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MAIZE AND COWPEA COLLABORATIVE RESEARCH NETWORKS
FOR WEST AND CENTRAL AFRICA

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ANNUAL
REPORT
1988 / 89

SEMI ARID FOOD GRAIN RESEARCH AND DEVELOPMENT
INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE
SAFGRAD-IITA 01 B.P. 1495 AND BP 1783
OUAGADOUGOU 01,
BURKINA FASO

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PREFACE

This report describes the activities of the IITA\SAFGRAD Project on the Maize and Cowpea Collaborative Research Networks for West and Central Africa from April 1988 to March 1989, which marked the complete transfer of the original SAFGRAD Project into Phase II.

During this period, the activities of the Networks were implemented by national programs of member countries according to the plans developed by their respective Steering Committees which met regularly to monitor and review the progress of project implementation. A mid-term evaluation of the Project, also sponsored by USAID, was undertaken during this operating year.

ABBREVIATIONS.

ACPO	Accelerated Crop Production Officer
BRA	Bureau de Recherche Agronomique Tchad
CORAF	Conference des Responsables de la Recherche Agronomique Africains et Francais
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo.
DSA	Direction des Services Agricoles
FAM	France-African Maize Network
GLIP	Grain Legume Improvement Program IITA
IARC	International Agricultural Research Centres
ICRISAT	International Crops Research Institute for the Semi- Arid Tropics
INERA	Institut National d'Etudes et de Recherche Agricoles
IRAT	Institute for Research in Tropical Agriculture and Food Crops
IRAN	Institut de Recherche Agricole Naitonal
IITA	International Institute of Tropical Agriculture
NARS	National Agricultural Research Systems
RENACO	West and Central Africa Cowpea Network
SAFGRAD	Semi-Arid Food Grain Research and Development
SCO	SAFGRAD Co-ordination Office, Ouagadougou
SPAAR	Special Program for African Agricultural Research
USAID	United States Agency for International Development
WECAMAN	West and Central Africa Maize Network.

ACKNOWLEDGEMENTS

The IITA/SAFGRAD Project gratefully acknowledges the continued support from the Government and people of Burkina Faso. In particular, the Ministry of Higher Education and Scientific Research assisted in providing land and other facilities at Kamboinse, Saria, Farako-Ba, Vallee du Kou, and Gampela Stations. Land provided by the Ministry of Agriculture at Loumbila and Pobe (Djibo) enabled the provision of the necessary technical support to sustain the Network collaborative activities. The excellent cooperation of the Director of the "Institut National d'Etudes et de Recherche Agricoles (INERA), the Directors of the "Direction des Services Agricoles (DSA)" and the Station Directors facilitated the successful execution of Network activities.

Enthusiastic support from the Directors of Agricultural Research in the National Agricultural Research Systems (NARS) of the Network member countries is gratefully acknowledged, and active participation of researchers of the National Maize and Cowpea Programs contributed largely to the successful operation of these Networks.

The Project commends the logistic support received from the SAFGRAD Coordination Office, especially in facilitating effective communication with NARS. Prompt and effective administrative and technical backstopping from IITA Headquarters at Ibadan, Nigeria, significantly contributed to the successful implementation of the programs of the Collaborative Research Networks.

Other IARCs and Organizations namely CIMMYT, ICRISAT, IRAT, ISP (University of Ouagadougou) and many ORD Directors, ACPO Program in Togo, and USAID/BF co-operated fully with this project.

Finally, the IITA/SAFGRAD Project deeply appreciates the allocation of funds by the United States Agency for International Development (USAID) which fully financed the project activities presented in this report.

Ouagadougou
June, 1989
and

Joseph M. Fajemisin
Project Leader

Coordinator, Maize
Research Network

DECLARATION

Mention of a particular pesticide, any other chemicals or products in this document does not imply endorsement of, or discrimination against any manufactured products by IITA/SAFGRAD.

IITA/SAFGRAD PERSONNEL

Principal Staff

Dr. A.O. Diallo	Maize Network Coordinator (March 1987 to May 1988)
Dr. J. M. Fajemisin	Maize Network Coordinator (May 1988 to date) and Project Leader, IITA/SAFGRAD (from July 30, 1988).
Dr. N. Muleba	Cowpea Network Coordinator
Dr. J. B. Suh	Entomologist and Project Leader (until July 30, 1988).

Support Staff

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Mr. B. Morgan Kamboke	Secretary
Mrs. Rachel Ouedraogo	Secretary
Miss Aminata Bohena	Secretary
Mr. Maurice Sawadogo	Facilitation Clerk
Mr. Seydou Ouedraogo	Mechanic-Driver
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INTRODUCTION

SAFGRAD Phase II is an extension of the original SAFGRAD project whose global objective was enhancement of the productivity and production of essential food grains namely sorghum, millet, maize and cowpea in the semi-arid zone of Africa. The major emphasis of SAFGRAD II is to optimize the utilization of scientific manpower, materials, financial resources and available technologies to improve research capabilities of participating NARS through collaborative research and development networks. This strategy is a major shift of primary emphasis from resident research to collaborative research networking.

The Maize and Cowpea Collaborative Research Networks for West and Central Africa are two of the 4 Crop-based Networks designed for implementation in SAFGRAD II. IITA accepted responsibility for implementation of the Maize and Cowpea Networks. The other two, namely, West and Central Africa Sorghum Collaborative Network and East African Sorghum and Millet Collaborative Network were contracted to ICRISAT.

The West and Central Africa Maize Network (WECAMAN) and the Cowpea Network (RENACO) were established in March 1987. before the conclusion of the IITA/SAFGRAD resident research project on these two crops in March 1988. IITA provided resident Coordinators and technical backstopping for these network activities.

