improved and Sustainable Maize and Sorghum Production</b>		
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 forage legume species).	2.1 A set of 5 experiments were planted on crop rotation

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
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.	2.2 A set of 3 trials were established.

**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.	3.1 Two trials are being conducted.
3.2 To evaluate different methods of Striga control on maize and sorghum.	3.2 On- farm research with maize and sorghum. (intercropping, herbicides, alley cropping etc...).	3.2 Five Striga trials are being conducted on the subject.

**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.	4.1 Two fiches techniques on maize have been prepared and distributed to many extension agents and farmers.
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.	4.2 More than 1500 farmers and extension agents have received seeds of the new varieties of maize, cowpea, pigeon peas.

#### **4.4 FOLLOW-UP ACTIVITIES**

We will continue the management of our field experiments (NCRE and SAFGRAD) and start the harvest of the trials as soon as they are ready.

We will help organize the annual workshop of IITA/COMBS Network during the first week of September. We are expecting 40 researchers from 7 different countries at IRA/Garoua. This year the emphasis is on the use of legume species to improve soil productivity as well as on testing and transfer of technology to small farmers. COMBS is the Collaborative Group on Maize-based cropping Systems and is sponsored by ITTA RCMP.

We are preparing the final report of the Unit. The experiments of this cropping season will not be included as they will not be harvested and processed before the end of the year and beginning of next year.

We will prepare for the visit of the German research team (University of Hohenheim-GTZ) who are coming in September to IRA/Garoua to discuss long-term cooperation with us on Striga research and extension.

We will continue on-the-job training for counterparts and technicians. We will continue the development of the new IITA/IRA-NCRE Striga Research Farm at Bokle. We will start to organize for IRA/North the seed bank of the soil improving legumes (for sustainable agriculture). The IITA T.A. will be preparing to hand over unit activities to National Counterparts.

#### **4.5 VISITORS**

Among the visitors received this period, it can be mentioned :

an evaluation team from the World Bank; Mr. Benbow and Dr. Crawford (USAID/Yaounde), and NCRE COP; Director of Annual Crops of CIRAD; The team of the Computer and Statistic Sections of IRA Nkolbisson; Dr. Spencer and Dr. Akobundu (IITA); Mr. Gaudard - Director of Development (SODECOTON); Mr. Cooper and Mr. Claassen (IITA farm Managers); Dr. Paliwal, Technical Director of Pioneer Seed Production Company, PACSA; Many farmers and extension agents; Coordinator of the Development Projet NEB.

## 5 SORGHUM RESEARCH UNIT

### 5.1 INTRODUCTION

Sorghum and millet are major cereals cultivated in North Cameroon. Two types of sorghum are generally grown; the rainy season and the post rainy season. The latter crop, known as "Muskwari" is a transplanted sorghum grown on the residual soil moisture. Pearl millet is grown only in the rainy season. It is a minor crop which represents about 10% of total production.

The goal of sorghum breeding is to increase sorghum and millet production through the development of high yielding cultivars, resistant to various pests and diseases. Earlier efforts had been directed toward developing short term breeding strategies which included screening of available germplasm and introduction of exotic germplasm from international research centers. Today, land races are used extensively in crossing. We aim to break out of a spiral of decreasing variability, diversify both the range of phenotypes represented in our breeding products and their genetic origins. Many crosses have been attempted, including local x local, local x exotic, exotic x exotic. Which are at present in the advanced yield trials and in on-farm trials. Best elite entries had already been given to the extension services.

In 1992 emphasis is toward breeding sorghum for drought tolerance, striga resistance, identify sources of resistance by screening additional germplasm, develop medium cycle varieties (110 days) for medium rainfall zone, identify short cycle and no photoperiod sensitive lines for pearl millet.

### 5.2 SUMMARY OF PROGRAM ACTIVITIES

During the first semester, the sorghum and pearl millet improvement program was involved in the following major activities:

Preparation of seed for various trials, distribution of seed to different IRA sections, distribution of nucleous seed to provide the seed company with pure seed. An adequate seed quantity was given to low income farmers who could not afford commercial seeds. The general strike observed by IRA workers in early June caused our seed processing and planting activities to be delayed.

From 9 to 12 March, 1992 Mr. R. Kenga participated in the special meeting on striga in Bamako, Mali. From 8 to 9 June he also participated in the 11th Steering Committee meeting of West and Central Africa Sorghum Research Network in Bamako, Mali.

Planting of sorghum and pearl millet trials started in early July. Many crosses which are at present in F1, F2, F3, F4, and F5 generations were sowed. Six locations were used to test advance yield trials. Many trials were received from different research institutes and planted. These trials included, Entomology trial, Phytopathology trials and some advanced elite lines. Collaborative research activities with a private seed company (PIONEER PACSA) are being carried out. More than 90 trials have been sowed at Guiring Research Station and in different IRA sub-stations.

The number of scientists working in the section has increased. Mr. Djonnewa Andre a sorghum breeder has returned from training in the US. Mr. Beyo Jacques, Ingenieur Agronome has completed a six months training course on entomology at ICRISAT Headquarter, India. The major challenge facing the sorghum breeding unit is inadequate training. Both breeders are Msc holders.

### 5.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1: Development of suitable cultivars of sorghum for different ecological zone.</b>		
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.	1.1 40 parents (Local and Exotic) were sowed to attempt new crosses in 1992 rainy season. 20 F1, 35 F2, 98 F3, 74 F4, and 82 F5 were planted at Guiring
	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).	1.1.1. 30 Entries under preliminary yield trial were selected. These entries are planted in two locations having different rainfall pattern. A collection of 35 early germplasm is being evaluated.
1.2. Increase sorghum productivity.	1.2.1. Advanced segregating generation will be subjected to various stress (striga, disease, drought).	1.2.1. Segregating material and elite lines are screened in the striga sick plot. Leaf disease nursery trial is being evaluated. Two striga trials are being carried out.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
	<p>1.2. Testing sorghum for high and stable yields with wide adaptation. Preliminary yield trials, multi-location trials and international trials are being conducted.</p>	<p>1.2. Two sets of multilocation trials made of 20 entries per set are planted in six locations. Many international trials related to yield, diseases and pest are being conducted. Preliminary trials are carried in two locations.</p>
<p><b>Operation 2: Development of varieties resistant to Striga</b></p>		
<p>2.1 Provide range of resistant entries.</p>	<p>2.1 Identify sorghum source line resistant to <u>Striga hermontica</u> among the collection of local and exotic germplasm available. Transfer the resistance to agroeconomically elite lines through hybridization.</p>	<p>2.1. About 35 local lines and 16 striga tolerant lines are planted. Many crosses will be made to stimulate variabilities and carry out selection.</p>
<p>2.2. Develop and test high level of resistance to <u>striga</u>.</p>	<p>2.2. Screening of advanced segregating materials. National <u>striga</u> nursery and International striga trial being carried out in different environments. Developing reliable screening techniques.</p>	<p>2.2. 30 segregating progenies are being evaluated in striga sick plot. A national striga trial made of 21 entries is being carried out using the Checkerboard layout. One regional trial of 14 entries has been sowed.</p>
<p><b>Operation 3: Maintenance, testing, and evaluate Hybrid parents</b></p>		
<p>3.1 Maintaining genetic resource for hybrid development.</p>	<p>3.1 Maintaining a collection of germplasm. Many A/B lines have been evaluated for drought resistant and disease resistant.</p>	<p>3.1. 32 A/B pairs are evaluated for drought, earliness, color of grains and disease reaction. 8 restorer lines are planted.</p>

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
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.	3.2 10 female lines are being test crossed to 20 different lines used as male parents. The study of combining ability of testcrosses and parents will be made.
<b>Operation 4: Development of nucleous/Breeder's seed</b>		
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.	4.1. The nucleous seed of CS-85 is being multiplied for 1993 cropping season.
<b>Operation 5: Muskwari Germplasm collection, maintenance and evaluation.</b>		
5.1. Evaluate the various muskwari collections.	5.1. Characteristics of various accessions available.	5.1. Nursery of selected genotypes (167 entries) along with 210 local germplasms of Muskwari will be planted.
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.	5.2. The nucleous seed of a promising early (SAF 40) will be multiplied. These activities will start in December 1992.
<b>Operation 6: Development of suitable pearl millet cultivars</b>		
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.	6.1. A series of trials is being carried out in different locations: On-station and on-farm to evaluate the performance of some promising entries at a large scale.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
6.2. Identify agronomically superior lines with stable source of resistance.	6.2. Screening and resistance identification of local and exotic germplasm. - Advanced segregating generation subjected to various stress (drought, striga, pest and diseases). - Preliminary yield trial and multilocation and disease resistance are the main criteria of selection.	6.2. 136 advance segregating material and lines have been planted. Selection will be made for photoperiodism reaction, drought, pest and diseases tolerance. Two sets of advanced yield trial are being carried out in 4 locations.

