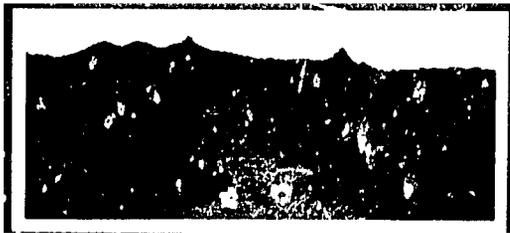


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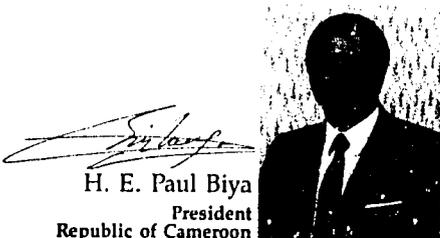
A
New Era
for
Food Crop
Research
in
Cameroon



A cooperative project of the
Cameroon Institute for
Agronomic Research (IRA)
International Institute of
Tropical Agriculture (IITA)
and the United States
Agency for International
Development (USAID)

Project No. 631-0013
November 1987

Assistance by USAID to the agriculture sector of Cameroon is a vital input in the national development strategy. The assistance provided to the National Cereals Research and Extension program of the Institute for Agronomic Research is especially valuable because it is making available the best of the world's agricultural technology through its linkage with the International Institute of Tropical Agriculture and the international agricultural research centers. I have noted with some pride the professional growth of the Cameroonian research staff who have joined this project and I look forward to their becoming the scientists and leaders of a dynamic and productive agriculture sector.



H. E. Paul Biya
President
Republic of Cameroon

The National Cereal Research and Extension Project (NCRE) illustrates the successful partnership and cooperation of the Government of Cameroon and the U.S. Agency for International Development (USAID). NCRE has become a 15-year, \$70,000,000 project of the Government of Cameroon to which USAID has contributed \$43,000,000. This booklet documents the impressive results of the first five years.

The long-term commitment is a historical one for USAID. It demonstrates our determination to be a dependable, long-term partner to a stable and committed country. The benefits of NCRE are twofold. First, Cameroon is able to strengthen its agricultural research system to maintain its policy of food self-reliance. Second, the research results are relevant and transferable to neighboring countries, which places Cameroon in a leadership position in produc-

ing research which other countries in the region can use.

The NCRE project is complemented by USAID assistance to the University Center of Dschang, which represents the other arm of our support to agriculture by strengthening agricultural education facilities. USAID's long-term commitment to food crop research in Cameroon is evident not only by funding cereals research through NCRE for fifteen years but also by undertaking the research project in tropical roots and tubers.

I am impressed by the accomplishments of the NCRE project and congratulate the Government of Cameroon's Minister of Higher Education and Scientific Research, the Institute of Agronomic Research and USAID/Cameroon on their successful collaboration in implementing this research program.

M. Peter McPherson
M. Peter McPherson
Director
U.S. Agency for
International Development



CONTENTS

INTRODUCTION 4

Agricultural research in Cameroon has a double impact, once for Cameroon and again for Africa as a region, because Cameroon is an agricultural research producing country.

NCRE 8

The partnership and cooperation of the governments of Cameroon and the United States, through the NCRE project, is a long-term commitment to food security.

MAIZE 10

Maize variety development intensified through the NCRE project, benefitting from IRA's previous ten years of successful varietal development work in both the highlands and lowland regions.

RICE 14

Many West and Central African countries stand to benefit from the rice research underway in Cameroon, especially those with similar agro-climatic conditions.

SORGHUM & MILLET 18

Under low rainfall conditions of the growing region for sorghum and millet, higher yielding varieties and improved cultural practices are essential to meet future needs.

TESTING & LIAISON UNIT 22

Developing and maintaining information channels between farmers, researchers and extension agents is essential for research to have an impact on agricultural growth.

COMMITMENT 26

NCRE is developing knowledge and operational approaches with national scientists to enhance their ability to identify problems, analyze alternatives, and formulate strategies that achieve food security.

COOPERATING INSTITUTIONS 32

ACRONYMS & ABBREVIATIONS 34

PERSONNEL 35

INTRODUCTION

Agricultural research in Cameroon has a double impact, once for Cameroon and again for Africa as a region, because Cameroon is an agricultural research producing country.

Development Strategy for Food Crops

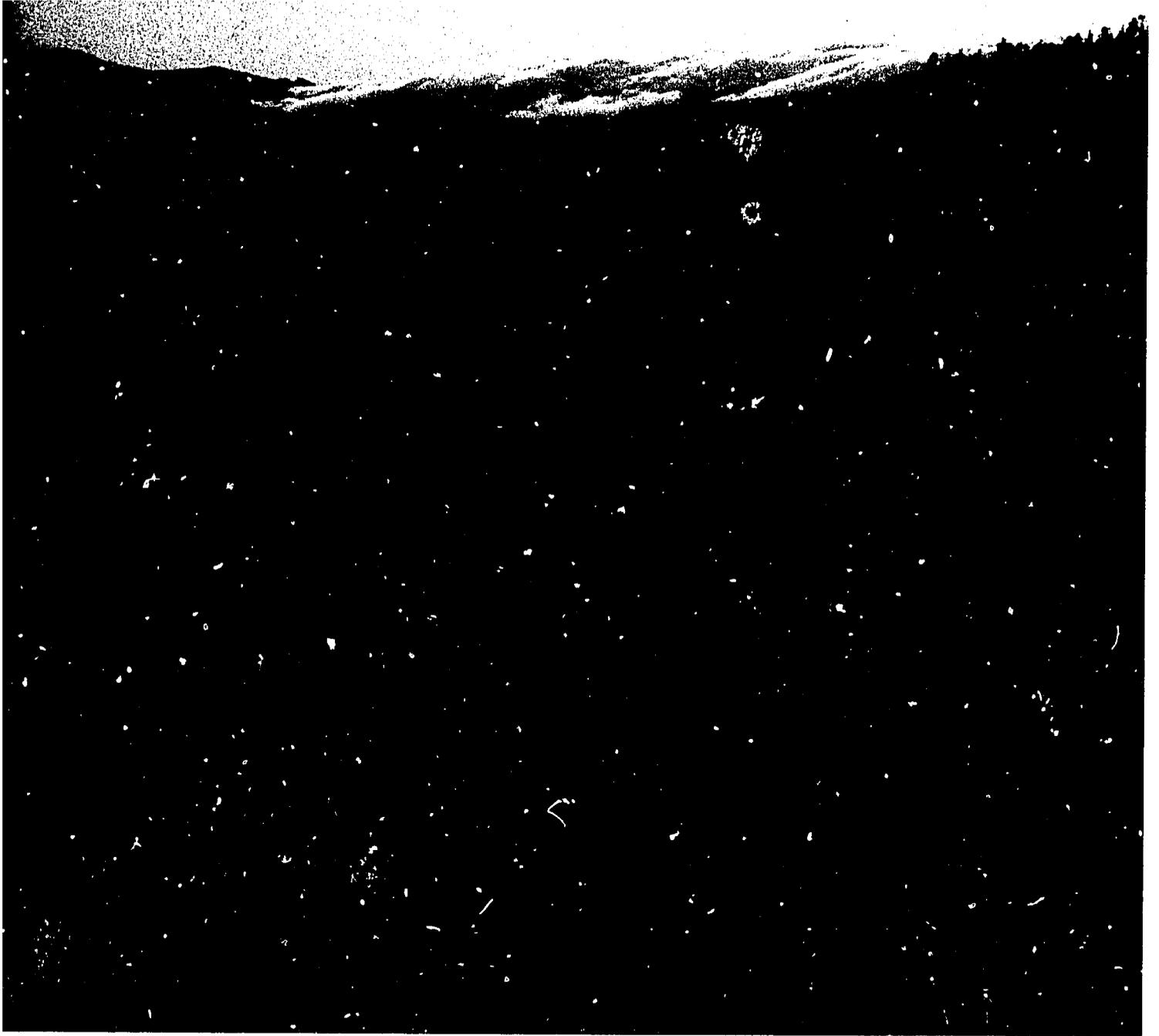
In Cameroon's national agricultural development strategy; one of the specific objectives set in the Fifth Five-Year Plan (1981-1986) was self-reliance in food production. This objective is further iterated in specific priorities that have been identified as areas of concentration within the rural sector, including improvement of farmer productivity through research efforts and information availability.

Cameroon has been virtually self-reliant in food production even though public investment has been directed largely toward cash and export crops in the past. Nevertheless, analysts have looked to the long term and determined that food self-sufficiency cannot be assumed. Experience elsewhere in West and Central Africa is a grim reminder of the tentative nature of food production.

In recent years government support for food crops research has more than doubled. Part of the reason for the increased emphasis on food crops is that Cameroon has a population growth rate of three percent or more. At the same time its rural population is declining due to rural-urban migration and aging. This trend can only increase the need for food production at a time when there may be less capacity to produce it. Approximately two-thirds of Cameroon's 8.9 million people remain in the rural areas of the country. By the year 2000 only half of the population is expected to reside in rural areas.

The government of Cameroon, conscious of the importance of agriculture in the development of a nation, has identified quality agronomic and farming method research as a key factor in the successful implementation of the country's long-term food production plan.





Agricultural Setting

Small-scale farmers dominate in food crop production, with most of them farming one to three hectares of land. The majority of farming operations are carried out by hand using traditional cropping systems and traditional crop varieties. A network of agricultural production companies, development societies, cooperatives and regional development authorities constitutes a support infrastructure for modernization of many small farms. Some of these organizations are area- and crop-specific, practice mechanized farming, and utilize improved varieties and agronomic practices. Others are set up to assist small-scale farmers, often with minimal inputs.

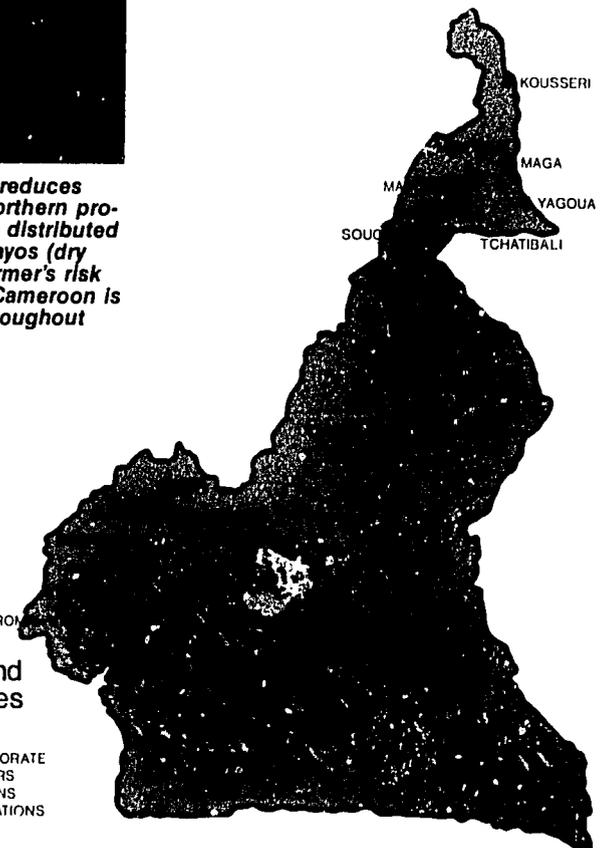


Aging and rural-urban migration are contributing to a decline in the rural population, while the overall population is growing at a rate of three percent or more. This trend is reducing the capacity for food production at a time when greater production is needed.