During the Workshop of the NARS maize and cowpea scientists in March 1987 which established the Networks, the major constraints limiting the production of these two crops in the West and Central African sub-regions were identified and appraised. As a result of the commonality of these problems across countries and the wide variations in the resources and manpower available from one country to the other, collaborative projects were identified. National programs with adequate research facilities, resources and skilled manpower accepted to serve as "Lead Centers" by

undertaking research assignments of primary interest to their countries and to all the Network member countries. Other national programs of WECAMAN and RENACO conducted mainly adaptive research activities by testing technologies introduced from IITA/SAFGRAD, IITA-Ibadan and from neighbouring countries.

A Steering Committee of 6 competent national full-time scientists and the Coordinator of the relevant network together with an observer each from IITA, USAID and SAFGRAD Coordination Office (SCO) was responsible for planning and monitoring the Program activities of each Network. Members of the Steering Committee were elected by representatives of member countries at the biennial general assembly. The Committee met at least twice a year.

The Network Coordinator is responsible for the implementation of the decisions of the Steering Committee and overall coordination of project activities, including arrangements for Steering Committee meetings, Workshops, Monitoring tours, Preparation and despatch of regional trials, Analyses, Collation and Despatch of results.

The mid-term evaluation by the funding agency USAID, conceded that the Networks were operational and evolving with effective leadership provided by the IARC's. However, the numbers of scientists, their levels of training and the diversity of disciplines involved within the NARS remain grossly inadequate. These deficiencies hold back timely and effective transfer of the research and development leadership from IARC to the NARS. The internal evaluation of each network and the USAID-sponsored mid-term external evaluation therefore recommended the development, funding and implementation of a program of higher degree training for scientists of the participating countries in order to facilitate the emergence of more competent national leadership.

TECHNICAL REPORT

MAIZE NETWORK

1. COLLABORATING NATIONAL SCIENTISTS

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2. MANAGEMENT OF THE MAIZE NETWORK

The Steering Committee of the Collaborative Maize Research Network met from April 1988 as follows:

Lome, Togo April 7-9, 1988
Zaria, Nigeria November 8-10, 1988
Lome, Togo March, 23-24, 1989

These meetings were attended by 6 of the 7 members together with observers from IITA, SAFGRAD and USAID.

The management matters of the Network discussed during these meetings, included

- (i) methods of improving the efficiency and effectiveness of regional trials,
- (ii) provision of research materials, equipment and funds to strengthen the capabilities of National Programs,
- (iii) planning, implementation and appraisal of visits of Network Coordinators and of members of the Steering Committee to National Programs,
- (iv) review of collaborative research projects assigned to technology-generating National Programs,
- (v) planning of 1988 Monitoring tour and of the 1989 Workshop and
- (vi) developing views on attempts to harmonize the activities of SAFGRAD Maize Network with those of the France-African Maize (FAM) Network under CORAF ("Conference des Responsables de la Recherche Agronomique Africains et Francais").

These activities are described in detail in the rest of this report.

3. STRENGTHENING NATIONAL PROGRAMS

Improvements in the capability of National Programs to conduct effective research is one of the principal objectives of the Network, and many activities were implemented during the year to achieve this goal. They included the co-ordinator's visits for technical consultations with NARS, provision of research materials, equipment and funds and training.

3.1 Visits to National Programs

The Network Steering Committee is an important vehicle for identifying and improving scientific leadership in National Agricultural Research Systems (NARS). Therefore, in addition to visits by the Coordinator to some of the participating countries, experienced national maize scientists, who are members of the Steering Committee, were each assigned to visit specific countries. This arrangement was expected to instil self-confidence and to sustain collaboration among NARS within the Network.

The Coordinator visited Benin, Central African Republic, Guinea-Conakry, Tchad and Togo, to appraise the research status of the national programs, suggest modifications where necessary, and discuss the roles of each national program in the maize network.

For example in Benin, the Coordinator reviewed the national maize program with the national scientists. The different maize populations and germplasm being utilized were examined for their relevance; some were eliminated while new ones were recommended for inclusion. For example TZB, a popular maize variety in Benin, was recommended to be replaced with its streak resistant version, TZB-SR. Simple, feasible, and effective breeding methodologies were suggested. Work plans were also discussed for agronomic experiments. The germplasm collection being maintained was examined and a more efficient method of maintenance was

recommended. The National Director of Agricultural Research was briefed about the restructured program. A second visit to Benin by the Network Coordinator during the year confirmed that the scientists had commenced implementation of the new program.

Members of the Steering Committee assigned to visit countries were as follows: (i) Dr. The Charles of Cameroon visited Tchad, (ii) Mr. Hema Idrissa of Burkina Faso visited Cape Verde and Guinea Bissau, (iii) Dr. Esseh Yovo Mawule of Togo toured Senegal, and (iv) Dr. B. Badu-Apraku of Ghana visited The Gambia. They were briefed about the various national programs, their structure, scope of activities and goals. They gave technical advice, shared experiences and participated in on-going research operations.

During these visits the Coordinator and members of the Steering Committee identified the major problems hindering research progress in most of the national programs. The major problems included:

- (i) poor design of projects and field experiments,
- (ii) inadequate research infrastructure, equipment and materials,
- (iii) lack of qualified scientific and technical staff and inability to retain qualified staff because of greater financial and other incentives in other sectors of the national economies, and
- (iv) lack of relevant and adequate scientific information.

3.2 Provision of Research Materials and Equipment

In order to strengthen the national programs for appropriate research, essential research materials were provided. The materials included moisture meters, balances, measuring tapes,

seed envelopes, pollination bags, labels, field note books, and sprayers. The following countries benefited from this intervention: Benin, Burkina Faso, Central African Republic, Guinea Conakry, Guinea Bissau, Mali, Senegal and Tchad.