#### 5.4 FOLLOW-UP ACTIVITIES

During the period of August 1992 through January 1993, sorghum and pearl millet unit will be involved in the following activities.

The Entomologist has just completed a series of visits organized from 23 July - 14 August, 1992 on all sorghum trials. A report is expected.

Research activities will be carried out as follow:

Hybridization and selection will remain the major activities throughout September, October and November at Guiring and Sanguere. Data collection on sorghum and pearl millet trials at various locations will be continued during the crop season. Male-sterile and restorer lines selected in 1991 cropping season will be used to make hybrid for testing. The Nursery for Muskwari germplasm will be established before end of August. Mr. Djonnewa Andre and R. Kenga will participate on the Third Field Day/Regional Sorghum Scientist Meeting from 10-11 September, 1992 in Kano, Nigeria. A sorghum breeder will participate on the 8th Regional Workshop of the East Africa Sorghum and Millet Network (EARSAM) from October 30 - November 5, 1992 and present a paper on Striga research in Cameroon.

#### 5.5 VISITORS

A visit of ICRISAT scientists in the disciplines of breeding and entomology is expected during the month of September to first week of October, 1992 to assist the program. The coordinator of West and Central Africa Sorghum Research Network, Dr. Thomas Melville will visit the program and evaluate the striga project financed by SAFGRAD through the Network. Mr. Limamoulaye Cisse, Coordinator of WCAMRN for Pearl Millet Research Network is expected to visit Cameroon to evaluate the activities of pearl millet research both on-station and on-farm. Dr. Yilma Kebede, the PIONEER'S African trials Coordinator will visit the sorghum program on the second to the third week of September, 1992.

## **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 hoped for 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 SUMMARY OF PROGRAM ACTIVITIES

The TLU succeeded in planting most of the scheduled on-farm and on-station trials in March and April. These included: 1) on-farm mid and high altitude maize variety trials that were targeted to 20 zones in the West and North West Provinces, selected to cover a range of soil types (parent material) and altitudes (mid and high); 2) the first on-farm hybrid maize variety trial; 3) Maize minikit trials; 4) agroforestry on-farm (soil erosion control and fertility management) trials; 5) on-station hybrid maize stepwise trial; 6) on-station maize/grain-legume intercrop compatibility trial; 7) on-station maize N-response trial; 8) on-station maize P maintenance trial; 9) on-station residual effects of soil amendments trial; and, 10) on-station hybrid maize fertilizer requirements trial.

During the same period, the TLU was also active in survey work. TLU staff assisted Drs. Baker (NCRE) and Dvorak (IITA) in the implementation of a national Resource Management Survey in May. A questionnaire to determine the rate of retention of improved maize varieties by farmers participating in the TLU minikit trials program during the years 1983-91 was distributed to agricultural posts throughout the 2 provinces. The TLU actively participated in a rapid rural appraisal survey of the Ngie clan enclave in Momo Division (North West Province) in July, under the auspices of the soil conservation and improvement coordinating committee (SCICC). Finally, a baseline survey questionnaire was finalized and distributed to peace corps volunteers in 7 villages, working under the 10-year peace corps agroforestry project.

The ongoing IRA workers' strike adversely affected the NCRE research work at IRA-Bambui, both on-station and on-farm. At the peak of the strike, which coincided with the time of harvest for the maize crop, workers, who were more than 10 months behind in their pay, blocked roads, impeded entry into the offices and effectively obstructed the research work. Only at the end of August, a partial payment of back wages induced workers to allow NCRE staff to proceed with the harvest.

Miscellaneous activities: At the beginning of March, McHugh and Osiname attended the program planning meeting at IITA.

### 6.1.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1. Identify farmers' circumstances and practices.</b>		
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.	1.1 Operation completed. One paper to be published in the <i>AFSR-E Journal's</i> next issue, and another submitted to the <i>Journal of Experimental Agriculture</i> . A third publication being prepared in collaboration with FAO-PFLRP.
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.	1.2.1 Soil and leaf samples were collected from the on-farm maize variety trials. The soil samples have been analyzed at the Ekona Soils Laboratory.
	1.2.2 Two field trials at Nfonta & Babungo comparing "ankara" with "no ankara". Soil & plant analyses to throw light on advantages or otherwise of system.	1.2.2 Trial was sited only at Nfonta. Soil and plant samples have been taken. In collaboration with HTA-Mbalmayo, the chemistry of soils burnt under "ankara" system is being investigated.
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; baseline survey in agro-forestry research villages, for future impact study.	1.3 Almost 1000 Retention Survey questionnaires were distributed to extension staff throughout 2 provinces. Many completed questionnaires have already been received by TLU. The scheduled Diffusion Survey was thwarted by the workers' strike.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
1.4 Produce a map of the Western Highlands based on soil fertility characteristics.	1.4 Collation of information from publications from previous soil mapping studies in the NWP & WP; with compensatory soil sampling and analysis where necessary.	1.4 Base soil map has been produced by Ekona Soils Centre. Detailed soil profile description and analyses have been carried out in collaboration with the University Centre-Dschang.
<b>Operation 2. Identify improved and well adapted varieties.</b>		
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.	2.1.1 On-farm maize variety trials were planted on more than 100 farms in 20 villages in the NWP and WP. Harvest has already begun, although results from many sites will be lost because of the IRA workers strike.
	2.1.2 On-station Intercropping trial of new maize varieties with grain legumes.	2.1.2 Trials successfully planted at Nfonta & Babungo. Intercropped legumes were harvested at Babungo.
	2.1.3 Researcher managed on-farm trials to evaluate the performance of new hybrid maize varieties.	2.1.3 On-farm hybrid evaluation trials were planted at five sites in the West Province. The IRA strike delayed the harvest.
2.2 Confirm value and acceptability of IRA/NCRE maize varieties.	2.2 Continued yearly distribution of 300 maize trial minikits to extension agents.	2.2 Minikit maize trials were distributed to extension staff in February as usual. First results are being received by post.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 3. Identify appropriate technologies for enhancing and sustaining soil fertility.</b>		
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.	3.1 A combined soil erosion control and fertility management trial was planted on an average 10 farms in each of 7 villages by peace corps volunteers. Harvest of maize is now beginning.
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.	3.2 (See 3.1) [Trials were of flexible design, allowing the participating farmers to chose among optional treatments.]
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.	3.3.1 Chemical analyses of both soil and plant materials from the pot trial were carried out. Phosphorus deficiency was strong in most of the soils.
	3.3.2 On-station Nitrogen requirement trial for a maize + grain legume intercrop.	3.3.2 One trial was sited at Babungo station. Soil and plant samples were taken for laboratory analysis. Intercropped legumes have been harvested.
	3.3.3 On-station fertilizer requirement trial for new hybrid maize varieties.	3.3.3 Trial was planted at Babungo and Ngaoundere. All cultural operations have been completed.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 4. Increase knowledge of improved crop production materials and methods.</b>		
4.1 Developing technical bulletins.	4.1 Completion of maize technical bulletin in collaboration with UCD, and preparation of other extension bulletins as needed.	4.1 Maize Technical Bulletin completed and field tested. Awaiting final printing at UCD and distribution.
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).	4.2 Delays in implementation of National Extension and Training Program, and impediments posed by the IRA strike, effectively stymied participation of TLU in all but a limited number of extension staff training activities in WP.
<b>5. Professional Development.</b>		
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.	5.1 Paper entitled " An appraisal of soil fertility constraints to production in the mid-altitude zone of the western highlands of Cameroon" to be presented at the ASA meeting in November. Paper entitled "The effect of storage loss rates on the valuation of maize stored traditionally by farmers and removed periodically for food, feed or sale in Cameroon" to be published in the next issue of the <i>AFSR-E Journal</i> .

#### 6.1.4 FOLLOW-UP ACTIVITIES

Harvest of on-farm and on-station trials will continue, strike conditions permitting, through October. Questionnaires for the agroforestry baseline survey and maize variety retention

surveys will be collected in September. Most of the rest of the year will be reserved for data tabulation, analysis, interpretation, and report writing. With the departure of the TLU IITA economist and agronomist in December and March, respectively, a lot of time will be devoted to handing over activities. The goal is for a smooth transition to effective TLU management by the national counterparts. The continued success of the TLU of course will depend to a large extent on the resources made available to TLU-Bambui in the future. We are, however, confident that the national staff will prove up to the task, if provided adequate support.

Mr. Meppe François and Marc Samatana will represent the TLU at a workshop of COMBS in Garoua in September. Dr. Osiname will present a paper at the ASA meeting.