Land Diversity

Cameroon is a land of diverse climates, ranging from humid tropics on the west coast of Africa to the Sahelian zone in the Extreme North Province. Rainfall in the humid tropics can be as high as 5000mm with 250 rain

Limited and uncertain rainfall reduces agricultural potential in the Northern provinces. With less than 800mm distributed over less than 90 days, the Mayos (dry rivers) run only seasonally. Farmer's risk of crop failure in this part of Cameroon is typical of Sahelian regions throughout Africa.



The Institute of Agricultural Research (IRA) has an extensive network of research centers and stations throughout the country. This distribution ensures a research capability in the various agroclimatic zones and supports the government's policy of integrated development.

IRA Infrastructure and NCRE Research Sites

- ★ DIRECTORATE
- CENTERS
- STATIONS
- ▲ SUBSTATIONS

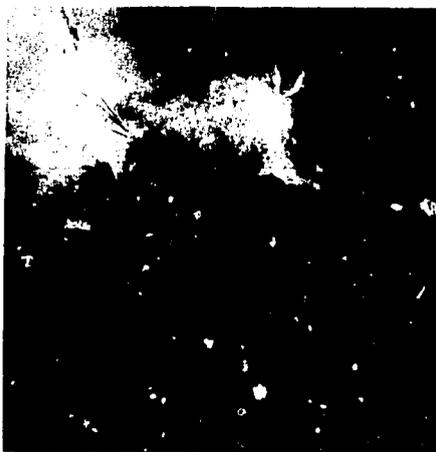


days per year, while in the Sahelian north total rainfall is less than 800mm distributed over a period of less than 90 days. In between these extremes is a regular succession of climatic zones broken by intervening mountains and plateau areas which affect both temperature and rainfall.

Soils in Cameroon are highly variable in composition, fertility and in their geographic distribution. These range from highly weathered soils in the southern forest with low nutrient holding capacity to alfisols and vertisols of the savanna, both of moderate to high productivity. There are also soils of volcanic origin found in Cameroon. These soils, along with the sedimentary materials of the flood plains and deltas, tend to be the most productive.

Logistical Challenge

This combination of variation in soils and climate created an enormous logistical challenge for the NCRE project. In order to establish an effective research program for each of the cereal units, it was necessary to devise multilocational testing for each of the crops in all (or a representative sample) of the areas in which the crops were



Burning crop residues underground is a traditional practice that gives good yields the first year but destroys soil organic matter and soil structure. Cereals research can provide alternatives to traditional practices, such as this one which is not recommended.

grown. In this respect, the IRA network of research centers and stations provided an excellent staging ground for cereals research and the basis for the NCRE project to strengthen the cereals research program within the IRA system. With this base of operation and the complete cooperation of IRA, the NCRE project was able to get off to a fast start and to function effectively.

IRA

Under the Ministry of Higher Education and Scientific Research, Cameroon's Institute for

Agronomic Research (IRA) became the organization through which the NCRE project was implemented. IRA has under its jurisdiction a National Cereals Research Program, one of 22 different programs for agronomic research in Cameroon.

In keeping with the government's policy of integrated development, IRA works throughout the country. There are research centers and stations located in each agro-climatic zone. Programs such as IRA's cereals research program join with these centers and stations, as appropriate, for research across a range of agro-climatic conditions and cropping or farming systems.

Most of the cereal crops in Cameroon are grown either as mixed crops or in rotation with other crops. Suitable varieties and agronomic practices in these cropping systems require a multi-disciplinary input. IRA cereals researchers, working out of different stations across zones, are able to capitalize on the expertise of their colleagues, both on the NCRE team itself and those in other IRA research programs, to address these added dimensions of their research.



The partnership and cooperation of the governments of Cameroon and the United States, through the NCRE project, is a long-term commitment to food security.

National Cereals Research and Extension Project (NCRE)

The National Cereals Research and Extension Project (NCRE) was conceived and designed in the late 1970s as a means to assist the government of Cameroon in achieving its long-term food production goals for the principal cereals: maize, rice, sorghum and millet. The strategy for NCRE to contribute to Cameroon's future needs was to fully support the Cameroon cereals research program with a twofold mandate: first, to strengthen Cameroon's institutional capacity through IRA for cereals research, with special emphasis on training; and second, to facilitate the adaptation and transmission of research results to farmers.

Funding

In its continued support to agricultural development in Cameroon, the United States Agency for International

Development (USAID) agreed to participate in funding the NCRE project and committed \$7.9 million toward its first phase. The government of Cameroon committed \$6 million for this start-up period. For the long-term 15-year timeframe for this project, the government of Cameroon and USAID have a combined commitment of \$70 million, \$27 and \$43 million, respectively:

Technical Assistance

The International Institute of Tropical Agriculture (IITA) was contracted by USAID to provide technical and material assistance to the project. As

Most of the cereal crops grown in Cameroon are grown either as mixed crops or in rotation with other crops. The challenge for cereal researchers is to identify superior varieties and agronomic practices suitable to farmers in a wide range of agroclimatic conditions.





an international agricultural research center already engaged in collaboration with Cameroon, IITA's ability to provide competent, experienced researchers and its capacity for technical backstopping were obvious advantages over other potential contractors.

The Research Team

Although the composition of the NCRE team evolved according to need during the first phase of the project, it began with a maize breeder, maize agronomist, cereals agronomist, rice breeder, rice agronomist, sorghum and millet breeder, agricultural economist, extension agronomist, a chief of party and an administrative officer. Members of this team were assigned to various IRA research centers and stations throughout the country.

The Pieces Fit

Total integration of the NCRE project into the Cameroonian system has been one of the most important aspects contributing to its success. Participating NCRE

scientists are in fact a part of the national system, with research geared toward solving problems of mutual interest. This united effort has introduced some novel aspects into the national cereals research program. For the first time in IRA, a project has worked to become a bridge between research stations, extension agents and farmers. NCRE's Testing and Liaison Unit offered a new approach in bridging traditional gaps between these entities. Also for the first time in IRA, there is a strategy underway for institution building on a long-term basis, geared to strengthening the system and its many components through training of personnel and building its infrastructure.

Benefits

On the technical side, NCRE benefits are evident in project achievements specifically focused on problems or technologies that have built on, strengthened and improved cereals agriculture in Cameroon. The project's four major research units (Maize, Rice, Sorghum and Millet, and Testing and Liaison) have achieved notable success. Their success is a large part of the story of the National Cereals Research and Extension Project.



Maize variety development intensified through the NCRE project, benefitting from IRA's previous ten years of successful varietal development work in both the highlands and lowland regions of Cameroon.

Potential for Increased Maize Production

The NCRE Maize Research Unit has achieved successes in both the highland and lowland zones of Cameroon. The Maize Improvement and Breeding Program identified new varieties that can yield twice as much as the varieties being used by farmers. For the highlands, one superior variety has been released to complement improved materials previously developed and introduced by IRA. New populations have also been established which will be the sources of future varieties. In the lowlands, two superior maize varieties have been identified for the savanna and forest areas.

A Promising Lowland Variety

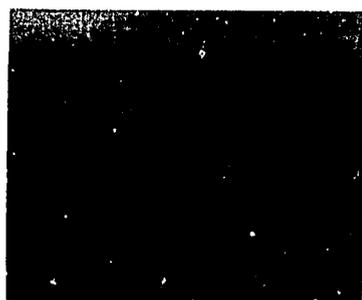
The performance of CMS-8501 (Cameroon Maize Series, 1985, 1st release) at several locations in the lowland savanna of Northern

Cameroon is shown in Figure 1. This higher yielding 90-day variety is a direct product of NCRE's maize improvement program and its objective of developing stable, high-yielding varieties for the short cropping season of the Sudano-sahelian zone of Cameroon.

Agronomic Findings

On the agronomic side, a multitude of experiments have been conducted ranging from fertilizer and population trials to residue management practices. Some of the results are striking. For example, NCRE agronomists

Early maturing, streak resisting maize varieties developed and introduced to Cameroon by IITA have made a special contribution to the NCRE Maize Research Unit and to the farmers of Cameroon. Streak is a yield-depressing disease that threatens maize production in Cameroon and throughout much of Africa where maize is grown.





determined that a single application of fertilizer on maize can double yields (see Figure 2). Another finding is the specificity of planting dates for maize that can make a three-tonne¹ difference in yield (see Figure 3). The main objective of the maize agronomy component is to develop appropriate and improved packages of cultural practices for maize farmers. Clearly, the kinds of results these researchers are getting can only have a positive impact on maize production in Cameroon.

These are but a few examples of the Maize Research Unit's successes and are intended only to illustrate the diversity and scope of their work. Research undertaken by this unit has been massive in scope and involved not only the NCRE maize researchers but many other organizations, institutions and individuals.

Collaborating Institutions

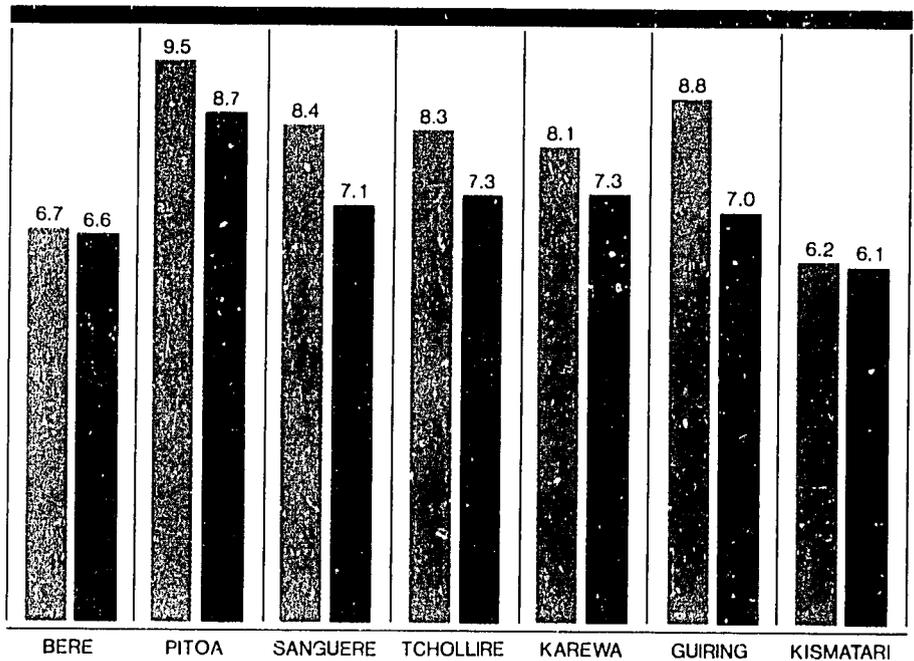
Numerous internationally known maize materials from IITA, CIMMYT, national maize improvement programs

Dramatic yield increases are possible with maize in Cameroon. NCRE researchers have introduced an improved maize variety capable of increasing farmers' yields by one tonne per hectare. Agronomic research has shown that a single application of fertilizer can double yields, and that planting dates alone can make a three-tonne difference in yields.