3.3 Provision of Research Funds

The provision of essential research materials and equipment to some countries was also supported with allocation of four thousand dollars to each (US\$4000) of the following countries Benin, Burkina Faso, Guinea Conakry, Senegal and Tchad in 1988. This fund was to supplement national budgetary allocations for vital research activities such as varietal maintenance, improved seeds production, and management of trials. The fund was particularly useful for easy execution of operational activities which previously often suffered from inadequate and/or disrupted funding.

Some national programs have developed relatively strong cadres of research personnel, adequate infrastructures and mature research programs but they still suffer from inadequate financial resources. The Steering Committee therefore decided that some of the relatively strong national programs which have been identified as lead centers should be provided with funds to enhance their effectiveness in generating technologies for the Network. Togo, which accepted responsibility for generating technology for maize streak resistance screening and Nigeria for agronomic research were each allocated three thousand, five hundred dollars (US\$3,500) in 1988.

3.4 Training

To improve the capability of maize technicians in National Programs to conduct research trials, a 5-month residential course was organized at Kamboinse, Burkina Faso from June to November, 1988. Six technicians from the following countries participated: Benin, Burkina Faso, Central African Republic, Guinea Conakry, Mali and Tchad.

Training focussed attention on management of field experiments varietal maintenance, seed production, agronomic practices including tied ridging as a method of water conservation in the semi-arid zones, data processing, and interpretation of results. The course up-dated the skills of experienced technicians and also provided opportunities for interaction within the group in order to strengthen regional collaboration. Each trainee managed an experiment from planting to harvesting, data collection and interpretation. He later wrote a report of his activities during the training course.

4. COLLABORATIVE RESEARCH

The similarity of researchable constraints to maize production in the semi-arid zone of West and Central Africa was one of the major conclusions of the 1987 Workshop of maize scientists in the sub-region. Collaborative research networking is an effective and efficient way of generating and adapting technologies for countries with similar agro-ecological conditions and farming systems.

Two groups of collaborative research activities were therefore undertaken during the year namely:

- (i) Regional Variety Trials, and
- (ii) Specific problem research by Lead Centers.

4.1 Regional Variety Trials

Regional variety trials provide an avenue for national programs with inadequate trained research personnel to adapt maize varieties appropriate to their ecologies for eventual adoption by farmers. Such trials also assist strong national programs, which generated some of the varieties in the trials, to achieve a fast and more cost-effective assessment of their varieties over a wide range of environments, thus providing some stability and a means for reappraisal of breeding strategies or methodologies.

Three types of Regional Uniform Variety Trials (RUVT) were offered by the Network to national programs in the sub-region in 1988:

RUVT-1 Drought resistant, early maturing maize varieties,

RUVT-2 Intermediate and full-season streak resistant maize varieties, and

RUVT-3 Extra-early maturing maize varieties.

Eighty-two trial sets were requested by 16 countries in the sub-region (Table 1).

The year 1988 was exceptionally wet. For example, in Kamboinse, Burkina Faso, the 840.8mm rainfall recorded in 1988 in 56 days was 45% higher than 578.5mm in 50 rainy days, recorded in 1987.

Data from the trials of each collaborating national program were sent to the Network Coordinator for analysis. The results of the analysis for the various agronomic characters were returned to the national program collaborators. In addition, summaries from all those collaborators that returned data were collated and sent to all the member countries of the Network. Across-location data on yield trials and data for days to flowering, together with coefficients of variation (CV) not greater than 30% are summarized in Tables 2, 3 and 4 for RUVT-1, RUVT-2 and RUVT-3, respectively.

Seven out of the 13 entries of the RUVT-1 were from Pool 16 DR (Pool 16 improved for drought resistance). One of them, Across 86 Pool-16 DR was the highest yielding across 11 locations in 6 countries; it gave 27.9% more grain yield than the local check and was 9.9% higher yielding than the average yield of all the entries.

In RUVT-2, Across 85 TZSR-W-1 was the highest yielder across 11 locations in 7 countries. Other high yielders in the trial were the other streak resistant varieties namely EV 8444-SR, TZPB-SR, Maracay 7921-SR and EV 8422-SR.

TZEE-Y flowered earliest (42 days to silk) among all the entries in the Extra-early variety trial (RUVT-3). The average silking date for the locals across locations was 51 days. Pop CSP Early flowered in 46 days and gave the highest yield, as in 1987.

4.2 Specific-Problem Solving Collaborative Research

In order to resolve some of the major constraints to maize production in the sub-region, some national programs with adequately trained personnel accepted to tackle specific researchable problems for the benefit of all the participating network-member countries. Progress reports on these projects are presented below.

4.2.1 Drought Resistance

4.2.1.1 Pool-16 DR : Unpredictable periods of drought are responsible for significant yield reduction and instability of maize production in West and Central Africa. Improvement of maize cultivars for resistance or tolerance to drought will reduce farmers' risks.

Pool 16, an early maturing tropical white dent maize, originally developed in CIMMYT, was identified in 1982 by SAFGRAD for its apparent drought resistance trait. In collaboration with the National Program of Burkina Faso, Pool 16 is being subjected to family improvement for drought resistance using two types of ridging systems, simple and tied ridges, to produce two levels of moisture stress under natural rainfed conditions in the Sudan Savanna zone. The resulting population now called Pool 16 DR has passed through two cycles of improvement.

In 1988, 603 S1 families generated from Pool-16 DR C2 full-sibs were testcrossed with the latest cycle of Pool 16 obtained from CIMMYT. One hundred and ninety-two testcrosses were selected and evaluated at Kamboinse under simple and tied ridging systems. The testcross families were arranged into 12 experiments of 20 entries per group consisting of 16 test-cross families and four recurring entries as checks namely CO, C1 and C2 of Pool 16 DR and Pool 16 (ex-CYMMYT used for the testcrossing). Simple and tied ridges were considered as main plots and the families as sub-plots. Because 1988 was an extremely wet year in the sub-region, response to tied ridges was not as enthusiastic in moisture utilization/conservation as in typical years. The rainfall caused excessive moisture and therefore resulted in reduced crop growth and productivity. Nevertheless, marginal moisture stress conditions were observed in the simple ridges, compared to tied ridges. This was discernible during the second half of the growing season. Under such atypical situations, many parameters were considered in selecting the best 11 families that will eventually lead to the formation of the experimental variety Kamboinse 88 Pool-16 DR. Among the traits considered were good performance under both simple and tied ridges, low degree of leaf senescence under drought stress, date to flowering, good husk cover and low counts for root and stalk lodging.