#### 6.1.5 VISITORS

Mr. Dave Poland	16-19 March	NCRE brochure consultant
Mr. McMann	28-30 April	First visit of new USAID ADO.
Mr. Benbow		
Dr. Atayi		
Dr. Dunstan Spencer of	June	Backstopping visit of the Director IITA/RCMD
Dr. Mark Winslow	August	Backstopping visit of Director of IITA/Maize Improvement Division
World Bank Consultants		Discussed World Bank funding of research
Mrs. Laetitia Enyong	July	Field visit in respect to her Doctoral thesis.

## **6.2 EKONA TLU**

### **6.2.1 INTRODUCTION**

Ekona TLU is responsible for the Coastal Humid Forest Region of Cameroon. This 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/HTA 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 SUMMARY OF PROGRAM ACTIVITIES**

Our focus for 1992 has been in developing low cash input technologies for improving and sustaining soil fertility and for weed management. Also trials to identify and determine the performance across environments of available improved maize and cassava varieties were continued during 1992.

We carried out diagnostic surveys in agroforestry in the Littoral and Southwest Provinces. A total of 720 farmers were interviewed from 24 villages in eight divisions. Twelve market price monitoring on eight major crop types, and once a month data collection was begun in April.

In our efforts to increase IRA technologies, our approach is to develop low cash input alternatives. We stressed 3 main constraint areas: variety, fertility and weed control. In terms of variety improvement we work in collaboration with breeders of the different crops. This include the maize, cassava, cocoyam and plantain breeders. Collaborative trials established for 1992 include five maize variety trials plus one hybrid trial, a cassava cooking trial and cocoyam and Plantains in alley.

Minikit trials continued with about 700 kits sent out this season. Most of our trials to improve fertility also lead to control of weeds because we consider these two important constraints as linked. In this respect we continued work on alley cropping with maize +

cassava intercrop at Yoke site; transferring the alley system to farmers' with the help of Peace Corps in 3 Divisions: Fako, Meme and Ndian. We also established a trial on the use of cover crops and intercropping systems for weed control and soil fertility improvement at Yoke with 13 cassava based systems. Cover crops establishment and rate of ground cover and weed infestation are evaluated. Component technology on-station and on-farm trials have been established to study the relative contribution of improved component technologies from our 3 constraint areas (variety, fertility and weed control) to the overall yield of a cassava + maize system. The on-farm trial involved 256 farmers in the South West province. This trial also helps to strengthen and institutionalize our collaboration with the extension staff of the Ministry of Agriculture through active participation.

Focus village meetings were held in March 1992. Sixty thousand cassava cuttings were acquired from some farmers and distributed to other farmers while 19300 sweet potato (Tib-1) vines were acquired and distributed to farmers in several villages in SWP. From the cassava and maize retention rate studies, 195 farmers (153 cassava users and 42 maize users) were interviewed.

The perennial request for more researchers and technicians to strengthen the socio-economic work managed by a single researcher remains to be addressed. Personnel from IITA's Resource and crop management Division, World Bank, Pioneer Seed, RTC Kumba and Ministry of Agriculture, Littoral Province, have consulted with TLU, Ekona during this period.

### 6.2.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1:</b>	<b>Diagnosis of farmers' circumstances and practices.</b>	
1.1. Feedback information on farming systems and markets.	1.1.1 Produce manuscripts for publication of FSR and Market monographs.	1.1.1 Not yet started.
	1.1.2 Resource management survey.	1.1.2 Collaborative with Dr. Dvorak of IITA and Dr. Baker of Economic Analysis Unit of IRA/NCRE. Data collected in February. Analysis and report awaited.
	1.1.3 Agroforestry potentials of small farmers of SW and Littoral provinces	1.1.3 South West data collected and coded. Littoral data collection to complete on August 22, 1992.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
1.2. Generate price data for use in economic analysis.	1.2.1. Periodic market monitoring.	1.2.1 Weighing scales were distributed to twelve market monitors, most of them market masters in March. Price data are being collected on 9 crop types. The first data for 2nd quarter 1992 already collected.
1.3. Generate labor cost data for whole farm budgeting.	1.3.1. Labor measurement of all field operations in food crop production.	1.3.1 Planned for second season.
1.4.	1.4.1. The contribution of cocoyam ( <i>Xanthosoma Spp</i> ) 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.	1.4.1 A University of Dschang student is being supervised. Topic of research is: Household study of cocoyam production in Fako Division. Data collected from 120 farmers are already coded.
1.5 Economic analysis.	1.5.1. Data analysis using SPSS, Lotus & SYSTAT. Consultation with SPSS specialist at Univ. Centre Dschang and with NCRE Economists in Bambui and Nkolbisson.	1.5.1 Analysis on cassava and maize retention, and agroforestry survey.

**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 planophile crops intercropped with maize and cassava.	2.1 Weed control and soil fertility trials are integrated 2 crop and three crop mixtures were established for study of both soil fertility improvement and weed control on a sandy soil area.
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OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
2.2 Assess benefits from short term leguminous fallows.	2.2 Rotational fallow for soil improvement and weed control. Establishment of Croton, Pigeon pea, Pueraria, Mucuna, and Mimosa in first season followed by second season crop.	2.2 Rotational annuals used in this trial are croton, mucuna, mimosa and pueraria, cassava + maize intercrop system are used to evaluate residual fertility following one season or one year of fallow.
2.3 Seed lot source for agroforestry trials.	2.3 Maintenance of Alley Spp. established at Yoke for seed lot. Replant lost stands.	2.3 Seed lot burnt by bush fire. Alternate approach to seed procurement through collection in farmers fields is being used while seed lot is re-established..
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.	2.4 Two alley species x 3 cropping systems (based on plantain) in three replications established in Ekona centre. Maize component harvested.
2.5 Acquainting farmers with alley system and management.	2.5 Introduction of agroforestry system to selected sites in Fako, Meme, and Ndian Divisions (Peace Corps volunteers).	2.5 Peace Corps alley - established plots in place at 4 sites in Meme Division and 2 sites in Fako. Ndian is an acid soil area therefore activity is slow - only cassia seedling is being established at present.
2.6 N and P management.	2.6.1. Continuation of Yoke agroforestry trial to determine N economy.	2.6.1 This long term trial has been re-established with cassava and maize intercrop in the alleys.
	2.6.2. P. characteristics of selected soils in SW and Littoral provinces using Isotherm method.	2.6.2 Not yet started.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 3: Identify appropriate crop protection practices.</b>		
3.1 Assess the effectiveness of Marshall seed treatment for egusi beetle.	3.1 Concluded	3.1 Write up in progress.
3.2 Identify locally adapted pest control methods.	3.2 Input in studies on use of indigenous plant materials for controlling storage pests (Mr. Asanga Dschang).	3.2 Write up in progress.
3.3 Assess effectiveness of furadan in controlling stem borers.	3.3 Discontinued, enough information available.	3.3 Write up in progress.
3.4 Determine cheap control methods of cocoyam root rot (CRRD).	3.4 Cultural control of CRRD using selected planting materials. ROTREP collaboration.	3.4 Trial established as split plot with 4 cocoyam sizes as main plot and five methods of CRRD control as sub-plots.
3.5 Evaluate low cost cultural weed control measures.	3.5 See 2.1, 2.2, 4.5.	3.5 Weed control and soil fertility studies combined since soil fertility and weed control are linked. See 2.1, 2.2 and 4.5.
<b>Operation 4: Identify improved and well-adapted crop varieties.</b>		
4.1. Variety Evaluation.	4.1 On-farm farmer minikit evaluation of maize, cassava, sweet potatoes. Extend evaluation to Littoral Province.	4.1 Package trials have been distributed to about 300 farmers in SWP and results are awaited.
4.2. Identify high yielding maize.	4.2 NVT maize trial established at two sites using Breeder's maize lines.	4.2 Improved and breeders' maize established at Yoke and Mile 17 in collaboration with Breeder. Maize already harvested. Stealing of cobs was a serious problem at both sites.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
4.3. Identify high yielding cocoyam.	4.3 On-farm cocoyam clonal evaluation for resistance to CRRD, collaborative with ROTREP (300.000).	4.3 Two available cocoyam selections from ROTREP established in 11 farmers' fields in Fako. Poor establishment on-farm noted. Other growth parameters are being recorded.
4.4. Ascertain starch contents of several root crops.	4.4 Rapid quality determination for root and tuber crops by specific gravity.	4.4 Evaluation done with cocoyam only. SG ranges from 0.9 - 1.3. Related to dry matter content of product.
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	4.5.1 On station trial completed at 2 sites. Maize and peanut harvests completed and have been analyzed statistically, economic averages will be done after cassava harvest.
	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.	4.5.2 About 40% data returned so far. Further Data awaited from NETP collaborators prior to analysis.
4.6 Evaluate maize and cassava variety retention rates and determinants of retention.	4.6 Maize and Cassava retention surveys.	4.6 Data collected from a total of 195 farmers - (153 for cassava and 43 for maize).
<b>Operation 5. Increase knowledge of IRA technologies.</b>		
5.1. Communicate TLU findings to extension agents and farmers.	5.1 Focus village meetings each year. TLU annual workshop. Technical information bulletin.	5.1 Focus village meetings held March 9-17 in 7 villages. Total number of participants were 406 (289 men and 117 women).