Maize Performance at Several Locations of the Lowland Savanna of Northern Cameroon

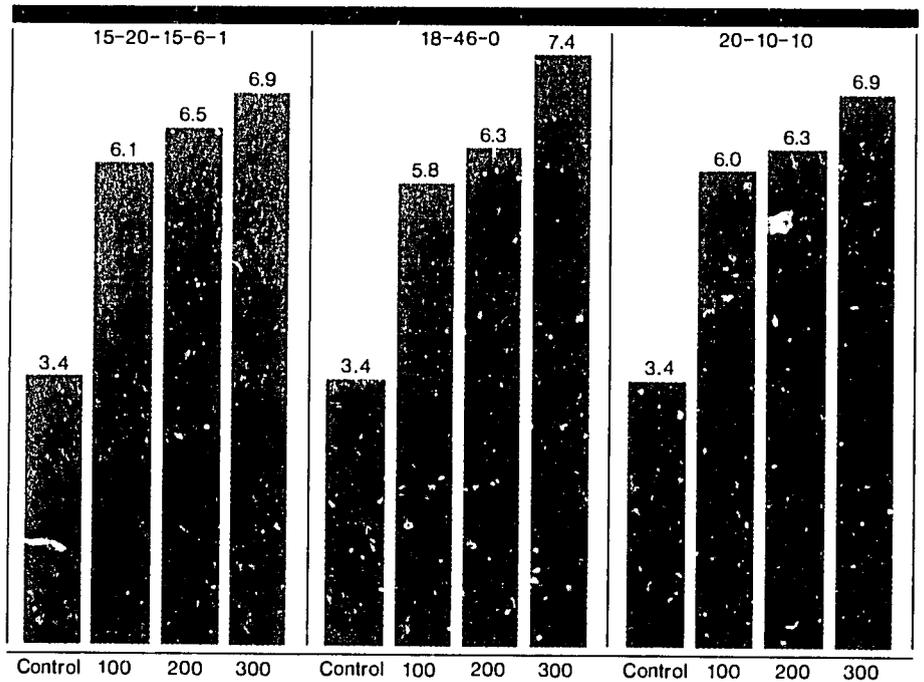
Grain Yield (T/Ha)

CMS-8501 90 DAYS ■
TZPB 115 DAYS (MOST WIDELY USED) ■



Effects of Different Rates and Sources of Fertilizer on Maize

Grain Yield (T/Ha)



in Africa, varieties previously developed by IRA and local varieties provided by farmers were screened by the NCRE Maize Research Unit. Multilocational trials were conducted throughout the IRA network to determine which maize materials grow best and where. Collaboration in this undertaking included ten different IRA stations, plus parastatals² and rural development projects including SODECOTON (Cameroon

Cotton Development Company), MIDENO (North West Development Authority), SODEBLE (Wheat Development Society/ Company) and CENEEMA (National Center for Study and Experimentation with Agricultural Machinery).

Other collaborators included the Ministry of Agriculture and the World Bank's Center-North project. Trials also involved hundreds of farmers throughout the provinces.

Broader Implications

Typical farm yields of maize in Cameroon are about one tonne per hectare, but NCRE researchers consider that with improved seed varieties, improved cultural practices and fertilization, maize yields of between 2.0 and 3.0 tonnes per hectare are obtainable in farmers' fields. Higher yields will require a relatively modest increase in production costs, but they are within the realm of possibility for Cameroonian farmers. Maize yields as high as 4.4 tonnes per hectare have been attained in on-farm trials under farmer management.

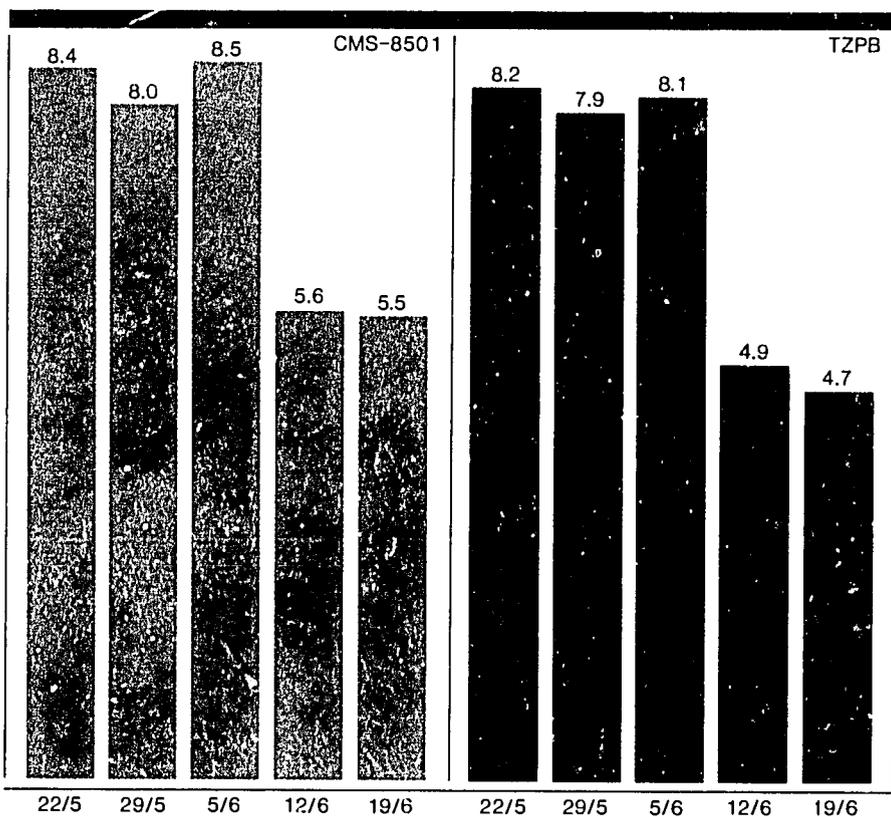
Future Needs

At the present time Cameroon is self-sufficient in maize. This position may be at risk as the rural population declines and the overall population increases since maize is a staple food in Cameroon.

Production constraints related to low maize yields are many, but include lack of improved varieties adapted to the various agro-climatic zones and poor agronomic practices. Cameroon's cereals research program is addressing these needs. The NCRE project has made notable contributions, but much work remains to be done if Cameroon is to maintain self-sufficiency in maize production.

Effect of Planting Dates on Grain Yield

Grain Yield (T/Ha)



¹Yields are given in tonnes per hectare (1 tonne = 1,000 kg). For comparison purposes "kilograms per hectare" is approximately equal to "pounds per acre."

²Parastatals include rural development projects, agricultural production companies, cooperatives and regional development authorities that are established or sanctioned by the government.



Many West and Central African countries stand to benefit from the rice research underway in Cameroon, especially those with similar agro-climatic conditions.

Rice Holds Promise for Cameroon

The NCRE Rice Research Unit has made significant contributions to the rice production of this country. Rice lines have been developed through the efforts of NCRE rice breeders that have such a capacity for production that they can triple rice yields. Another breakthrough has been the introduction of low-temperature tolerant varieties (two such varieties are now available to farmers). These varieties can be widely grown where altitude-related low temperatures have historically inhibited rice production.

Concentrating efforts in developing high-yielding varieties, the project's Rice Research Unit has also introduced two high-producing varieties for north central and western Cameroon.

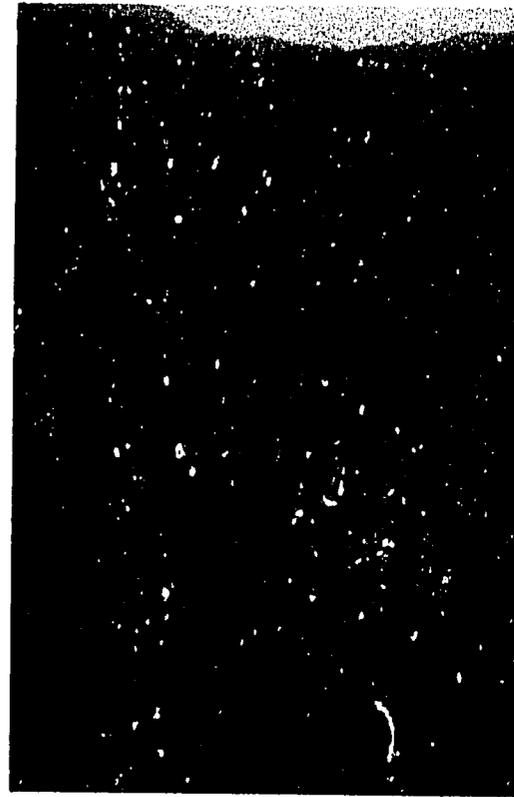
Better Procedures

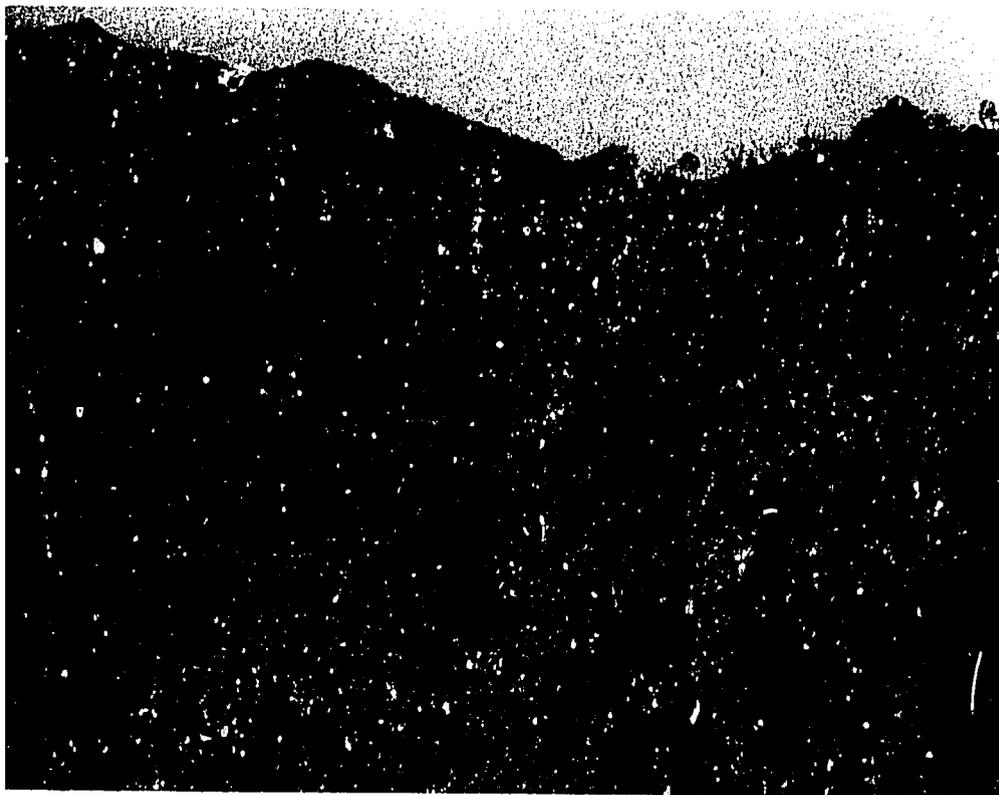
Through agronomic trials, the Rice Research Unit has