The same 192 testcrosses together with the 4 checks were evaluated in a 14 x 14 simple lattice experiment under high plant density, 106,666 plants/ha, at Farako-Ba. The best 12 testcrosses were selected for the formation of the experimental variety, Farako-Ba 88 Pool 16 HD. After a thorough examination of families across the various stress conditions: Kamboinse (drought/excess moisture) and Farako-Ba (high density), the best 10 testcrosses were selected for the formation of Across 88 Pool 16 DR and the best 50 testcrosses selected for the generation of Pool 16 DR C3.

In the 1988/89 dry season, the F1 recombination of Pool 16 DR C3 and of the three experimental varieties were formed from the

remnant seeds of the S1 families that were used in producing the selected testcrosses. These will be planted under maize streak virus pressure at IITA-Ibadan and the streak resistant plants will be used to pollinate another set of the same materials planted simultaneously in a streak-free environment in order to increase the frequency of streak resistance in the population without significant erosion of drought resistance.

4.2.1.2 Drought resistant germplasm pool. In order to provide diverse genetic materials to National Programs for developing drought resistant varieties, seven maize entries that had shown promising response under drought stress were recombined in a diallel fashion. The entries were 2 local varieties namely Jaune Flint de Saria from Burkina Faso and Maka from Mauritania; others were 5 improved cultivars/genotypes: Tuxpeno DR, Temperate x Tropical N 42, Capinopolis 8245, Pool 16 DR, SAFITA 104 and a drought resistant synthetic developed at IITA.

The F1 crosses were advanced to F2 in the 1988/89 dry season, and the population will be subjected to selection and further improvement under drought stress.

4.2.2 Extra-Early Maize

To further reduce risk to maize farmers in situations where the rainfall period may be short, due either to late commencement or to early cessation of rains, extra-early maize varieties are being developed. Such varieties would mature in 82 days or less compared to 90 days for early varieties.

The three extra-early white composites TZEE-W1, TZEE-W2 and TZEE-W3 were recombined. The product was then crossed to the earliest fraction of an early maturing streak resistant donor EV 8430 SR. This was done in order to incorporate streak resistance and therefore ensure good performance of the varieties if the extra-early variety is planted after re-planting due to erratic rainfall

which is characterized by high level of streak incidence experienced in northern Togo in 1987 and 1988.

Similarly, the extra-early yellow composite TZEE-Y was crossed with the earliest fraction of TZEF-Y, an early maturing germplasm in order to improve its plant type and yield while at the same time retaining its extra-earliness. This improved TZEE-Y was also crossed with the earliest fraction of an early maturing streak resistant variety, EV 8431-SR.

4.2.3 Development of Streak Resistance Screening Capability

The National Maize Program of Togo has developed modest greenhouse facilities for streak resistance screening of germplasm. Artificial mass rearing of the *Cicadulina* leafhopper vector is done and the insects are used for controlled infestation of the plants and selection of streak resistant plants. The Program has developed streak resistant germplasm of various maturity cycles.

5. MONITORING TOUR

The conduct of monitoring tours of the activities of the participating national programs is an important way of achieving information exchange and of enhancing interaction and collaboration among maize research workers in the sub-region. It enables scientists to become familiar with the problems and potentials of maize production in other countries and to observe how production constraints are being tackled by other scientists.

A Monitoring Tour of the National Programs of Burkina Faso and Ghana was undertaken 12-20 September, 1988. Participants consisted of a representative each from 6 countries namely: Benin, Burkina Faso, Chad, Guinea-Conakry, Nigeria, Senegal and Togo together with the Network Coordinator.

In both countries, the participants were shown many on-station research experiments in breeding, agronomy and seed protection. They were also exposed to on-farm trials. The regional uniform trials coordinated by the Network were observed and the differential performance of the varieties in the trials were compared between different locations within the same country and between the two countries.

In both Burkina Faso and Ghana, the participants performed selections from among different families in family-structured breeding experiments and in yield trials at various levels of the breeding projects. Notes on selections were compared among participants and many made instant requests for promising germplasm.

The Global 2000 project in Ghana was regarded as a remarkable means of accelerating the adoption of technologies generated within the country. Maize varieties and improved cultural practices developed by the Ghana Crops Research Institute are being extended to farmers by the foreign-assisted project. The project features farmer-to-farmer multiplier effects. The Project which started about 3 years ago now includes thousands of convinced maize farmers.

Participants unanimously acknowledged the opportunity to participate in the monitoring tour, and recommended that it should be a continuing activity. It was noted that the tour eroded the language barrier which always tended to create unnecessary hindrance to exchange of ideas. The younger participants found the activities of the more experienced scientists most inspiring. Although relatively young, the Burkinabe Program was highly committed. It however lacked the vital linkage with farmers thus, seed production activities were either non-existent or not structured. By contrast, the Ghana Program was all-embracing and balanced.

6. WORKSHOP

A Joint Maize and Cowpea Networks Workshop was held in Lome, Togo. March 20-24 1989. A total of 78 scientists from 16 countries, regional and international institutions participated. This Workshop, emphasized the presentation of scientific papers by national scientists. A total of 20 papers were presented by the maize scientists and 15 by the cowpea scientists. The maize papers consisted of 7 on breeding, 6 on agronomy and 7 on crop protection. The papers on breeding were largely on methodologies and on genotype x environment interactions and their implications for breeding maize in the different ecologies of the sub-region. The agronomic papers presented results of agronomic options for maize culture in the semi-arid zone; the effects of nitrogen and plant density on yield and yield components of hybrid maize and the effects of planting date and varietal maturity on seed production and storability of maize. Three papers highlighted the incidence and importance of Striga on maize together with current research efforts to alleviate the problem. There were also papers on weed control, the control of the larger grain borer, Prostephanus truncatus, and on maize streak virus and other maize diseases.