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
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.	5.2 Training completed at 3 sites in Fako Division, 2 sites each in Meme, Manyu and Ndian Divisions. About 180 extension personnel involved.
5.3.	5.3. Acquisition and provision of improved planting materials to farmers and extension agents in S.W. & Littoral Provinces.	5.3 A total of 19,300 Sweet potato vines acquired and distributed directly to farmers. 60,000 cassava cuttings secured for later distribution.

**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).	6.1 Work still at planning stage with Ekona soils. Financing may limit this study which is to be started in October if there is enough finance.
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**6.2.4 FOLLOW-UP ACTIVITIES**

1. Data analysis and report writing
2. Market data collection for 3rd and 4th quarters
3. Labor cost data collection
4. On station 2nd season trial and soil characterization studies if money is still available.

## 6.2.5 VISITORS

Prof. Joseph Owona	MESIRES
J. Ayuk-Takem	Director of IRA, Nkolbisson, (now Minister MRST)
Jay P. Johnson	Director USAID (Retired)
Peter Benedict	Director, USAID Yaounde
Taylor L.	USAID Yaounde
Quincy Benbow	USAID Yaounde
Dr. Spencer	IITA Ibadan
Dr. Henk Mutsaers	IITA Ibadan
Dr. I.O. Akobundu	IITA Ibadan
Carter, John	Yaounde
E.A. Atayi	NCRE Chief of Party, Nkolbisson
M. Moussie	Sr. Economist, NCRE Nkolbisson
Ron Harvey	Deputy Director of USAID Yaounde
Nkangu L. Denis	Accountant, CDC Ekona Banana
Jameson M. Mutwerandu	PAID Buca
Mnapenn Felix	Provincial Service of Agriculture
Tchetchoum Puchet	Provincial Service of Agriculture
Dvorak K.	IITA Ibadan
Nkweta Z.	Botanical Garden Limbe
Nkefor Joseph	Botanical Garden Limbe
Maureen-Durkin-Powell	KORUP Project
William C. Anderson	Peace Corps Rep. Buca
Octisenbain Christoph	RTC Kumba
C.L.A. Asadu	Univ. of Nsukka Nigeria
Nganje Martin	Botanical Garden Limbe
Christopher Glaudel	Kitiwum, Bui Div. NWP.
Nguele Diodonne	Minagri, Buca
M.F. Roche	Minagri FAO/World Bank consultant
Mustafa Cetinrol	Egypt, Army forces bloc NASR CITY-CAIRO
Sona Ebai	Pioneer Seed company BP 5021 Yaounde
Lekunze John	Prov Service of Manpower and employment Buca
Michele J. Sison	US Consul, Douala
Lorie Pearson	Peace corp Director Yaounde
William Anderson	Peace corp Delegate in Buca
Ngu M Api	University of Ibadan Nigeria
Georges Same	Paris, France
J.L. Messa	CIRAO Yaounde
Christophe Philibet	Paris
Teresa LeClair	Peace Corps - Buca
Arrah Emmanuel	Delegation of Agriculture Buca
Bawak Ebai S.	Nnamdi Azikiwe University, Nigeria

## **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-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 well 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 SUMMARY OF PROGRAM ACTIVITIES**

During 1992 Maroua TLU reduced emphasis on diagnostic activities in favor of more on-farm tests and minikits. Diagnostic studies are now limited to millet appraisal survey and storage practices for sorghum and peanuts. The 3 year agricultural practices survey has been completed and analysis is progressing well.

Distribution of minikit tests has been extended to include the Kaele Division. To improve the quality of data TLU has initiated a series of field visits to meet farmers and MINAGRI agents collaborating on minikit tests.

Regional tests of sorghum and peanut varieties have been equally split between SODECOTON and PNVFA as TLU moves toward more involvement with MINAGRI. Except for 2 tests abandoned for poor sanitation and incorrect application of fertilizer, the progress in monitoring field activities is good. Only one test (land preparation) is being conducted in the TLU observational village (6 replications per village). The cover crop trial in the 4 villages is supervised by TLU agents. On-station technology generation to stabilize yields of sorghum comprises (1) two trials on the effect of striga treatment on subsequent striga population, (2) three trials on the effect of cowpea association on striga population in sorghum (one in collaboration with grain legume section), (3) screening of cover crop for soil protection and (4) observation (2nd year) of pigeon pea and *Cassia Siamea* hedgerows and associated crops. A trial on mulch and moisture conservation in Muskwari (dry season sorghum) is being conducted in collaboration with IRA soil section.

The counterpart agricultural economist left for long term training in the USA in January 1992. The counterpart agronomist is expected to attend ASA meeting to present a poster paper on TLU activities. All TLU scientists will participate in the IITA's COMBS workshop in Garoua Sept 1-4, 1992.

A strike by IRA workers in early June delayed planting of some on-farm tests. Corrective action was taken.

### 6.3.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1: Improve knowledge of farmers' circumstances, practices and institutional framework.</b>		
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.	1.1.1 Monitoring food crop prices in progress (50%). Millet survey to begin end of September.
	1.1.2 Survey of storage practices for sorghum, peanut, millet. Marketing survey for sorghum.	1.1.2 Questionnaire designed and tested. Survey implementation by Mid October (20%).
	1.1.3 Resource management survey for Far North Province (IITA/IRA).	1.1.3 Survey completed; analysis in progress at IITA.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
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.	1.2 Analysis to be completed by October (50%) preliminary report in November. Preliminary report of agroforestry survey is available (70%).

**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.	2.1 Trials planted in June Biometric observations in progress.
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.	2.2 Trials planted in June; first measurements of cover crops made. Other Biometric observations in progress. Leguminous trees pruned (alley cropping).
2.3 Identify viable practices to conserve soil moisture in Muskwari.	2.3 Trials of mulch and plowing for moisture conservation.	2.3 Trial in second year; Muskwari nursery planted.

**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.	3.1 Completed 4 of the 6 field visits planned. 80% of tests in good standing. Preparations underway for harvesting peanut tests.
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.	3.2 Completed 4 of 6 field visits planned. 75% of tests in good standing.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
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.	3.3 One of the 24 tests abandoned for poor performance. Progress good in monitoring and data collection.
3.4 Monitor farmers preferences and utilization of IRA varieties.	3.4 Retention survey of peanut varieties and minikit themes.	3.4 Implementation by Nov. 92. Questionnaire being designed (10%).
<b>Operation 4: Identify low cost, practicable post harvest technologies for reducing grain losses.</b>		
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.	4.1 Preparations (40%) made for demonstration with extensions agents in October. Implementation at village level, November-January 93.
<b>Operation 5: Disseminate knowledge of improved crop production</b>		
5.1. Communicate findings to extension agents and farmers.	5.1 Writing and disseminating working papers and extension leaflets, minikits tests.	5.1 3 working papers in press. Extension leaflets on cowpea storage ready for distribution. Good progress in monitoring minikit tests.

### 6.3.4 FOLLOW-UP ACTIVITIES

Millet appraisal survey and study of storage practice for sorghum and peanut will be at the end of October. Analysis of 3 year agricultural practices to be completed by October, first draft of working paper will be written in November. Retention survey of peanut variety and minikits will begin in November. All regional variety tests are expected be harvested by end of September (peanut) and October through November (sorghum). Data processing to proceed through January 93. Regional demonstrations of cowpea storage will be conducted in October-November in collaboration with SODECOTON and PNVFA.

### 6.3.5 VISITORS

- Dr. D. S. C. Spencer, and RCMP team of IITA for backstopping of TLU activities, June 18-20
- Mrs. Enyong, NCRE counterpart and Ph D candidate, Virginia Technical University, to collect data and interview with researchers, June 24-July 03
- Mrs. Enyong, March 13-14 with Dr. Atayi
- Mrs. Enyong, June 6 with Supervisor Dr. D. Oliver, Virginia Tech
- Mr. S. Claassen, IITA, Mbalmayo Station Manager
- Dr. G. Weber, IITA/RCMD, April 10-11
- Dr. Bekayo, DRTA, Ndjamena, Chad, March 24
- Mr. Djoulet, IRCT, Bebejia, Chad, March 16
- Mr. Ouatouroum, ONDR, Bebedjia, Chad, March 16

## 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 MINAGR'. 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 SUMMARY OF PROGRAM ACTIVITIES

During the reporting period, March-August, 1992, the TLU carried out five on-station trials at two sites (Minkomeyos and Ntui) on agroforestry, planted fallow, and maize variety (hybrid vs open-pollinated). During this same period, the TLU distributed and supervised about 400 regional variety and fertility tests, and over 500 regional maize adoption plots. More than 75% of participant farmers implemented the tests. Because of the support and collaboration of the MINAGRI delegates of the South and Center provinces, the participation of farmers and implementation of the trials have been much better than last year.