found that green manuring of transplanted rice can increase yields by up to 30 percent. This is a low-input technology, as the green manure crop is grown on the plots during the off-season when the land is fallow.

Agronomic research has also determined that puddling before transplanting results in a 50 percent increase in yield over the yield obtained under the local system of land preparation (spading). Results of three-year trials have determined the optimum age for seedling transplants of short-duration cultivars is four to five weeks, while longer-

Cold tolerant rice varieties developed through NCRE not only benefit Cameroonian farmers but hold potential elsewhere in Africa. Similar agroclimatic conditions in Burundi and Rwanda, for example, are in need of cold tolerant rice varieties. Cameroon's leadership in developing these varieties is an example of its ability to produce research of broader benefit to the region.





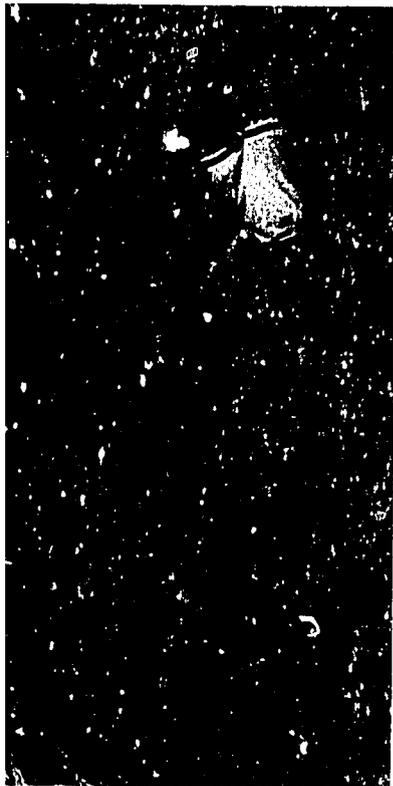
duration cultivars can be transplanted at up to seven weeks without appreciable yield loss.

As examples of successful research conducted on rice in Cameroon, these contributions of the Rice Research Unit should be placed in context. The examples given merely represent a part of IRA's rice research in north and western Cameroon and serve to illustrate some of the successes this unit of the NCRE team has achieved.

Rice Areas

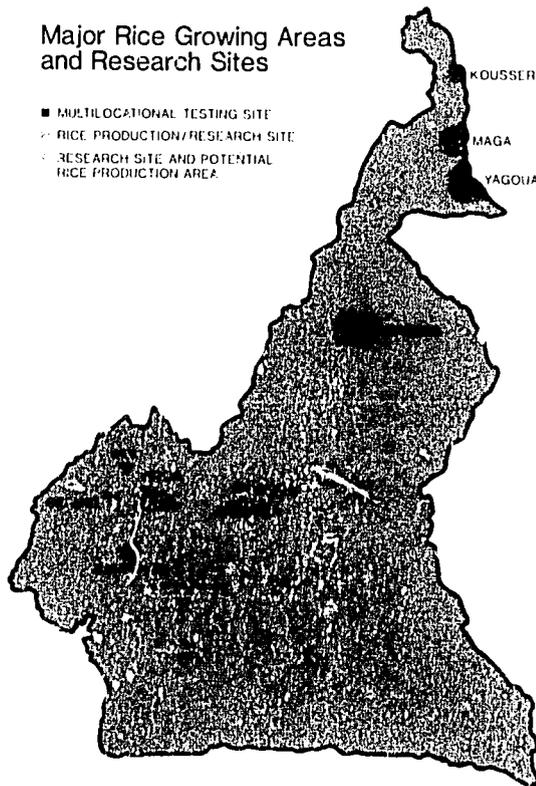
The Rice Research Unit has focussed its research in support of the priorities placed on rice production by the government of Cameroon.

This focus is on the promotion of rice production through intensive cultivation in three major irrigated rice development projects: SODERIM (Society for the Development of Rice in Mbo Plain), UNVDA (Upper Nun Valley Development Authority), and SEMRY (Society for the Expansion and Modernization of Rice in Yagoua). In keeping with these priorities, the Rice Research Unit was posted at Dschang in the Western Province, about 34 kilometers from Mbo Plain and 150 kilometers from Ndop Plain (see map).



Major Rice Growing Areas and Research Sites

- MULTILOCATIONAL TESTING SITE
- ▨ RICE PRODUCTION/RESEARCH SITE
- ▤ RESEARCH SITE AND POTENTIAL RICE PRODUCTION AREA



Another area that is coming into prominence for rice is Karewa, in the Upper Benoue Valley area, North Province. Irrigation facilities are now available in this region due to the construction of Lagdo Dam and the creation of a large reservoir.

Irrigated Rice Development

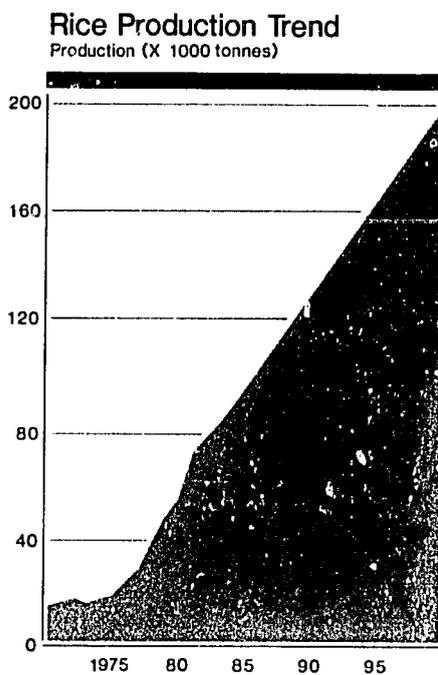
NCRE's Rice Research Unit has screened and tested thousands of experimental rice lines. Materials have come from IITA, IRRI (International Rice Research Institute), IRAT (Institute de la Recherche Agronomiques Tropicales et des Cultures Vivrieres), and from national programs of India, China, Taiwan and Sri Lanka.

Testing

Screening and testing has been done under the different ecological conditions of the irrigated rice growing areas of Cameroon. Scientists have been evaluating these materials for their high-yield potential in combination with resistance to blast, leaf scald, brown spot lodging and cold temperatures, which are the major impediments to rice production.

Dschang

The NCRE Rice Research Unit, operating out of the



IRA Station in Dschang, conducts many trials that are a direct result of requests from the parastatals desiring specific information for their rice growing operations. The parastatals provide land, labor and other inputs to support the research. Results of these trials are often incorporated into recommendations that parastatals make to their farmers. Given promising varieties, the parastatals are prepared to move quickly into their own seed production.

Each of the rice parastatals is in a different agro-ecological area. This has meant that selection of rice varieties and agronomic investigations have been varied and tailored to regional needs.

Ndop Plain

At Ndop Plain, where UNVDA is stationed, the 1100 meter altitude creates a low temperature constraint. An associated problem is the severity of sheath rot and grain discoloration. NCRE researchers targeted their research toward these constraints. Several thousand introductions were tested by researchers collaborating from NCRE, UNVDA and the Cameroon Institute of Agronomic Research. Multi-year testing has proven IR 7167-33-2-3 to be extremely stable. In collaboration with UNVDA this variety has been identified as one likely to replace the standard variety (TAINAN V) which has poor grain quality and is not acceptable to farmers (See Figure 4).

Mbo Plain

The SODERIM project is based at Mbo Plain in the West Province. The area is about 700 meters above sea level and surrounded by mountains. Rainfall is high and light intensity is low during the growing period. These conditions contribute to problems of neck blast and leaf blast in rice.

Intensive collection and screening by NCRE rice



scientists has identified a number of genotypes suitable for this location. All have moderate resistance to blast and their grain quality is superior to that of the mainstay variety, Tainan V. These genotypes have been provided to SODERIM for their consideration and potential release to farmers.

Upper Benoue Valley

Collaboration with researchers at the Karewa Experimental Farm has identified several promising genotypes for different maturity rice groups suited to this region. Cooperating with NCRE since 1982, the Karewa Experimental Farm is one of the few experimental areas in the country with irrigation facilities and capabilities. From the collaborative results obtained on irrigated rice, authorities concerned with the development of the region (Upper Benoue Valley) have been convinced of the potential for irrigated rice as a viable crop. As a result, newly proposed projects in this area included rice as part of their production scheme.

Future Considerations for Rice

Although rice is a relatively new crop in Cameroon, it is of growing importance in both the diet and the economy of the country. The



Labor requirements for transplanting rice has been potentially reduced by 75-80 percent due to the efforts of NCRE Rice Research Unit scientists. This modified and adapted IRRI rice transplanter promises production efficiencies not previously available to Cameroon's rice farmers.

irrigated development projects are having a profound effect on production, which is anticipated to reach 200,000 tonnes by the year 2000. The SEMRY project alone already produces more than 75 percent of the total rice produced in Cameroon.

Effects

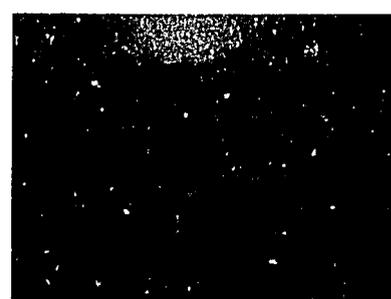
Rice production is having a far-reaching effect in contributing to the Government's integrated development plans. Ndop town did not exist prior to the rice project there. Ndop's existence is an example of the broader perspective of

development, where a community grows and revolves around agricultural initiatives, bringing people, homes, electricity, roads and the attendant businesses and services that accompany this growth.