The Workshop also reviewed Maize Network Activities for the past two years and discussed plans for the next two years. Results of regional trials were reviewed and nominations were called for to reconstitute the 1989 trials. Cameroon, Ghana and Togo, IITA-SAFGRAD, and IITA-Ibadan nominated varieties. Requests for sets of these trials for 1989 season were also received from the national program scientists. The collaborative Research Projects assigned to the different national programs were reviewed in line with current status of personnel and funding in the countries concerned.

The training program of the Network was discussed. The second 5-month residential course organized by the Network was approved for a participant each from Cape Verde, Central African Republic, Ghana, Guinea-Bissau, Senegal and Tchad. The Workshop

also provided avenues to initiate the production of an inventory of training needs for scientific staff in member countries.

In accordance with provisions for establishing the Network, 50% of the membership of the Steering Committee was subjected to election by the assembly of maize scientists during the Workshop. This was to ensure the injection of new ideas while at the same time retaining an adequate level of continuity.

Table 1. Number of sets of Regional Uniform Variety Trails (RUVT) requested per country, 1988.

Country	Number of trials requested		
	RUVT-1	RUVT-2	RUVT-3
Benin	4	2	4
Burkina Faso	3	2	3
Cameroon	3	2	2
Cape Verde	-	-	2
Central African Republic	2	1	1
Cote D'Ivoire	2	1	3
The Gambia	2	-	2
Ghana	1	1	-
Guinea Bissau	2	2	3
Guinea Conakry	-	4	-
Mali	-	-	-
Niger	1	1	1
Nigeria	1	2	1
Senegal	3	3	3
Tchad	1	1	1
Togo	3	3	3
TOTAL	28	25	29

Table 2. Grain yield, days to 50 % silking and % grain moisture at harvest of varieties tested in RUVT-1 (drought resistant maize) trial at 11 locations in 6 countries in 1988.

Variety	Location Code	GRAIN YIELD (T/HA)										Variety Mean	Days to 50 % silking	Mean % Moisture	
		BENIN		BURKINA FASO			C A R	CAMEROON		NIGERIA	TOGO				
		1	2	3	4	5	6	7	8	9	10				11
Across 86 Pool 16 DR		4.95	4.88	4.45	5.45	5.08	2.84	6.32	5.33	4.04	3.38	2.24	4.45	53	20.8
Pool 16 DR CO		5.33	4.85	3.94	5.51	4.63	3.41	5.50	5.51	2.92	2.42	2.08	4.19	52	19.9
Early 86 Pool 16 DR		4.60	4.40	3.94	4.79	5.26	3.29	5.60	4.98	3.17	3.26	2.55	4.17	52	20.3
Kamboinse 86 Pool 16 DR		4.77	4.88	4.46	4.62	4.39	3.42	5.27	5.34	2.85	3.22	2.61	4.17	54	20.7
AR 22		6.01	5.07	4.92	3.79	3.12	4.05	5.24	5.45	3.42	2.63	2.06	4.16	56	24.1
Pool 16 DR C1		5.17	4.61	4.85	4.73	3.81	3.22	5.47	5.06	3.01	3.46	2.24	4.15	53	21.2
Pool 16 DR C2		5.29	4.77	5.03	4.76	4.61	2.41	5.31	4.90	2.96	3.02	2.33	4.12	52	20.7
Across 86 Pool 16		4.83	4.92	4.20	5.75	4.85	2.39	5.37	4.99	2.66	2.99	2.39	4.12	51	19.1
Farako-Bâ 86 Pool 16 HD		4.81	4.26	3.80	5.08	5.01	3.17	5.49	4.86	2.90	3.04	2.03	4.04	52	20.7
SAFITA-2 (RE)		5.21	4.47	3.84	5.18	3.79	4.02	5.58	4.76	2.37	2.65	2.20	4.01	54	21.6
Kamboinse(1) 84 IZESR-W		4.82	4.30	3.74	4.94	3.94	2.73	5.41	4.68	3.06	3.08	2.44	3.92	52	19.6
Kawanzie		5.17	4.30	4.47	4.01	4.24	3.12	4.09	3.86	2.70	2.86	2.17	3.73	52	19.7
Local check		4.61	2.72	3.56	4.11	4.61	2.63	4.98	4.60	2.85	1.74	1.88	3.48	58	19.6
Location mean		5.04	4.49	4.25	4.83	4.41	3.12	5.36	4.95	2.99	2.90	2.25	4.05	53	20.6
L.S.D. 5%		0.65	1.00	1.36	1.23	1.44	1.35	0.14	0.80	0.73	0.25	0.71			
Prob. of F.		0.009	0.006	0.416	0.061	0.170	0.204	0.018	0.017	0.017	0.003	0.707			
C.V. %		9	15	22	17	23	30	12	11	17	18	22			

Location codes : 1 = Angaradebou, 2 = Bagou, 3 = Fada, 4 = Farako-Bâ, 5 = Kamboinse, 6 = Grimari, 7 = Garoua, 8 = Sanguere, 9 = Samaru, 10 = Broukou and 11 = Tantieou.

Central African Republic. = CAR

Table 3. Grain yield and days to 50% silking of varieties tested in RUVT-2 (intermediate and late maturing maize) trial at 11 locations in 7 countries in 1988.