The number of TLU research villages has increased from two to six. The TLU is now working in two villages in each of the TLUs three research zones: Humid forest, Sub-humid forest, and forest-savanna transition. During the first season, 1992, the TLU carried out on-farm maize variety trials in about 90 sites (15 per village) and one alley cropping trial in ten sites/farms at Nkolpép, Center province.

### 6.4.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1: Farming systems</b>		
1.1. Provide information and identify research needs.	1.1.1 Village-level resource management survey.	1.1.1 Survey completed, data being analyzed.
	1.1.2 Farm input-output study	1.1.2 Survey to be conducted during second season, 1992.
1.2. Evaluate technology adoption and impact.	1.2 Retention survey on improved maize and cassava	1.2 Survey completed, data entry in progress.
<b>Operation 2: On-farm technology evaluation.</b>		
2.1. Identify well-adapted and acceptable varieties.	2.1.1 Farmer maize variety tests.	2.1.1 Tests implemented, with open-pollinated and hybrid varieties in old research villages, and CMS 8806 and DMR in new research villages.
	2.1.2 Farmer assessment surveys.	2.2. Completed questionnaires to be collected from extension delegates.
2.2. Testing support for IRA researchers.	2.2 Hybrid versus open-pollinated maize trial.	2.2 Trial implemented and harvested. Analysis in progress.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 3: Technologies for sustainable Soil Improvement</b>		
3.1. Evaluate benefits from leguminous hedgerows.	3.1.1 Cassia/food crop trial (on-station).	3.1.1 Maize yields and biomass production measured for tree/crop arrangements at two sites. Data analysis in progress.
	3.1.2 Establishment of Calliandra hedgerows	3.1.2 More than 20 sites established in two research domains, and first year maize harvested.
	3.1.3 Monitoring of socio-economic aspects of agroforestry trials	3.1.3 Labor input data into alley cropping system collected and are to be quantified.
3.2. Identify species and practices for legume fallow.	3.2.1 Sesbania and Mimosa fallow management	3.2.1 Third and final tests implemented. Mimosa appears to be more effective in improving soil fertility and in controlling weeds.
	3.2.2 Maize-Cajanus cajan fallow test	3.2.2 Ten tests implemented and first season maize harvested from five sites.
	3.2.3 Groundnut-Crotalaria- Desmodium fallow test.	3.2.3 Both species well established, and are to be cropped this second season.
3.3. Finalize maize fertilization recommendation	3.3 Regional maize fertilization tests for urea and 20-10-10	3.3 Material distributed to 124 farmers in 31 villages. About 80% implemented the trial. Harvested data being collected.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 4.</b>	<b>Dissemination and extension Liaison</b>	
4.1. Validate on-farm test results	4.1.1 Regional varietal testing program.	4.1.1 Material distributed to 248 farmers ; maize harvest data collected from about 75% of farmers.
	4.1.2 Harvest cassava from 1991 regional varietal testing program.	4.1.2 Harvest data of 1991 cassava collected. Data being analyzed.
4.3. Provide materials to farmers.	4.3.1 Regional adoption plots.	4.3.1 Material distributed to 465 farmers across the TLU mandate area. Farmer assessment forms collected from about 75% of adoption tests.
	4.3.2 Pilot village-level Calliandra and Lucaena seedlings multiplication.	4.3.2 About 10,000 <u>Calliandra</u> seedlings grown by farmers. All planted in hedgerows in their fields.
4.4. Train MINAGRI personnel	4.4. Training sessions for regional tests and demonstrations.	4.4 Training related to TLU regional testing program provided to 30 MINAGRI extension staff.

#### 6.4.4 FOLLOW-UP ACTIVITIES

##### For Operation 1:

Finalize analysis of Resource Management Survey and produce preliminary report in collaboration with Economic Analysis Unit.  
 Implement farm input-output survey during second season.  
 Finalize analysis of the retention survey and produce preliminary report.

For Operation 2:

Analyze maize variety tests and farmer assessment survey.  
Analyze hybrid versus open-pollinated maize trial, and repeat trial during the second season.

For Operation 3:

Follow-up trial with soybeans and desmodium for the Cassia trial.  
Follow-up trial with Cajanus cajan and continue monitoring for the on-farm alley cropping trial.

For Operation 4:

Finalize analysis of first season regional maize variety test and 1991 cassava harvest data. Repeat trial in second season with fewer villages.  
Finalize analysis of first season adoption tests and plan for effective implementation in first season, 1993.  
Provide a number of training session to extension agents who implement/supervise the regional tests.

#### 6.4.5 VISITORS

Drs. Spencer and Akobundu - RCMP/IITA  
Dr. Mutsaers - RCMP/IITA  
Dr. Akobundu - RCMP/IITA

A team of USDA forestry specialists  
A consultant from AID Washington on input-output studies

Three researchers from Equatorial Guinea.

## **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 SUMMARY OF PROGRAM ACTIVITIES**

The EAU's major research activity for the first half of the year was a nation-wide resource management survey. The survey required more than two months of fieldwork and several weeks of office time. Implementation was only possible through collaboration with the TLUs, IITA's Humid Forest Station and IITA's Resource and Crop Management Division--with all collaborating parties bearing part of the survey cost.

IRA Research Services responsibilities accounted for two other time-consuming activities. One was a research priority setting study. As a prelude to priority setting workshops, IRA priority rankings were revised. A new procedure was developed for establishing priorities and linking priorities to research budgets. The new procedure was pre-tested in an IRZV workshop. The second activity was revision of IRA's Performance Contract. As part of the contract revision process, IRA was required to specify research objectives and performance indicators for all programs. The list of objectives took some time to prepare since little information is available on current research. Although little progress was made, some time was spent on two other Research Services activities: designing IRAMIS (IRA's research management information system) and preparing research budgeting guidelines.

Most of the rest of the time was spent working on various research papers. Two conference papers were completed. One, co-authored with Eric Crawford of Michigan State University, was on "Farming Systems Research and Economics in Africa." The second, invited for presentation at the AFSRE Symposium, is entitled "Inability of Farming Systems Research to Deal with Agricultural Policy." Both papers identify issues and strategic orientations for economists working in technical research institutes, and help clarify the policy analysis, impact measurement and priority setting functions of the Economic Analysis Unit. A third paper is being prepared on maize fertilization in the humid forest zone. Some work was also done on two monographs (one on NCRE/TLU experiences and the other on Nkolbisson TLU maize-cassava work).

Small amounts of time were required for: (a) survey design advice for four studies, (b) participation in HTA's work planning week, (c) creation and set-up of the Economic Analysis Unit office, (d) participation--as the Director's representative--in a rural crisis and adjustment workshop at University Center of Dschang, (e) discussions with the FAO/World Bank evaluation mission, and (f) review and comments on Mrs. Enyong's dissertation research.

### 7.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1: Analyze economics of IRA research.</b>		
1.1. Evaluate policy and other factors affecting technology demand.	1.1.1 Resource management survey.	1.1.1 Fieldwork complete nationwide except for a few missed villages; data entry on-going in Ibadan.
	1.1.2 CAPP collaborative studies.	1.1.2 Discussions were held but collaboration put on hold pending outcome of CAPP review/redesign.
1.2. Determine research priorities.	1.2.1 IRA priority setting study.	1.2.1 (a) Developed new priority setting approach which links research priorities and budgets. (b) Revised IRA priority rankings and assigned target budget envelopes by center and program groups. (c) Developed scoring model for research budget allocation and pre-tested model in IRZV workshop.
1.3. Appraise research benefits.	1.3.1 TLU rates of return study.	1.3.1 Not yet started (planned for November/December).
	1.3.2 Research evaluation workshop.	1.3.2 Not yet started (planned for January).

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 2: Institute economic analysis support services.</b>		
2.1 Help IRA researchers with research budgeting and analysis.	2.1.1 Design and analysis advisory service.	2.1.1 Provided survey design advise for four studies.
	2.1.2 Research budgeting guidelines.	2.1.2 Working on this as part of IRAMIS.
	2.1.3 Statistics workshops.	2.1.3 IRA Biometrics Unit took over responsibility for this activity.
2.2. Provide support to IRA Research Services.	2.2.1 IRAMIS implementation.	2.2.1 (a) Management system and draft data forms designed. (b) Compiled list of current and proposed research activities.
	2.2.2 IRA contract requirements.	2.2.2 (a) Helped revise IRA's Performance Contract. (b) Prepared document on objectives and performance indicators for all programs at each center.