Technological Promise

Technology developed by NCRE researchers contributes directly to this growth and development through production efficiencies. For example, NCRE scientists, working with SODERIM and UNVDA, adapted a rice transplanter (designed by IRRI) to ease the job of transplanting. The equipment was tested and demonstrated at SODERIM and UNVDA plots to cooperating farmers. The transplanter, as modified, reduces transplanting time from 25-30 days to 6-8 days for a farmer planting one hectare of rice. It is expected that the transplanter will be widely adopted by rice farmers over a large area.

Other developments, such as the cold tolerant rice varieties developed through NCRE, not only benefit Cameroonian farmers but hold potential elsewhere. Similar agro-climatic conditions in Burundi and Rwanda, for example, are in need of cold tolerant varieties. Cameroon's leadership in developing these offers potential improvement for other African nations.



Under low rainfall conditions of the growing region for sorghum and millet, higher yielding varieties and improved cultural practices are essential to meet future needs.

Sorghum and Millet Developments

The IRA Sorghum and Millet Program has benefitted considerably through the incorporation of NCRE activities, especially through the Sorghum and Millet Research Unit. Their combined efforts were directed toward establishing a solid base for the national program.

Significant advances have been realized through the identification of sorghum variety S-35 as one suitable for zones with annual rainfall of less than 800 millimeters. Promising lines have also been identified (S-34 is an example) where the rainfall allows a 110 to 120-day cropping period. Varieties previously grown in these zones have had low yields because they were 160-day varieties.

In addition, one pearl millet cultivar, IKMV-8201, has been identified as a short-cycle, disease-tolerant cultivar that

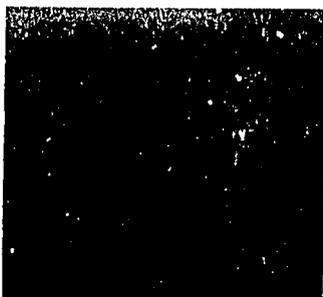
has high yield potential without the use of fertilizer.

Sorghum variety S-35 yielded 35 percent more than the local check variety in multi-locational trials over a three-year period. Similarly, in multi-locational, multi-year trials with sorghum variety S-34, 29 percent greater yields were achieved over the exotic check variety E35-1.

Introductions

Breeding materials of rainy season sorghum and pearl millet were introduced from ICRISAT and its ongoing programs in Africa, as well as from Nigeria, Burkina Faso and many other national

Sorghum and pearl millet are the main cereal crops grown in the semi-arid areas of northern Cameroon. They are not only the staple foods, but their stalks provide fodder, fuel and shelter. This dependency, coupled with a harsh environment, contributes to the inherent risk that farmers face in the region.



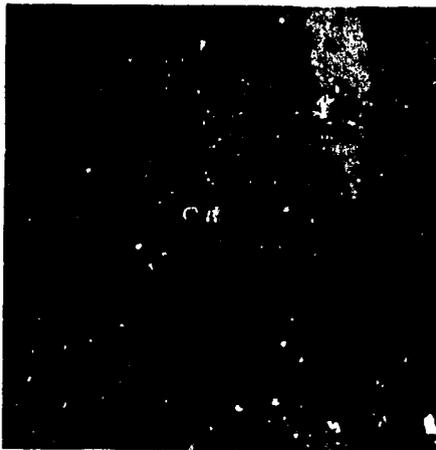


programs. Muskwari (a transplanted sorghum) germplasm was collected from various African countries by the NCRE sorghum team. In all, 824 accessions of rainy season sorghum, 583 accessions of pearl millet and 142 accessions of Muskwari sorghum were initially screened and tested for their potential in Cameroon.

Priorities

The primary aims of the Sorghum and Millet Research Unit are the breeding of suitable cultivars of sorghum and millet and the development of production systems that lead to higher yields and great stability across a range of environments. Another objective is the development of suitable agronomic practices or improved varieties.

As important as improved varieties are, they cannot be considered ready for farmer use until agronomic research has identified important cultivation parameters for their use. Sorghum and millet agronomists experiment to determine, for example, the optimum planting dates, plant population and fertilizer requirements for each variety in a particular agro-climatic zone. This information is critical to ensure a variety's success.



White-grained sorghum varieties are preferred, although yellow-grained sorghum is important in some areas. All sorghum is produced for consumption. The white-grained varieties are mainly prepared as a porridge or made into "fou-fou," a bread-like preparation.

Hybridization Program

Between 1981 and 1985, ten staff members from IRA-Maroua Research Station were trained in hybridization techniques. This training has helped to bolster the national hybridization program and is an example of NCRE's support to build capability in Cameroon cereals research. The hybridization program is expanding its efforts with this greater capability. In generating Cameroon national segregating materials, 120 crosses have been attempted (local x local, local x exotic, and exotic x exotic) and are presently in the F1, F2, F3 and F4 generations.

Research Collaboration

The SAFGRAD³ project has worked very closely with IRA researchers in the northern provinces of Cameroon. SAFGRAD has collaborated as the operational research component of the NCRE Sorghum and Millet Research Unit, testing improved varieties and agronomic practices in farmers' fields. The SAFGRAD project has also assumed responsibility for studying the agronomic and economic implications of new recommendations. Feedback on farmers' results, concerns and problems are an important contribution of this research team. The SAFGRAD project, for example, conducted on-farm tests at 88 sites during 1984 alone, confirming the productive capacity of the NCRE-tested sorghum variety S-35. These trials, conducted at the farm level, yielded 85 percent higher than the farmers' local check variety.

ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) has played an integral role in strengthening millet and sorghum research in Cameroon. Working closely with NCRE scientists, ICRISAT has provided and helped screen an extensive

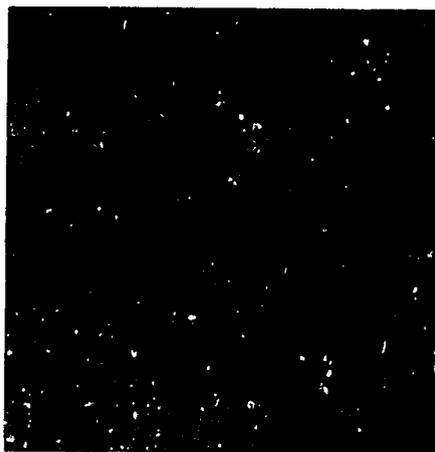
³SAFGRAD stands for Semi-Arid Food Grain Research and Development.



collection of germplasm in the search for varieties suitable for the northern provinces of Cameroon. Relations have been fortified by the Sorghum and Millet Research Unit's annual participation in ICRISAT's in-house review. Results of the Cameroon national sorghum and millet breeding program are presented as a regular part of the review itinerary. Reciprocally, ICRISAT participates in NCRE's annual review and planning meetings.

ICRISAT'S Genetic Resources Unit has collaborated with the NCRE Sorghum and Millet Research Unit to evaluate 1,827 lines of Cameroon local sorghum germplasm, collecting data on morphological, taxonomic and agronomic traits. After computer analysis at ICRISAT headquarters, a detailed classification of the Cameroon germplasm will be published. ICRISAT has also collaborated with IRA in a similar way with Cameroon millet germplasm, collecting and cataloguing data for storage and retrieval.

SODECOTON is a primary mover of agricultural technology in the northern region of Cameroon. This parastatal organization works directly with NCRE researchers in identifying



Red-grained sorghum varieties are extensively grown in the three ecological zones of the sorghum-growing areas of northern Cameroon. Red-grained varieties are mainly used for making "Bill-Bill," a local beer.

research needs, collaborating in research trials, and evaluating research results. NCRE researchers and, more broadly, IRA scientists serve as part of the research arm of SODECOTON, whose mandate for rural development includes cereals production. IRA and SODECOTON interface through a specific written protocol agreement that elaborates how the joint research will be conducted. Annual meetings between IRA researchers and SODECOTON scientists and administrators establish research targets, including those specific to cereals research.

The NCRE Sorghum and Millet Research Unit also collaborates with two other development agencies, SEMRY and AGRILAGDO (Karewa Experimental Farm), with the Ministry of Agriculture, the World Bank's Center-North Project and with independent small-scale farmers throughout the region.

Implications for Sorghum and Millet

Considerable unfilled potential exists for sorghum and millet in Cameroon. Yields in the north average about 800 kilograms per hectare, but NCRE researchers consider that with improved seed varieties, improved cultural practices and fertilization, sorghum and millet yields of 1.2 tonnes are obtainable. Sorghum yields of six tonnes per hectare have been achieved on demonstration plots.

Given the low rainfall and uncertain rainfall conditions of the growing region for sorghum and millet, higher yielding varieties available for these conditions are essential to lessen farmers' risk of crop failure. Although Cameroon is self-sufficient in both sorghum and millet production, an annual increase in yield of approximately seven percent will be required over the next decade to maintain this self-sufficiency.



Developing and maintaining information channels between farmers, researchers and extension agents is essential for research to have an impact on agricultural growth.

Developing Linkages Between Researchers, Extension Workers and Farmers

Developing linkages between researchers, extension workers and farmers is an explicit objective of the NCRE Testing and Liaison Unit. It is also charged with transmitting agronomic research results to extension agencies, with transmitting farmer's problems to NCRE researchers and with considering some of the economic and social consequences of agronomic research.

Early Mandate

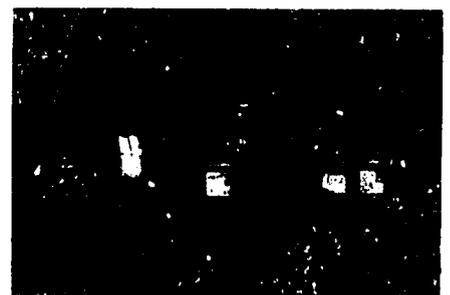
During the first three years of the project, the Training and Liaison Unit concentrated its efforts on short-term training, surveys to identify biological and socio-economic constraints to production, the design and implementation of verification trials, and establishing "pre-extension"

field demonstrations. These efforts were geared toward establishing linkages with the extension service, parastatal agencies and other development projects. Technology testing, primarily of IRA's improved maize and rice varieties, became a significant function of the Testing and Liaison Unit.

Expanded Scope

The unit later broadened its perspective to incorporate an on-farm research methodology. Exploratory and

Minikit trials, developed by the Testing and Liaison Unit of the NCRE, contain all of the materials necessary to conduct an on-farm trial: seed, fertilizer, a string calibrated for planting distance, as well as instructions and a user response form. The TLU has distributed more than 1100 such kits to participating extension workers and farmers.





formal surveys became the *modus operandi*. On-farm trials were designed with consideration given to the survey findings. These trials, initially managed by researchers, were eventually managed by researchers and farmers, by extension workers and farmers, or by farmers themselves. The North West and West Provinces were divided into broadly-defined recommendation domains, based primarily on altitude, rainfall, general soil fertility and common maize-based cropping patterns.