Variety	Location Code	GRAIN YIELD (T/HA)											Variety Mean	Days to silking		
		BENIN		BURKINA FASO		CAMEROON		C A R	GHANA	NIGER	NIGERIA				TOGO	
		1	2	3	4	5	6	7	8	9	10	11				
Across 85 TZSR-W-1		2.83	6.12	4.13	4.55	4.67	3.83	3.52	3.00	3.41	4.48	1.94	3.86	66		
EV 8444-SR		3.09	6.02	3.37	5.24	3.80	3.56	2.27	3.85	4.01	4.46	1.83	3.77	61		
TZPB-SR		3.25	5.61	3.86	4.49	4.07	3.94	3.72	2.63	2.94	5.15	1.51	3.74	66		
Maracay 7921-SR		2.82	6.02	3.38	4.49	5.25	3.02	2.63	2.89	3.19	4.54	1.67	3.63	65		
EV 8422-SR		3.41	6.52	3.78	3.58	4.09	3.30	2.50	2.90	3.33	4.74	1.87	3.63	65		
EV 8428-SR		3.38	5.35	3.00	4.98	3.87	3.54	3.09	2.75	3.60	4.75	1.40	3.61	63		
Farako-Bâ 85 TZSR-W-1		3.29	5.59	3.65	3.98	3.79	3.86	2.99	3.37	2.49	4.59	1.74	3.58	66		
Loumbila 84 TZUT-Y		3.01	6.57	4.02	5.09	3.77	2.92	2.17	3.15	2.55	4.03	1.89	3.56	60		
Farako-Bâ TZSR-Y-1		2.15	6.58	3.41	3.88	4.16	4.21	2.48	3.21	2.39	4.40	2.07	3.54	65		
Local check		2.80	6.12	4.30	4.19	5.35	2.74	2.15	2.38	2.19	4.31	1.68	3.48	64		
EV 8445-SR		3.29	6.08	3.80	4.13	4.00	3.21	2.03	2.66	2.07	4.44	1.64	3.40	64		
Aburotia		3.05	5.86	3.18	5.26	4.24	2.88	1.85	2.40	3.10	3.24	2.24	3.39	62		
Location mean		3.03	6.04	3.66	4.49	4.25	3.42	2.62	2.93	2.94	4.43	1.79	3.60	64		
L.S.D. 5%		1.13	1.75	1.13	1.56	1.47	1.32	1.12	1.23	0.98	0.76	0.60				
Prob. of F.		0.644	0.937	0.445	0.396	0.349	0.394	0.029	0.497	0.005	0.006	0.287				
C.V. %		26	20	21	24	24	27	30	29	23	12	23				

Location codes : 1 = Ina, 2 = Farako-Bâ, 3 = Vallée du Kou, 4 = Garoua, 5 = Sanguere, 6 = Grimari, 7 = Nyankpala, 8 = Bengou, 9 = Samaru, 10 = Broukou, and 11 = Tantieou.

* Central African Republic. = CAR

Table 4. Grain yield, days to 50% silking and % grain moisture at harvest of varieties tested in RUVT-3 (extra-early maize) trial at 9 locations in 5 countries in 1988.

Variety	Location Code	GRAIN YIELD (T/HA)									Variety Mean	Days to 50% Silking	Mean % Moisture
		BENIN		BURKINA FASO		CAMEROON		NIGERIA		TOGO			
		1	2	3	4	5	6	7	8	9			
Pop CSP Early		2.31	3.81	4.83	3.48	4.78	3.96	3.92	2.63	1.87	3.51	46	29.0
CSP x L. Rayliri F2		2.11	3.47	6.58	3.33	4.99	3.97	2.64	2.42	1.60	3.46	48	26.6
Local check		2.33	3.97	4.78	3.10	4.17	4.62	3.01	1.92	1.88	3.31	51	27.9
TZFF-Y		1.97	4.21	4.54	3.26	4.81	3.57	1.57	2.82	2.25	3.22	48	28.1
Across B131 x FJS x LR F4		1.86	3.56	4.93	3.31	4.26	3.46	2.03	2.36	1.97	3.08	47	28.3
TZEG-W x GUA 314 BC1 F2		2.17	3.29	4.30	2.66	3.48	3.62	2.62	2.96	2.01	3.01	46	25.4
TZEE-W-2		1.89	2.97	3.90	3.47	3.48	2.79	2.80	2.66	1.59	2.84	45	26.7
Pop 30 x GUA 314 BC1 F2		1.83	2.89	3.59	2.93	4.17	3.33	2.12	2.56	1.95	2.82	45	27.3
Pool 27 x GUA 314 BC1 F2		1.83	2.64	3.74	2.97	3.66	2.68	1.35	1.81	1.42	2.46	45	27.0
TZEE-W-1		1.75	2.30	3.55	3.14	3.38	2.61	1.71	2.17	1.55	2.46	46	26.2
TZEE-Y		1.44	2.25	3.17	2.16	3.76	2.90	1.78	1.36	1.47	2.26	42	26.5
Pool 28 x GUA 314 BC1 F2		1.64	1.57	3.54	2.48	3.12	2.40	1.32	1.73	1.68	2.16	44	26.2
Location mean		1.93	3.08	4.29	3.02	4.00	3.33	2.24	2.28	1.77	2.80	46	27.4
L.S.D. 5%		0.41	0.78	1.45	1.17	0.92	1.08	0.57	0.42	0.61			
Prob. of F.		0.003	0.000	0.003	0.457	0.002	0.005	0.000	0.000	0.204			
C.V. %		15	17	23	27	16	23	18	13	24			

Location codes : 1 = Guene, 2 = Niaouli, 3 = Kamboinse, 4 = Sarie, 5 = Garoua, 6 = Sanguere, 7 = Samaru, 8 = Droukou, and 9 = Tantieou.

COWPEA NETWORK

1. COLLABORATING NATIONAL PROGRAMS/SCIENTISTS

1.1 RENACO Lead Centers

Burkina Faso Dr. Dabire Clementine (Entomologiste)
INERA, 03 B.P. 476
Ouagadougou 03

- Research: Breeding for drought,
Striga insect pest and disease resistance.
Pathology.