#### 7.4 FOLLOW-UP ACTIVITIES

The most important activities for the rest of the year, in order of priority, as follows:

Finish data entry and documentation for Resource Management Survey. Carry out preliminary data analysis and write summary of major findings.

Make site visits to each TLU in order to collect information and data for the TLU rates of return study. Hopefully, to estimate rates of returns for 2-4 recommendations per TLU by the end of the year.

Prepare an overview of IRAMIS and seek approval from the Director for implementation. Subject to approval, finalize data sheets, write instruction booklet and budgeting guidelines, and pre-test the operation and activity forms with a sub-sample of IRA/NCRE researchers.

Schedule the research evaluation workshop (for January) and send out a call for papers.

Finalize the unfinished research monographs and fertilizer paper mentioned above.

Hold a series of priority setting workshops in order to generate consensus on program priorities and establish transparency in budget allocation. (Implementation of the workshops depends on IRA Directorate interest and financial support.)

## **7.5 VISITORS**

1. Karen Dvorak (IITA) - resource management survey
2. Anne-Marie Izaac (IITA) - IRA collaboration on wetlands research
3. Dunstan Spencer (IITA) - program orientation and review
4. M. D. Mitchnik (World Bank) - second phase of World Bank research project, FAO/World Bank evaluation mission, IRA participation in PNVFA
5. M. A. Kawalec (FAO) - IRA proposal for second phase of World Bank research project
6. Don Corbett - IRA proposal for second phase of World Bank research project and FAO/World Bank evaluation mission
7. Ann Gordon (NRI, England) - FAO/World Bank evaluation mission
8. M. T. Teuscher (GTZ) - IRZ proposal for second phase of World Bank research project and priority setting workshop
9. Rudolf Contant (ISNAR) - IRA management information system and priority setting methods.

## 8 SOIL/AGROFORESTRY UNIT

### 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. This will include Stimulation of growth and productivity of Leucaena leucephala with manure, Response of selected species to repeated pruning, Alley cropping for soil fertility management, Comparison of simultaneous fallow with calliandra and Tephrosia, Decomposition and nutrient release patterns from biomass of shrub legumes, 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. This will include Screening of indigenous species for soil fertility improvement, Nitrogen contribution of Tephrosia and Crotalaria, Crop response to P fertilization under improved fallow management, Examination of residual effect of screening trial begun in 1991, Comparative studies on short and long term fallow with *Cajanus cajan*; begun in 1991.

### 8.2 SUMMARY OF PROGRAM ACTIVITIES

Our research agenda addressed the two major soil-related issues namely N and P deficiencies as revealed by earlier diagnostic surveys and the site characterization exercise conducted in 1991. In general, soils of the highland eco-zones (Mbiyeh, Upper Farm, Nfonta and Dzung) had higher P requirements than the lowland soils (Befang, Babungo and Fombot). Similarly, aluminum saturation was elevated in the highland and virtually non-existent in the lowland soils. We have found that green manuring with *Mucuna*, *Crotalaria* and *Tephrosia* enhanced P availability and supplied maize with about 50% of its N fertilizer requirements. It appears soil aluminum and Calcium determine the productivity of green manure crops in the region. Comparatively, *Crotalaria* was found to be more stable and gave reasonable biomass at all the test sites. The value of agroforestry as soil improver on the acid infertile soils can be chattered by stimulating early growth of the shrubs with a handful of starter manure. Our studies continue to ascertain the sustainability of the systems in question. On the whole, the season began fairly well but was interrupted at the latter part by the IRA strike. The strike and the ensued vandalism almost ruined our efforts for the season.

### 8.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1. Shrub Evaluation.</b>		
1.1 Stimulation of growth and productivity and of leucaena with manure.	1.1 Identify method of Leucaena establishment on poor soils.	1.1 Application of about 1kg poultry manure per plant resulted in three fold increase of leucaena biomass.
1.2 Response of selected species to repeated pruning.	1.2 Information of coppicing ability of shrubs.	1.2 Calliandra and Leucaena were promising species.
1.3 Alley cropping for soil fertility management.	1.3 Yield sustainability with Alley cropping.	1.3 Trials have been installed at five eco-zones.
1.4 Comparison of simultaneous fallow with Calliandra and Tephrosia.	1.4 Suitable fallow management with perennial and bi annuals.	1.4 Tephrosia is preferred in the short term. While calliandra shows potential for longterm soil fertility management.
1.5 Decomposition and nutrient release pattern from biomass.	1.5 Information on proper management of agroforestry species.	1.5 Was not carried out because the research materials were not received from IITA.
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.	1.6 Fourteen trials have been established in collaboration with IRZV. A field day was organized.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 2. Evaluation of herbaceous legumes</b>		
2.1 Screening of indigenous species for soil fertility improvement.	2.1 Identification of suitable local species for different eco-zones.	2.1 Nine legume species have been identified for 5 eco-zones.
2.2. N contribution of Tephrosia and Crotalaria.	2.2 Management option for Tephrosia and Crotalaria improved fallow.	2.2 Tephrosia and Crotalaria N can replace about 50% of purchased N Fertilizer for maize.
2.3 Crop response to P fertilization under improved fallow management.	2.3 Reduced fertilizer requirement with green manuring.	2.3 Mucuna enhanced P fertilizer availability to maize and supplied N in addition.
2.4 Examination of residual effect of screen trial begun in 1991.	2.3 Reduced fertilizer N requirement with green manuring.	2.3 Study is in progress.
2.5 Comparative studies on short and longterm fallow with Cajanus, begun 1991.	2.4 Management systems for Cajanus used as improved fallow.	2.4 The short term (6 months) fallow appeared better than the longterm (12 months) fallow.

#### 8.4 FOLLOW-UP ACTIVITIES

Trials will be harvested and the data analyzed. Second season plantings will be done for selected trials to determine sustainability of the proposed systems. End of year report will be written as well.

#### 8.5 VISITORS

- 1) USAID Director
- 2) ADO (USAID Yaounde)
- 3) Project Manager (USAID Yaounde)
- 4) USAID Project Officers (Yaounde)
- 5) NCRI COP, DCOP and some administrative Staff (Yaounde).
- 6) Director (RCMD, IITA) and Dr. Akobundu (IITA)
- 7) Director (CID, IITA).

## 9 GRAIN LEGUME RESEARCH UNIT

### 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) and Field insect pests.

### 9.2 SUMMARY OF PROGRAM ACTIVITIES

The activities could be summarized as follow:

- Participation in the IITA work planning week for 1992
- Participation in the IRA/North technical meeting (presentation of the 1991 research results)
- Preparation of work plan for 1992
- Preparation of planting materials and layout of the experimental fields at Guiring, Guetale and Sanguere
- Planting of all the trials
- Observation on plant stand, flowering insects and diseases
- Collaboration with NEB (Nord Est Benoue) project for on-farm trial with cowpea.

### 9.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1. Identify high yielding and adapted varieties</b>		
1. Identification of good performing varieties of cowpea and soybeans.	1.1 On-station testing of different varieties of cowpea and soybean.	1.1 All cowpea varietal trials (6) have been planted at Guiring from July 6 to July 17, 1992. A soybean observation trial has also been planted at Guiring.
	1.2 Multilocation testing of best performing varieties of cowpea previously identified.	1.2 Regional cowpea varietal trials (3) have been planted at Sanguere on July 9 and 10, 1992. The same trials have been planted at Guetale from July, 13 to July 24, 1992.
<b>Operation 2. Evaluation of germplasm and varietal development</b>		
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 performing lines of the previous test.	2.1 A total of 75 lines have been planted at Guiring, Guetale, and Ndonkole, 50 of which are selections from the 1991 evaluation test.
2.2 Develop new varieties.	2.2. Crossing of improved lines with selected locally adapted lines and advancing generations.	2.2 F2 population of 26 different crosses have been planted at Guiring.
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.	2.3 A simple questionnaire has been written and will be followed up in few villages

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 3. Evaluation of cowpea genotype under different cropping systems.</b>		
3.1 Identification of good performing genotype under low insecticide application.	3.1. Testing of genotype in combination with chemical treatment.	3.1 20 selected varieties from the 1991 test have been planted at Guiring under different insecticide regimes.
<b>Operation 4. Evaluation of cowpea line for resistance to <u>Striga</u> and virus.</b>		
4.1. Identify sources of resistance under natural infestation.	4.1. Field testing of selected lines on <u>striga</u> sick plot.	4.1 20 lines have been planted on a naturally, infested plot at Guiring.
	4.2. Field screening of selected lines under natural virus infestation at a known virus hot spot.	4.2 16 entries have been planted at Guiring.
<b>Operation 5. Varietal purification and seed multiplication.</b>		
5.1. Purify the released varieties.	5.1. Plant to row evaluation of the selected planted in 1991.	5.1 Progenies rows of the selected plants in 1991 are established at Guiring.
5.2. Make seed available for multilocation test or on-farm test.	5.2. On-station seed multiplication of selected varieties.	5.2 Some varieties are being multiplied for seed production at Guiring (e.g. BR1, and Vya)

#### 9.4 FOLLOW-UP ACTIVITIES

Activities to be undertaken during the next part of the season are listed below:

- Continue management of the trials (weed control, insecticide application)
- Data collection during vegetative growth on plant characteristics, insects, diseases, flowering, striga, maturity
- Harvesting of the trials
- Recording the post harvest data (grain yield, fodder yield, seed characteristic)
- Start data analysis and report of the results
- Participation in the BEC on-farm research monitoring tour for Northern Cameroon and Chad
- Participation in the IITA/GLIP monitoring tour in Nigeria.