Mutual Support

The Testing and Liaison Unit (TLU) has worked closely with maize and rice researchers and has contributed to their programs by testing their materials and agronomic practices. Maize packages, for example, have been developed for different locales, specifying appropriate varieties and fertilizer applications for increased yields. In collaboration with the NCRE Rice Research Unit, improved irrigated rice varieties and moderate fertilizer applications have been identified for two zones in the North West Province. These regimes can provide a yield increase of at least one tonne per hectare more than the improved varieties already being grown

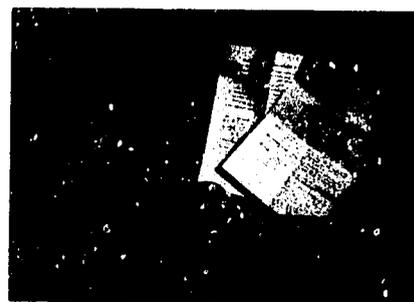
in these zones. TLU verification and on-farm trials have helped to move proven materials from the research station into the hands of farmers.

Training Extension Workers

Following its early mandate for training, the TLU held three two-week courses in methods of on-farm systems research for Ministry of Agriculture (MINAGRI) field demonstrators and parastatal extension agents. In all, 110 extension workers participated in these courses. Course objectives were: to familiarize participants with basic principles of food crop production; to teach how to work with farmers in extending improved methods of crop production; to instruct in carrying out basic socio-economic surveys; and to offer training in how to conduct on-farm research trials. Collaboration with MINAGRI in training continued until the MIDENO (North West Development Authority) organization assumed responsibility for training. With these linkages established, however, all three organizations continued to be supportive of each other's programs.

Collaboration in Training

NCRE researchers with the Testing and Liaison Unit have also cooperated with IRA



Bambui Station scientists, MIDENO's Training and Demonstration Center staff, senior extension staff and Provincial Delegate for Agriculture technicians in conducting training. This training has included topics related to the cropping calendar in participants' work areas, laying out on-farm trials, and the use of new varieties and agronomic research trials.

North West Province Development

MIDENO was created in 1981 as an integrated rural development institution for the North West Province. While its mandate includes many and varied development initiatives, IRA and NCRE interface directly with MIDENO's Extension and Adaptive Research Programs. These programs represent innovative concepts of agricultural development in support of small-scale farmers. Through a broadly based linkage between farmers, the Extension Service and the investigative resource of IRA (including NCRE), there is a capability in the North West Province to address the technical difficulties and production potential of the region's agriculture.



Through maize trials the TLU has succeeded in defining promising maize technologies that can already be extended to farmers in specific ecological zones. These include the identification of improved maize varieties and economic rates of fertilizer application.

NCRE and MIDENO

What has been established through MIDENO is a system that works with various sectors involved in agricultural development. New technological information is provided by NCRE to feed through this system. A major role of MIDENO's Adaptive Research Program is to complement the work of NCRE in providing the Extension Service with information relevant to farming conditions and farmers' circumstances in the province.

On-farm trials are conducted at MIDENO's nine Training and Demonstration Centers. Trials are designed to test appropriate varieties and agronomic practices developed

by NCRE. Once the best potential varieties and agronomic practices have been identified, they can be recommended to replace traditional varieties and practices.

In working with MIDENO, IRA has assumed responsibility for variety development and applied agronomic research with maize. On-farm testing and economic assessment is handled by the Testing and Liaison Unit of NCRE, and adaptive research is conducted by the Provincial Delegation for Agriculture. Extension of recommendations is the prerogative of the Extension Service.

Broader Perspectives

Smallholder farmers in Cameroon encounter many food crop production constraints. At the same time, farmers typically make efficient use of the resources at their disposal. Their cropping systems and cropping patterns have evolved over generations of trial-and-error research of their own.

What researchers can do, and an important role that a

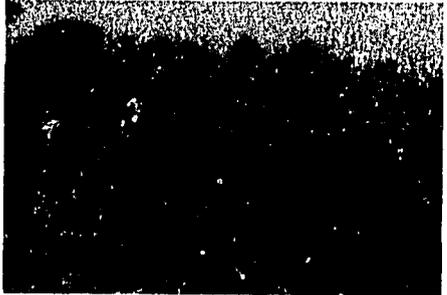
NCRE researchers and technicians carefully record quantitative factors at harvest, in this case of maize. TLU verification and on-farm trials have helped to move proven materials and methods from the research station into the hands of farmers.





Testing and Liaison Unit can perform, is identify constraints to production that cannot be addressed using resources presently available to the farmer, and then investigate the possible solutions to provide the necessary resources. For example, if maize streak virus becomes a serious problem in a particular area, it is unlikely that farmers will have access to maize varieties that are resistant to this virus. The researcher can not only identify the constraint (maize streak virus) but can also provide varieties having resistance to this disease.

The importance of developing and maintaining information channels between farmers, researchers and extension agents cannot be overrated. The concept of TLU is fully in concert with these important linkages. The NCRE Phase I Evaluation Report recognized the potential of this approach: ". . . the TLU concept holds promise to be a significant breakthrough in research management especially in regard to organizational structure and to research entity function. Whether the TLU will realize its promise depends on certain other aspects of management, and only time will test the viability and durability of the concept."



NCRE is developing knowledge and operational approaches with national scientists to enhance their ability to identify problems, analyze alternatives, and formulate strategies that achieve food security.

Strengthening Cameroon Cereal Research Capability

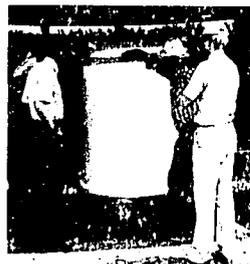
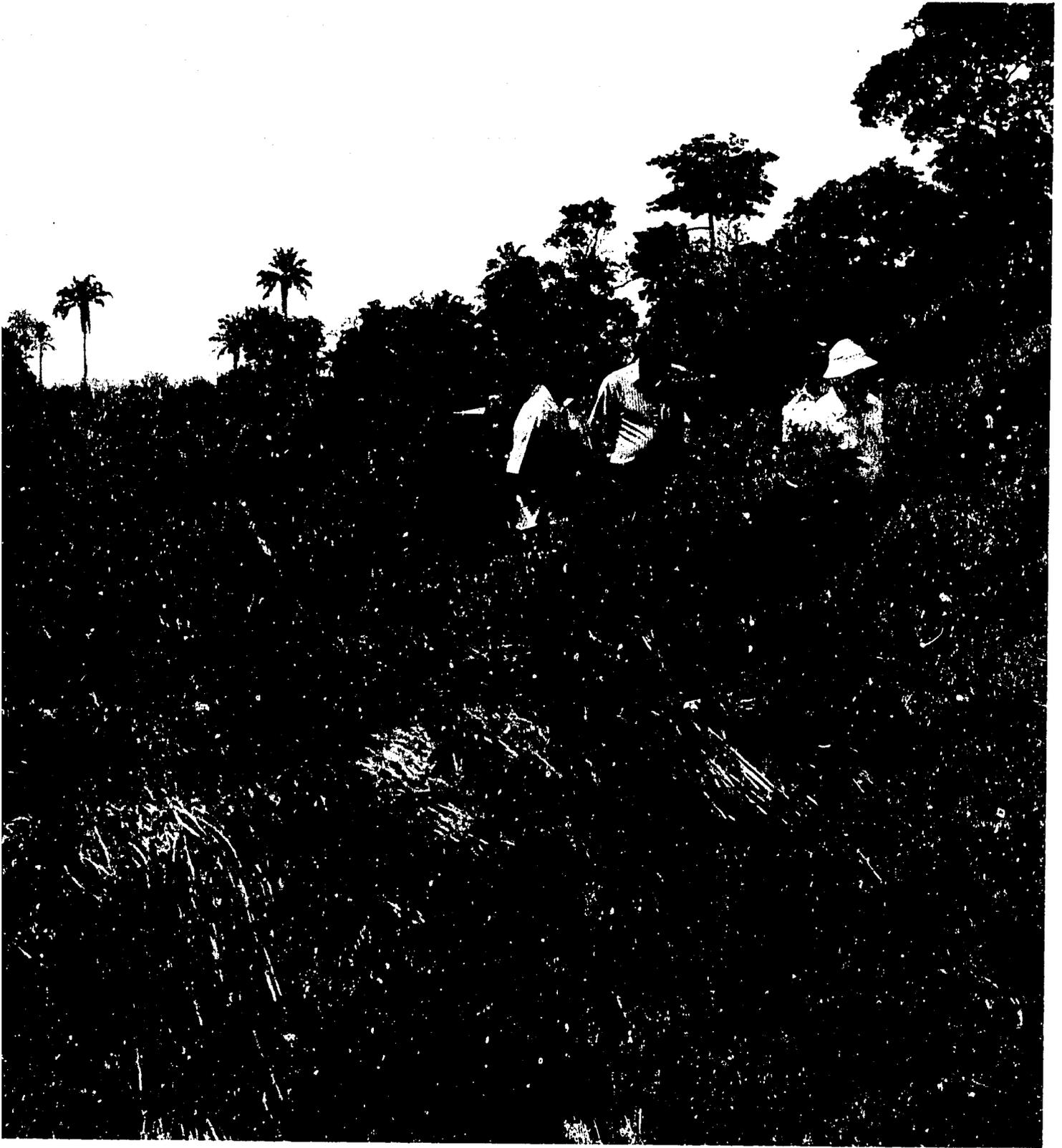
Cereals research is more ambitious than it used to be in Cameroon. It has a focus on the problems of farmers. It is national in scope and tied to the international technology network, while attuned to the diverse requirements of agro-climatic variability in the different regions of the country. It is generating technologies and methodologies that are suitable and affordable to farmers. This research is effective because of its effective integration in the national system. IRA, IITA and USAID can be credited with long-term support to the process of institution-building and strengthening Cameroon cereals research capability, but the true strength of the national cereals research program is in its people.

Professional Improvement

Cameroon scientists, researchers and technicians have strengthened their capacity to address research needs for food production through professional improvement. This has been facilitated through NCRE support to training in three ways: on-the-job training; "in-service" training (through short courses offered by international agricultural institutes); and degree-related training. Training is a comprehensive and integral part of the NCRE project, helping to strengthen the

Monitoring tours and project evaluations have strengthened the working relationships of the government of Cameroon, IITA and USAID. They have also contributed to the planning process in project initiatives and research direction.





Cameroon cereals research capability. Emphasis has been on the development of human resources as a strategy for building IRA's capacity to sustain an effective national cereals research program.