Cameroon Mr. Ntoukam Georges
Entomologist, IRA,
B.P. 33, Maroua

- Research: Entomology with particular
emphasis on storage insect pests control.

Niger Mr. Moutari Adamou
Breeder, INRAN
B.P. 429, Niamey

- Research: Breeding for drought,
Striga, pests and disease resistance.
Agronomy and Pathology,
including *Striga*.

Nigeria Prof. O.I. Leleji (until December 1988, and was replaced by Dr. O.O. Olufajo) Cowpea Agronomist, Department of Agronomy, IAR/ABU, PMB 1044, Zaria.

- Research: Breeding for drought, *Striga*, insect pests and diseases. Agronomy, Pathology and Entomology

Senegal Mr. Cisse N'Diaga
Cowpea Breeder, ISRA/CNRA
B.P. 52, Bambey

- Research: Breeding for drought, insect pest and disease resistance. Entomology.

1.2 Other RENACO Member Countries

Benin Dr. Jean Detongnon
Cowpea Breeder, SRCV-Niaouli
B.P. 3, Attogon

Cape Verde Mr. C.E.P. Silva
Agronomist, INIA/MDRP
B.P. 50, Praia

Cote D'Ivoire Mr. Adou Amalaman
Institut des Savanes
B.P. 121, Ferkessedougou

The Gambia	Mr. Bojang Musa Dept. of Agriculture Research Yundum W. Division
Ghana	Mr. G. Atuahene-Amankwa Cowpea Breeder, Crops Research Institute P.O.Box, 3785, Kumasi
Guinea Bissau	Mr. Sadjo Malam Cowpea Agronomist MDR/DEPA. C.P. 71, Bissau
Guinea Conakry	Dr. F.L. Guilavogui Cowpea Entomologist Ministere de l'Education Nationale IRAG, B.P. 1003, Conakry
Mali	Mr. Kodio Ondie Cowpea Breeder, IER/DRA/SRCVO B.P. 438, Bamako
Mauritania	Mr. Sidi Fall Breeder, CNRADA B.P. 22, Kaedi
Togo	Mrs. Akossiwa Duyiboe Cowpea Agronomist DRA, B.P. 2318, Lome

2. MANAGEMENT OF THE COWPEA NETWORK

The fourth and fifth Meetings of the Steering Committee were held between April 1988 to March, 1989.

2.1 The Fourth Steering Committee Meeting

The 4th Steering Committee Meeting was held in Zaria, Nigeria at the Ahmadu Bello University from 7-11 November, 1988.

The following RENACO activities were discussed at this Meeting:

- a. The 1987 results of RENACO's Regional Trials.
- b. The 1988 Mid-Term RENACO Activity Reports.
 - i) Research activities in Burkina Faso.
 - ii) Research activities in Nigeria.
 - iii) Research activities in Niger.
 - iv) Research activities in Cameroon.
 - v) Research activities in Senegal.
 - vi) Research activities in IITA.
 - vii) The 1988 Cowpea Regional Trials.
 - viii) Cowpea Monitoring Tour, 5-21 September, 1988.
 - ix) Coordinator's visit to five national programs and other related activities of the Network.
- c. Training activities fo RENACO.
 - i) Seminar for national scientists from Lead Centers.
 - ii) Training of field technicians.
 - iii) Cowpea Workshop to be held in Lome, Togo, March 1989.

- d. Funds allocated to support national programs for 1988.
- e. Supplementary Budget Proposal (submitted to SPAAR).
- f. Research Work Plans for RENACO Lead Centers.
- g. Miscellaneous.

The Steering Committee made recommendations and took appropriate decisions for implementation by the Network Coordinator at its fourth Meeting.

2.2 The Fifth Steering Committee Meeting

The fifth Meeting of the Steering Committee was held in Lome, Togo, on March 23-24, 1989 immediately after the joint Maize-Cowpea Workshop.

The following RENACO activities were considered at this Meeting:

- a. Identification of new technologies generated by RENACO's Lead Centres and by IITA for possible recommendation for the 1989 Regional Trials.
- b. Evaluation of the performance of RENACO's Lead Centers.
- c. Evaluation of the performance of other RENACO member countries.
- d. Miscellaneous.
 - i) IITA-GLIP's new research strategy.
 - ii) IITA Grain Legume Bulletin
 - iii) Publication of the proceedings of the Seminar for RENACO's Lead Center scientists held at IITA, Ibadan in November 1988.

- iv) Training activities of RENACO.
- v) Cowpea Entomology Regional Trials for 1989-1990.

The Steering Committee made recommendations and decisions for implementation by the Network Coordinator.

New technologies which were of interest to RENACO member countries were identified for testing in the 1989/90 RENACO's Regional Trials as follows:

Burkina Faso

- i) Striga resistant varieties: KVx 396-11-6G, KVx 396-8-5G'; LVx396-6-1G, KVx 396-4-4-2, KVx 396-4-4-4. B 301. IT82D-849.
- ii) Aphid resistant varieties: IT86D-1057, IT83S-172-2, IT84S- 2246-4, KVx 145-27-6, KVx 146-27-4, KVx 165-14-1.
- iii) Bruchid resistant varieties: KVx 30-G467-5-10k, KVx 30-G183-3-5K.
- iv) Multiple disease resistant varieties: IT86D-1056, IT83D-219, IT86D-1057, IT85D-3577.

Nigeria.

- i) Dual purpose varieties: 7/180-4-5-1, 7/80-4-5.
- ii) Scab resistant varieties: IT86D-1056, IT83D-219.
- iii) Brown blotch resistant varieties: IT85D-3577, IT82E-32.

Senegal

IS86-275: combines resistance to bruchids, virus and bacterial blight.