## 9.5 VISITORS

The program was visited by the following:

1. Dr. Bekayo N. Derla, Agronomist, "Direction de la Recherche et des Technologies Agricoles, Ministère du Développement Rural", N'Djamena, Chad.
2. Mr. Manfred Ailt, Mission Baptiste Européenne, B.P. 82 Maroua, Station de Dagaï, Cameroon.
3. Dr. E. A. Atayi, Chief of Party, NCRE Project, Yaounde, Cameroon.
4. Dr. B. B. Singh, Cowpea Breeder, Officer in Charge, IITA/Kano Substation, Kano, Nigeria
5. Dr. Diane Florini, Pathologist, GLIP IITA, Ibadan, Nigeria.
6. Dr. T. Mesfin, Entomologist, IITA Ibadan, Nigeria.
7. Dr. Butemberg, Entomologist, IITA Kano Substation, Kano, Nigeria.
8. Dr. Standford Blade, Agronomist/Breeder, IITA Kano Substation, Kano, Nigeria.

## **10 ADDITIONAL RESEARCH SUPPORT ACTIVITIES**

### **10.1 HIGHLAND CEREALS ENTOMOLOGY**

#### **10.1.1 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 efficiencies 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.

#### **10.1.2 CONSTRAINTS**

During the period in review, no experiment was terminated but work progressed on four of the five research operations outlined in the 1992 work plan.

The major operation that received a lot of attention during the period was the survey of the use of natural plant materials by farmers for stored grain protection against storage pests. Contact were made with the TLU researchers of Bambui and Ekona, the Provincial Delegations of Agriculture in the West, North West and South West Provinces to authorize their field staff to help in the survey. All those contacted were willing to collaborate but due to transportation constraints survey activities concentrated in the West and North West Provinces. The Agro-Economists of TLU Ekona participated actively in the review of the old farmers' questionnaire.

The next operation in importance was the identification of maize post harvest losses associated with storage methods and Agro-ecological zones. Again the Agro-Economists of TLU Ekona participated in the production of a detailed farmers' questionnaire. The operation was approved for funding by the Regional Research Project for maize and cassava but the funds were still awaited.

In the experiment to test the efficiency of stored grain insecticides on maize under major traditional storage methods, two observations were made during the period. The experiment will be terminated next November 1992. In the hermetic maize storage trial, the last observations were made on the maize high moisture contents (i.e. 17.4% and 20.3% mc).

Preliminary contacts and discussions with the technical staff of the rice sub-program in the North and Extreme North Provinces were made to start the operation of rice field insect survey and identification of sources of rice stem borer resistance next period when rice fields are established.

### 10.1.3 WORKPLAN TABLE

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1: Identify the use of natural plant materials by farmers for grain storage pest control.</b>		
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.	1.1 The old questionnaire was reviewed with the Agro-Economists of TLU Ekona. Over 500 names have been collected from the N. W. Province plus some 200 in the West Province and forms have been completed for about 80 users.
1.2. Identify the plants and parts used.	1.2. Visit the farmers who use the plant materials and collect specimens for laboratory identification.	1.2 Specimen collection has not yet commenced.
<b>Operation 2: Identify grain post harvest losses associated with each storage method and agro-ecological zone.</b>		
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.	2.1 A detailed farmers' questionnaire was drawn up in consultation with the TLU Agro-economist at Ekona. Only 25 farmers have been interviewed and the operation has been planned for the dry season.
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.	2.2 The farmers whose barns shall be monitored are still being selected from among those completing the questionnaire.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
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.	2.2. The farmers whose farms shall be monitored are still being selected from among those completing the questionnaire.
2.3. Document stored grain insect species and their intensities.	2.3. Identify insect species present in each barn sample.	2.3 The insects shall be identified from samples when taken.
<b>Operation 3: Identify sources of stored grain insect pest resistance from the major grains at various ecological zones.</b>		
3.1 Identify maize varieties which show resistance to weevils and other storage grain pests.	3.1. Some 200 maize breeders' lines will be stored in Bambui, Mfonta and Foubot for 3 monthly evaluations.	3.1. The strike by IRA workers started just when breeders' lines to be used for the trial were getting ready for harvest.
3.2. Conduct laboratory screening of Rice and Sorghum varieties for weevil resistance.	3.2. Raise cultures of Rice weevils in lab and collect Rice and Sorghum varieties from breeders for screening.	3.2 Screening of rice and sorghum varieties for resistance to weevils is being planned for next year.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 4: Survey rice field insects and identify rice varieties resistant to rice stem borers.</b>		
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.	4.1 The fields for survey and responsible staff were identified in Agri Lagdo and Bokle in the North Province and Maga and Yagoua in the Extreme North Province in June before transplanting.
4.2. Identify rice varieties resistant to stem borers.	4.2. Establish rice stem borer nurseries at various ecological zones.	4.2 The rice replicated varietal yield trials were selected in the same sites as for the survey in 4.1 above plus Ndop and Santchou sites in the Western Highlands.
<b>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.</b>		
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.	5.1 Installed on 18/11/91 two observations at three monthly intervals were done on the 17/02/92 and 15/05/92. The third and fourth are scheduled for 15/08/92 and 15/11/92 and terminated before analysis of the results.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
5.2. Test the suitability of plastic cans with tight fitting 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 2mes and on 11/01/91 for the 3rd mc respectively.	5.2 The second and last observations of the high moisture maize in 25 liter plastic cans were done after 18 months of storage on the 12/05/92 and the low moisture one was scheduled two months later on 10/07/92. the results will be reported in the 1992 annual report.

#### 10.1.4 FOLLOW-UP ACTIVITIES

Research activities in the next six months will be corrected on the four operations reported above. However laboratory screening of maize breeders' lines for weevil resistance may be started if samples are supplied.

Hundreds of names and addresses of farmers who use natural plant materials for stored grain protection against storage pests were recorded during the/first phase of the survey in the West and North West Provinces. Questionnaires will be completed for as many of them as possible and grain samples collected for analyses during the next half year. Farmers' maize storage survey questionnaire will be completed along with the questionnaire on the use of natural plant materials mentioned above and farmers for monitoring will be selected.

The operation entitled a "survey of rice field insects screening of rice varieties for resistance to rice stem borers" will be installed in Agro Lagdo and Bokle in the North Province and Maga and Yagoua in the Extreme North Province in the next half year. Screening for stem borer resistance will be also carried out in Bamunka - Ndop plain.

The researcher (Asanga Cletus Tangwe, Cereals Post Harvest Entomologist) has been admitted for a PhD program in Entomology in the Universities of Reading (England) and Ibadan (Nigeria). He intends to register as a part-time Higher Degree by Research Student in one of the Universities if financial assistance is available.

## **10.2 LOWLAND CEREALS ENTOMOLOGY**

### **10.2.1 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 in charge of developing sources of resistance and cultural practices (operation 3 and 4).