Types of Training

On-the-job training provided by NCRE scientists is not only geared to project counterparts but also to technicians and field recorders. Each of the NCRE research units has on-the-job training as part of their mandate.

In-service training, primarily for technicians, has also been available to IRA researchers. It is more formalized, usually offered through one of the international agricultural research centers, and ranges from two weeks to six months in duration. IITA has offered a number of technical short courses which IRA personnel have attended. Other short courses have been offered by IRRI, CIMMYT and ICRISAT. Another form of in-service training has been IRA scientists with higher degrees serving as visiting scientists at

"Learning by doing" is a concept that describes on-the-job training, as researchers and technicians coordinate their efforts in establishing field trials. This concept also describes the product or results of the research effort, identifying technologies and methodologies suitable for farmers.

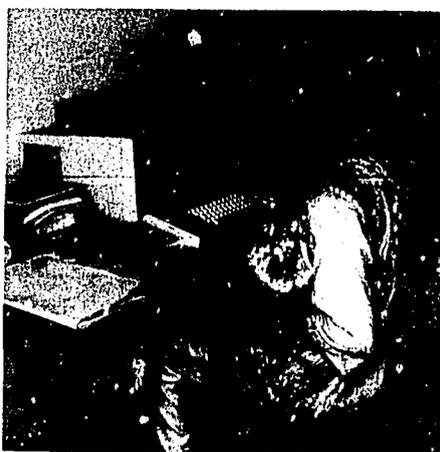


international agricultural research centers such as IITA and CIMMYT. More than 30 technicians have participated in in-service training through the NCRE project.

Degree-related training has broadened and strengthened the expertise of Cameroon's cereals research program. Promising scientists have received training in various disciplines according to program needs. This training at the B.Sc., M.Sc. and Ph.D. levels, has involved 13 Cameroonians in the following fields: maize, rice and sorghum breeding, grain storage, and in cereals and extension agronomy.

Annual Reporting and Planning

Professional improvement is a fundamental part of building institutional capacity. As research competence increases it is reflected in program planning and execution. This is most evident, perhaps, in the annual IRA Cereals and Farming Systems Programmes Planning Meetings. These meetings bring together more than 100 national and international scientists and researchers to present their research results and plan the following year's research activities. These meetings are attended by all of the IRA



In-service training usually includes a component on data analysis.

cereals program researchers, along with researchers from other IRA programs, IRA Chiefs of Stations, representatives of seed production organizations, development organizations, extension, and from various international and other donor projects and research centers. The NCRE project initiated these annual program planning meetings and IRA has enthusiastically adopted them.

Participation

Those who have attended the planning meetings since they began in 1982 observe a marked change in participation over the years. In the beginning, IITA scientists and other expatriate researchers often presented the reports and led the discussions during their sessions. While the Cameroonian counterparts

actively participated in the process, they did not necessarily assume program leadership. Over a four-year period, these roles were reversing. By 1985 Cameroonian researchers were increasingly presenting the reports and otherwise assuming leadership in the reporting and planning process. They had also gradually assumed responsibility for organizing these meetings.

IRA's Institutional Management

The NCRE project demonstrates the importance of institutional management in project achievement. From the sheer logistics of initiating a complex project such as NCRE to the program planning and execution of project initiatives, IRA has provided strong management. NCRE has been fortunate in this regard and has proven the potential of a project to strengthen the host institution when management is skillful in exploiting that potential.

Commitment to Infrastructure

NCRE represented a major expansion of the IRA program in cereals research.



A significant commitment was required of IRA both for offices and research facilities throughout the provinces. IRA and USAID funds were committed to supplement these facilities with some new construction as needs arose. IITA handled procurement of research equipment and supplies through their budget for such basic items as scales, seed counters, shellers, and moisture meters. Some large equipment was also secured through the project, including threshers for both the Rice and Sorghum and Millet Research Units, laboratory analysis equipment for the IRA stations in Bambui and Dschang, and three tractors for the Nkolbisson, Maroua and Bambui IRA Stations.

Technical Assistance

IITA's role in providing technical assistance has been pivotal. Not only has the research staff been highly qualified, it has been motivated in conducting its research and in working with national researchers. IITA scientists have shown a serious commitment to excellence in their research, service to farmers and building the cereals research program in Cameroon.

IITA brought to NCRE an international dimension in more than one respect. An obvious one is the institution's



Farmer field days have proved to be a powerful tool for researchers and extension workers. As many as 2000 farmers have attended a single farmer field day sponsored by NCRE in collaboration with local and regional agricultural organizations.

relationship to its sister centers in the international agricultural research center system. This affiliation accounted for early input from other international centers into cereals research in Cameroon. It has fostered good working relationships between the national cereals research programs in Cameroon and created a network between IRA and international center scientists.

Another international dimension gained through IITA was its access to a world stock of germplasm. With such tremendous diversity in agro-climatic conditions in Cameroon, literally thousands of plant materials were provided by or secured through IITA for screening.

Varietal selection and development has been a long process, but a successful one. NCRE has identified maize, for example, adapted to the three ecological zones and suited to local production and market requirements. As another example, IITA's maize germplasm has provided streak resistance, badly needed by Cameroon's maize farmers. These materials are critical for the continuing varietal development of Cameroon's cereals research program.

A third important dimension that has been evident through IITA's participation in the NCRE project is its experience in African farming systems and crop improvement. This expertise has provided excellent backstop capability for technical assistance.





Farmer participation in on-farm trials has helped to move research information onto the farm while serving to feed information on farmer's problems back to researchers. Tested technologies provide extension workers varieties and methods they can

Research and Extension

The interface of research and extension, so often ignored, has been of special interest to NCRE researchers in Cameroon. Their commitment to conduct effective research is dependent on a continual feedback on prevailing technologies, farmers' constraints and the performance of recommended technologies in farmers' fields. From a practical standpoint this has made a research/extension interface an imperative.

The Testing and Liaison Unit of NCRE is novel in this regard. Because IRA management has determined to provide the structure, staff and resources, this unit of NCRE exists to ensure a research/extension interface. Technologies generated through research are tested in on-farm trials under extension and farmer management. This

provides a critical and practical assessment of technologies at the farm level. It is at this level that the TLU gives exposure to research findings while extension workers and farmers are able to verify the suitability and adaptability of those findings.

IRA's Relations with National Organizations

Cameroon has a wide range of agencies which serve the producers of almost all food and cash crops. Each of them looks to IRA to serve as its research and development arm. Some are powerful and energetic and press hard on IRA for technological support. Some wait for IRA to deliver its technology to them, and others receive support at a level between the two extremes. Through its 22 programs, IRA is doing a

remarkable job serving a variety of organizations across Cameroon's crop spectrum.

Implications of Sustained Support

The food production problems in Africa are well known. In addition to restraints posed by an unfriendly ecology, farmers in many countries have also labored under inadequate support from their governmental institutions. Cameroon farmers face the general situation imposed by the harsh environment, but through IRA they have the support of a research institution to help them with technologies needed in the diverse ecologies. Cereals research in Cameroon has year by year intensified its efforts and grown to serve the farmer better. This is due to sound management in IRA, supported by a stable government and reasonable policies. Indications are that the institutional evolution will continue and will be accompanied by development of the complementary institutions needed for agricultural growth. This institutional evolution is encouraging indeed for Cameroon, and since it involves decisions and actions available to any nation, it may be encouraging for Africa in general.



COOPERATING INSTITUTIONS

The Institute of Agronomic Research (IRA) is one of the five specialized research institutes in the Ministry of Higher Education and Scientific Research. Created in 1974, its operational structures comprise six research Centers, 16 Stations and 29 Antennas spread throughout the diverse ecological areas of Cameroon. Presently, IRA employs about 170 researchers ranging from M.Sc. to Ph.D. degree holders.

Twenty-two research programs, both in cash and food crops, are being implemented by IRA.

Eight of them are food crops oriented, namely: Cereals, roots and tubers, legumes, vegetable crops, plantains, fruits, bananas and pineapples.

The Cereals and Farming Systems research programme do have more than 40 scientists working in cereals improvement, agronomy, plant protection, pre-extension and farming systems. Their results are passed on to users through collaboration with the Ministry of Agriculture and government parastatal organizations like SODECOTON, UCCAO, MIDENO, UNVDA, SODERIM, SEMRY etc . . .

In order to effectively carry out its assigned role of increasing food crops production and productivity in Cameroon, IRA collaborates with many international Research Centers.

For cereals research, this collaboration is very active with IITA, CIMMYT, IRAT, WARDA, IRRI as well as regional organizations like SAFGRAD.

Research funding of IRA comes mainly from Cameroon Government. But IRA entertains a very active technical cooperation with many agencies. The USAID is one of these, through projects like NCKE, Bean and Cowpea CRSP and Roots and Tubers. Others are CIRAD, ORSTOM, UNDP, FAO, IDRC, the World Bank and Gatsby Charitable Foundation.

Established in July 1967 as the first major African link in an integrated network of international research and training centers located throughout the developing regions of the world, the International Institute of Tropical Agriculture (IITA) is an autonomous, nonprofit corporation with headquarters on a 1,000-hectare experimental farm at Ibadan, Nigeria, in close proximity to the University of Ibadan. Its location facilitates research in three ecological zones of Nigeria—humid forest,

Research Collaboration Matrix

IRA Centers and Stations	Collaborating Institutions									
	Maize Breeding	Maize Agronomy	Rice Breeding	Rice Agronomy	Sorghum and Millet Breeding	Sorghum and Millet Agronomy	TLU Agronomy	TLU Agricultural Economics	Plant Pathology	Entomology
MAROUA	X	X	X	X	X	X				X
NIOMBE	X		X	X						X
DSCHANG	X		X	X			X	X	X	
BAMBUI	X		X	X	X		X	X	X	
EKONA	X	X						X	X	
NKOLBISSON	X	X			X			X		X
FOUMBOT	X							X		
BARONBIKANG	X									
DOUALA							X	X		
IRA Antennae										
KOUSSERI			X	X	X	X				
GUETALE	X	X			X	X				
MAGA	X		X	X	X					
YAGOUA			X	X						
MAKEBI	X	X				X				
TCHATIBALI					X	X				
VOUNALOU			X	X						
SOUOUNDOU	X	X			X	X				
SANGUERE	X	X			X	X				
FIGNOLE	X	X			X	X				
TCHO LLIRE	X	X				X				
NDOCK	X	X				X				
TOUSORO	X	X			X	X				
SANTA	X						X	X	X	
BABUNGO	X		X	X	X		X	X	X	
SANTICHO			X	X					X	
LYGOKA							X			
BANGANGTE	X									
BERTOUA	X	X								
BERE	X	X			X	X				

transitional, and savanna — and these zones are representative of climate and soil conditions in many areas of Africa. In addition, research is conducted in many areas of Africa in cooperation with regional and national programs.