### **10.2.2 SUMMARY OF PROGRAM ACTIVITIES**

Lowland Cereals Entomology activities for first season 1992 were carried out by both Mrs Aroga and Miss Ndemah as follows:

First season trials were implemented in three locations: Ntui (Transition) Minkomeyos (Semi-Humid Forest) and Mbalmayo (Humid Forest)

### 10.2.3 ACCOMPLISHMENTS

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 1: Maize-borer Monitoring</b>		
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).	1.1 Programmed for second season.
1.2 Develop decision tools to be used by farmers as basis for applying control measures.	1.2 Intensive samplings to characterize the relationship between yield and borer infestation (both 1st and 2nd seasons in 5 locations).	1.2 Trials carried out in 3 agro-ecologies. Data will be analyzed later.
1.3 Find out which crop growth stage is most vulnerable in each ecological zone.	1.3 Same as 1.2	1.3 Same as 1.2
1.4 Diagnose factors affecting incidence of <i>Musidia</i> in the transition zone.	1.4 Sampling in farmers' fields as from anthesis.	1.4 Not implemented due to lack of means of transport. Carried forward to 2 <sup>nd</sup> season.
<b>Operation 2: Biological Control using natural enemies</b>		
2.1 Diagnose the role of natural enemies in suppression of pest populations.	2.1 Monitor and document incidence of natural enemies on maize across locations.	2.1 The parasites collected have been sent for identification to Dr. Andrew Polaszek via Drs. Bosque-Perez and Fritz Schulthess.
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.	2.2 A list of borer alternate host plants is being developed.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
2.3 Assess the selectivity of insecticides vis-a-vis natural enemies in farmer's fields.	2.3 Samplings in treated and untreated plots.	2.3 Due to work load and lack of transport facility, this was not implemented.
<b>Operation 3: Developing sources of resistance</b>		
3.1 Studies on pest biology.	3.1.1 Study of the life cycle of <u>B. fusca</u> , <u>S. calamistis</u> and <u>E. saccharina</u> .	3.1.1 This study has been done during the first cropping season
	3.1.2 Study of distribution of species in different localities.	3.1.2 This study has been done only in one location.
	3.1.3 Study of yield loss due to attacks of borers.	3.1.3 Two trials on the study of yield loss due to attacks had been conducted in Minkoameyos and Ntui.
3.2 Identification of some resistance varieties.	3.2 Test of varieties with respect to attacks under natural and probably artificial infestation.	3.2 66 varieties had been tested under natural infestation in ENSA field.
<b>Operation 4: Cultural practices</b>		
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.	4.1 The influence of intercropping maize and groundnut or cassava on stem borers attacks had been evaluated in Minkoameyos and in Ntui.
	4.2 Trials on the influence of soil fertilization on attack.	4.2 The influence of soil fertilization on attack had been estimated.

OBJECTIVES	ACTIVITIES	ACCOMPLISHMENTS
<b>Operation 5 : Chemical control</b>		
5.1 Identify cost-effective rates for quickest impact.	5.1 Repeat the on-farm marshall seed treatment trial carried out in 1991.	5.1 Programmed for the second season.
5.2 Carbofuran residue analysis in harvested crop from insecticide treated plots.	5.2 Send samples for chromatography.	5.2 Due to strike and other reasons, appropriate contacts were not made.

#### 10.2.4 FOLLOW-UP ACTIVITIES

Miss Ndemah: The trials carried out during the first season will be continued in the second season. In order that the work planned for on-farm be effectively carried out, a means of transport should be provided for the unit.

Mrs Aroga: For the second cropping season, three trials will be conducted on each location.

#### 10.2.5 VISITORS

Dr. N. A. Bosque-Perez, senior maize entomologist in the plant health and Management division of IITA.

## 11 LIST OF NCRE RESEARCHERS

### 11.1 INTERNATIONAL STAFF

Name	Nationality	Position	Location
Dr. Emmanuel A. Atayi	Togolese	Chief of Party	Nkolbisson
Dr. Thomas Stilwell	American	Deputy Chief of Party	Nkolbisson
Mr. Greg Servant	American	Administrative Officer	Nkolbisson
Dr. M. Moussie	Ethiopian	Agricultural Economist	Nkolbisson
Dr. John Poku	Ghanian	Systems Agronomist	Nkolbisson
Dr. Doyle Baker	American	Agricultural Economist	Nkolbisson
Dr. Noel Beninati	American	Maize Breeder	Bambui
Mr. Dermot McHugh	American	Agricultural Economist	Bambui
Dr. Olumuyiwa Osiname	Nigerian	Systems Agronomist	Bambui
Dr. Charles Yamoah	Ghanian	Soil/Agroforestry Specialist	Bambui
Dr. Humphrey Ezumah	Nigerian	Systems Agronomist	Ekona
Dr. Henri Talleyrand	American	Cereals Agronomist	Garoua
Dr. Robert Carsky	American	Systems Agronomist	Maroua
Dr. Jean Detongnon	Beninois	Grain Legumes Specialist	Maroua
Dr. Mulumba Kamuanga	Zairois	Agricultural Economist	Maroua

## 11.2 NATIONAL COUNTERPARTS

Name	Title	Unit
*Dr. Jacob Ayuk-Takem	Maize Breeder NCRE Natl. Coordinator Director of IRA	IRA-Nkolbisson
Mr. Michel Ndoumbe	Extension Agronomist	TLU-Nkolbisson
Mr. Kaho Francois	Extension Agronomist	TLU-Nkolbisson
Mr. Augustin Fouaguegue	Agricultural Economist	TLU-Nkolbisson
*Dr. Pauline Zekeng	Extension Agronomist	TLU-Nkolbisson
*Dr. Charles Thé	Maize Breeder	Maize Breeding-Nkolbisson
*Mr. Celicard Zonkeng	Maize Breeder	Maize Breeding-Nkolbisson
*Mr. Jean-Bosco Zangue	Maize Breeder	Maize Breeding-Nkolbisson
Mr. Roger Nkoa	Maize Breeder	Maize Breeding-Nkolbisson
Mrs. Regine Aroga	Entomologist	Entomology-Nkolbisson
Miss Ndemah Rose	Entomologist	Entomology-Nkolbisson
*Dr. Edward Ngong-Nassah	Extension Agronomist	IRA Fomouot
Mr. Francois Meppe	Extension Agronomist	TLU-Bambui
Mr. Jean Enam	Agricultural Economist	TLU-Bambui
*Mr. Marc Samatana	Agricultural Economist	TLU-Bambui
Mr. Christopher Ngong	Agronomist	Agroforestry-Bambui
*Mr. Martin Nguegum	Agronomist	Agroforestry-Bambui
Dr. Pierre Tchamo	Maize Breeder	Maize Breeding-Bambui
Mr. Isidore Tabi	Maize Breeder	Maize Breeding-Bambui
*Mr. Zachee Ngoko	Plant Pathologist	Plant Pathology-Bambui
*Mr. Pascal Ngninbeyie	Rice Breeder	Rice Program-Dschang
*Mr. Cletus Asanga	Entomologist	Entomology-Dschang
*Dr. Manfred Besong	Agricultural Economist	TLU-Ekona
*Mrs Christine Poubom	Extension Agronomist	TLU-Ekona
Mr. Mboussi A. Messia	Extension Agronomist	TLU-Ekona
Mr. Martin Fobasso	Extension Agronomist	TLU-Maroua
Mr. Endondo Chevalier	Legume Agronomist	Grain Legumes-Maroua
Mr. Fokou Joseph	Rice Agronomist	Rice Program-Maroua
*Mr. Richard Kenga	Sorghum Breeder	Sorghum Breeding-Maroua
Mr. Jacques Beyo	Sorghum Breeder/Entomol.	Sorghum Breeding-Maroua
*Mr. Andre Djonnewa	Sorghum Breeder	Sorghum Breeding-Maroua
Mr. Blaise Mongmong	Maize Breeder	Maize Breeding-Garoua
*Dr. Julius Takow	Soil Scientist/Rice Agron.	Rice Program-Garoua

### National Counterparts in Training

Name	Specialization	Unit/University
Mrs. L.A. Enyong	PhD Agricultural Education	TLU-Nkolbisson/Virginia Poly
Mr. Georges Dimithe	MSc Agricultural Economics	TLU-Nkolbisson/Michigan State
Miss Mankolo Regine	Msc Agronomy	TLU-Nkolbisson/Virginia Poly
Mr. Pierre Boumtje I.	Msc Agricultural Economics	TLU-Nkolbisson/Univ. Illinois
Mr. Blaise Aubin N.	Msc Agronomy	TLU-Nkolbisson/Univ. Illinois
Mr. Mbassa Ndioro	Msc Maize Breeding	Maize Breeding-Bambui/U. Minnesota
Mr. Claude Nankam	PhD Plant Pathology	Plant Pathology-Bambui/U. Illinois
Mr. Birang a Madong	Msc Agronomy	Rice Program-Dschang/Univ. Arkansas
Mr. Fabien Jeutong	PhD Sorghum Breeding	Sorghum Program-Maroua/U. Nebraska
Mrs. Comfort Ateh	Msc Agronomy	TLU-Ekona/Wisconsin State Univ.
Mr. Ranava Ndikawa	Msc Agronomy	TLU-Maroua/Ahmado Bello Univ.
Mr. Charles Njomaha	Msc Agricultural Economics	TLU-Maroua/Oklahoma State Univ.
Mr. Titus Ngoumou	PhD Agronomy	Cereals Agronomy- Garoua/Cornell U.
Mr. Anatole Ebete	Msc Agronomy	Cereals Agronomy-Garoua/Mississippi