The "geographic mandate" of IITA includes the humid and subhumid tropical regions of the world, but the Institute concentrates its research and training activities primarily on the needs of sub-Saharan African countries. The central objective, in cooperation with national programs, is to undertake research to increase food production, employment, and income in those

countries. A food crisis in many of them has been building up over the years as rapid population growth, drought, and lagging agricultural production have brought about a chronic food deficit.

Four out of five of the research programs of IITA are crop centered: Grain Legume Improvement, Maize Research, Rice Research, and Root and Tuber Improvement. The fifth is the Farming Systems Program.

The United States Agency for International Development (USAID) provides foreign aid on behalf of the U.S. Government. It is

committed to helping developing countries in their efforts to meet basic human needs—to overcome the problems of hunger, illiteracy, disease and early death. USAID provides assistance through grants and loans which are used to support development projects and programs of governments, private institutions and international organizations. These programs seek to raise income, eliminate hunger, raise health levels, eradicate illiteracy and/or ease unmanageable population pressures. USAID operates worldwide in some 55 countries.

In Cameroon, USAID has been assisting in the sectors of agriculture, public health, education and human resources since 1961. USAID supports Cameroon's goal of food self-sufficiency by helping the Institute of Agronomic Research's work in improving productivity of grains. In education and human resources, USAID supports programs to modernize Cameroon's primary education system and to train persons to be modern managers in development fields. In health, USAID's programs offer assistance in training better qualified health workers. A project is being designed that will improve health care specifically to children and mothers. USAID also finances students to pursue development-related graduate studies in the U.S. Since 1961, USAID has provided almost \$270 million to assist Cameroon's development efforts.

	Maize Breeding	Maize Agronomy	Rice Breeding	Rice Agronomy	Sorghum and Millet Breeding	Sorghum and Millet Agronomy	TLU Agronomy	TLU Agricultural Economics	Plant Pathology	Entomology
KISMATARI	X	X					X			
MBANG MBIRNI	X	X			X	X				
Cooperating Organizations										
SEMIY	X	X	X	X	X	X				
UNVDA			X	X			X	X	X	
SODERIM			X	X					X	
AGRILAGDO	X	X	X	X	X	X				
MIDEVIV	X	X			X	X				
SODEBLE	X	X								
Baigom Rice Project			X	X						
Project SEMENCIER	X	X			X	X				
SODECOTON	X		X	X	X	X	X	X		
ENSA	X						X	X		
MIDENO	X									
MOA Seed Production	X		X	X	X	X				
UCCAO	X						X	X		
WADA	X		X							
MINAGRI	X									
Project Centre Nord	X	X			X	X				
VCEP			X	X						
MAISCAM	X	X				X				
PVOs			X	X	X	X	X	X		
International Bodies										
USAID	X		X	X	X	X	X	X	X	X
IITA	X		X	X	X	X	X	X	X	X
CIMMYT	X									
CIRAD (IRAT, GERDAD)	X		X	X		X				
SAFGRAD					X	X	X	X		
CIAT			X	X						
IRRI			X	X						
CRSPs					X	X				X
WARDA			X	X						

ACRONYMS & ABBREVIATIONS

AGRILAGDO	Karewa Experimental Farm	GERDAT	Groupment d'Etudes et de Recherches pour le Development de l'Agronomic Tropical.	PVOs	Private Volun- tary Organizations
AID	Agency for International Development (United States)	ICRISAT	International Crops Research In- stitute for the Semi-Arid Tropics	RTC	Rural Training Center, Mfonta, Bambui
CENEEMA	Centre National d'Etudes et d'Experi- mentation du Machinisme Agricole	IDRC	International Research Development Center	SAFGRAD	Semi Arid Food Grain Research and Development
CIMMYT	International Center for Maize and Wheat Improvement	IITA	International Institute of Tropical Agriculture	SEMRY	Company for the Expansion and Moder- nization of Rice Produc- tion in Yagoua
CIAT	International Center for Tropical Agriculture	IRA	Agricultural Research Institute	SOCAPALM	Palm Oil Development Company
CIP	Centro Inter- national de la Papa	IRAT	Institut de Recherche Agronomique Tropicale et de Culture Vivrieres	SODEBLE	Society for the Development of Wheat
CIRAD	Centre de Cooperation Internationale en Recherche Agronomique pour le Developpe- ment	IRRI	International Rice Research Institute	SODECOTON	Society for the Development of Cotton
CRSP	Collaborative Research Sup- port Program	ITA	Institute of Agricultural Techniques	SODERIM	Society for the Development of Rice in Mbo Plain
ENSA	National Advanced School for Agriculture	MAISCAM	Cameroon Maize Farm	UCCAO	Union Centrale des Cooperatives Agricoles de l'Ouest
FAO	Food, Agricultural Organisation	MIDENO	North West Development Authority	UNVDA	Upper Nun Valley Development Authority
FEMEC	Camercon Evangelical Mission	MIDEVIV	Seed and Food Development Authority	USAID	United States Agency for International Development
FONADER	National Fund for Rural Development	MINAGRI	Ministry of Agriculture	WADA	Wum Area Development Authority
		NCRE	National Cereals Research and Extension Project	WARDA	West African Rice Development Association

PROJECT PERSONNEL

The national counterparts who served in the NCRE Project are as follows:

Name	Position	Location
Dr. Jacob A. Ayuk-Takem	Maize Breeder & NCRE Coordinator	Bambui, Yaounde, Nkolbisson
Dr. Charles The	Maize Breeder	Nkolbisson
Dr. Jean Tonye	Maize Agronomist	Nkolbisson
Dr. Julius Takow	Rice Agronomist	Dschang
Ms. Pauline Zekeng	Extension Agronomist	Bambui
Mrs. Regine Aroga	Entomologist	Nkolbisson
Mr. Ngoko	Plant Pathologist	Bambui
Mr. Mart Samatana	Socio-Economist	Bambui
Mr. Titus Nga Ngoumou	Cereals Agronomist	Garoua
Mr. Jupiter Ndjeunga	Socio-Economist	Nkolbisson
Mrs. Christine Poubom	Extension Agronomist	Ekona
Mr. Manfred Besong	Agricultural Economist	Ekona
Mr. Richard Kenga	Sorghum Agronomist	Maroua
Mr. Anatole Mbeng Ebete	Cereals Agronomist	Garoua
Mr. Jacob Eta-Ndu	Maize Breeder	Bambui
Mr. Francois Meppe	Extension Agronomist	Bambui
Mr. Ezechiel Passam	Administrative Assistant	Nkolbisson
Mr. Cletus Asanga	Entomologist	Dschang
Mr. Fabien Jeutong	Rice Breeder	Dschang
Mr. Bernard Soneh	Cereals Agronomist	Ekona
Mr. J-B. Zangue Cheuka	Maize Breeder	Nkolbisson
Mr. Claude Nankam	Plant Pathologist	Bambui
Mr. Edward Ngong-Nassah	Extension Agronomist	Bambui
Mr. Andre Djonnewa	Sorghum Breeder	Maroua
Mr. Martin Ngueguim	Extension Agronomist	Bambui
Mr. Celicard Zonkeng	Maize Breeder	Nkolbisson

The following national support staff served in the project:

Name	Position	Location
Mr. Mathias Tsabgou Tonfack	Agricultural Technician	Bambui
Mrs. Grace N. Tima	Agricultural Technician	Bambui
Mr. Jean-Claude Wafu	Agricultural Technician	Bambui
Mrs. Mirabelle Karawa	Agricultural Technician	Bambui
Mr. Thaddeus Ngwa	Agricultural Technician	Bambui
Mr. Anthony Foraukon	Field Recorder	Bambui
Mr. Abbas Abba	Field Recorder	Bambui
Mr. Andre Ossombe	Agricultural Technician	Dschang
Mr. Salomon Ebandan	Agricultural Technician	Santchou
Mr. Martin Nguimatsa	Agricultural Technician	Santchou
Mr. Michel Douanla	Agricultural Technician	Santchou
Mr. Joseph Mbo	Field Observer	Santchou
Mr. Dieudonne S. Sezine	Field Observer	Dschang
Mr. Madgaji	Field Observer	Maroua
Mr. Jean-Claude Ngongang Nono	Agricultural Technician	Nkolbisson
Mrs. Esther Teke	Agricultural Technician	Nkolbisson
Mr. Ferdinand Boyomo	Agricultural Technician	Nkolbisson

Mr. Emmanuel Bouambi	Agricultural Technician	Nkolbisson
Mr. Michael Njume	Agricultural Technician	Nkolbisson
Mr. Anatole Hounwa	Agricultural Technician	Ntui

Listed below are the technical personnel who served in the NCRE Project from 1981—1985:

Name	Position	Location
Dr. Emmanuel A. Atayi	Agricultural Economist and Deputy Chief of Party, (became Chief of Party during Phase I)	Bambui
Dr. Thomas G. Hart	Chief of Party	Nkolbisson
Mr. Daniel C. Goodman	Administrative Officer	Nkolbisson
Dr. Jay Chung	Maize Breeder	Nkolbisson
Dr. Animesh C. Roy	Rice Agronomist	Dschang
Dr. D. Janakiram	Rice Breeder	Dschang
Dr. Henri Talleyrand	Cereals Agronomist	Garoua
Dr. Om Dangi	Sorghum and Millet Breeder	Maroua
Dr. Joseph Kikafunda-Twine	Extension Agronomist	Bambui
Mr. Dermot McHugh	Agricultural Economist	Bambui
Dr. Leslie Everett	Maize Breeder	Bambui
Mr. Toby Chamberlain	Administrative Officer	Nkolbisson
Mr. Scott A. Welch	Administrative Officer	Nkolbisson
Dr. Laures T. Empig	Maize Breeder	Nkolbisson

USAID personnel associated with NCRE from 1980—1987:

James Williams	Mission Director	1/80-11/80
Ronald Levin	Mission Director	12/80-9/84
Jay Johnson	Mission Director	6/85-Present
Herbert Miller	Acting Director	9/84-6/85
Eric Witt	Agr. Development Officer	9/76-8/82
William Litwiller	Agr. Development Officer	3/82-12/85
John Balis	Agr. Development Officer	4/86-Present
Richard Goldman	Deputy ADO	10/78-9/82
Larry Dominessy	Deputy ADO	9/82-9/86
Raymond Rifenburg	Project Development Officer	11/78-6/82
Samuel Scott	Project Development Officer	10/82-Present
Abdel Moustafa	Project Officer	9/81-12/84
William Judy	Project Officer	5/85-Present
Edward Egbemba	Assistant Project Officer	12/83-Present

The views expressed herein are those of the author, Steve Kearl, and not necessarily those of the government of the Republic of Cameroon or of the United States Agency for International Development.

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