Niger/IITA-ICRISAT

- i) Extra-early varieties: IT86D-715, IT86D-719, IT83D-219.
- ii) Medium maturity varieties: IT83D-3517-2, IT85D-3516-2

Niger, INRAN

- i) Striga resistant varieties : TN 5-78, TN 93-80, TN 121-8.

IITA/Ibadan

- i) Bruchid resistance
- ii) Aphid resistance
- iii) Virus resistance.

The Network has incorporated these new technologies in the design of the following Cowpea Regional Trials for the 1989-90 crop season.

- Aphid resistance.
- Bruchid resistance
- Virus resistance.

- Striga resistance.
- Adaptation trials for Sudano-Sahelian zones.
- Adaptation trials for Northern Guinea savana zones.
- Adaptation trials for moist savana zones.

In addition, 3 Regional Entomology Trials were designed for 1989-90. Details of these trials were communicated to national programs who will receive trials of their choice upon request.

It is noted that the Burkina national program took over all research activities of IITA/SAFGRAD in April 1988 and worked closely with the Network Coordinator. Technologies proposed by Burkina Faso therefore reflect the merged activities of IITA/SAFGRAD and the national program.

The performance of Lead Centers were found to be satisfactory and encouraging. They were therefore urged to keep up the good work with their research thrust, particularly in adopting the multi-disciplinary research approach, to problem solving. The official representative from Cameroon was unable to attend the workshop because of difficulties with flight connections.

3. STRENGTHENING NATIONAL PROGRAMS.

Efforts to strengthen the capability of national programs, involved the following activities.

3.1 Visits to National Programs.

The Cowpea Network Coordinator visited 5 national cowpea programs in August 1988. The objectives of the visits were:

- a. To become acquainted with the National Cowpea programs and their problems.

- b. To make on-the-spot verification of reports presented at the March 1987 Cowpea Network Workshop.
- c. To meet with national scientists and administrators who could not attend the 1987 cowpea network workshop and to discuss the objectives, activities and advantages of networking.
- d. To survey research activities of potential interest to the cowpea network, and not necessarily conducted by national cowpea scientists in the countries visited.
- e. To discuss, with national cowpea scientists, the most beneficial ways to utilize funds allocated by the Network to support their research activities.

The following countries were visited: Cameroon, 5-10 August; Tchad, 13-16 August; Senegal, 17-20 August, Cape Verde, 20-23 August; and Togo; 2-5 October, 1988. In addition, Mr. Ouedraogo Jeremie, a Burkinabe National Cowpea Breeder, visited northern Togo on behalf of the Coordinator.

During his visit to Tchad, the Coordinator identified the following major problems which were responsible for Tchad's low participation in the RENACO's activities.

- i) Tchad did not conduct the 1987 regional trials due to severe drought. The trials were however, established in the 1988 season by field assistants at the Gassi Research Station.

- ii) The absence of a National Cowpea Research Coordinator in Tchad, coupled with administrative changes at the headquarters especially at the "Bureau de Recherche Agronomique" (BRA), did not permit initiation of any cowpea research activities or other activities of SAFGRAD-RENACO in the country at the time of the Coordinator's visit. Although Tchad was invited to participate at the 1988 monitoring tour, it was clear that the country would not benefit from such RENACO activities in the absence of a national cowpea research structure and a local Cowpea Research Coordinator.

Apart from Tchad, cowpea research activities in the other countries visited were quite satisfactory and encouraging. With regard to the results of the regional trials, although not reported, the visit revealed that the poor condition of some of the trials was associated with weather hazards, either droughty conditions in 1987 or wetness in 1988, which severely damaged some trials.

3.2 Provision of research materials and financial assistance to National Programs.

Small equipment and materials amounting to about 700 US dollars were supplied for network activities to the following countries directly from IITA's Central Warehouse at Ibadan in 1987: Guinea Bissau, Guinea Conakry, Cape Verde and Nigeria. Benin received cash payment of 200.000 CFA francs for the same purpose.

In order to facilitate the smooth execution of RENACO's activities assigned to Lead Centers, financial assistance was provided to them as follows: (see table 5).

Table 5. Disbursement of Research fund Assistance to RENACO Lead Centers.

Country	Amount
Burkina Faso	2.940.000 CFA
Cameroon	585.000 CFA
Niger	585.000 CFA
Nigeria	4,000 US\$
Senegal	877.000 CFA

Requests and justifications for SAFGRAD-RENACO financial support from other national programs, namely Togo, Guinea Conakry, Cape Verde, Mauritania and Ghana, were received. Approved allocations are being transferred.

3.3 Training.

Dr. G. Konate, a Virologist from Burkina Faso, benefited from RENACO's training program sponsorship to IITA, Ibadan for 1 week. At IITA, he visited the Virology Unit and interacted with colleagues there as well as with scientists in the IITA Grain Legume Improvement Program.

A 10-day Seminar for RENACO's Lead Center Scientists was organised at IITA, Ibadan from November 14-25, 1988. The objective of the Seminar was to enable professional interaction between national scientists from RENACO's Lead Centers and those of IITA to know each other, exchange ideas and experiences, and to discuss the methodologies adopted for solving cowpea production

constraints. Scientists of various disciplines (agronomy, entomology, pathology and breeding) from Nigeria (O. Leleji, E.C. Odion, C. Amatobi, A.M. Emechebe); Niger (Hassane Hama, Adam Toudou); Senegal (Cisse Ndiaga, A.B. Bal); Burkina Faso (J. Ouedraogo, C. Dabire); Cameroon (G.Ntoukam); Ghana (M. Owusu) attended. The Seminar consisted of lectures given by scientists from IITA, the five Lead Centers and Ghana, in the following consecutive sessions: Agronomy, Entomology, Pathology and Breeding.

3.4 Regional Trials.

To facilitate the flow of technologies from IITA, IITA/SAFGRAD and RENACO Lead Centers, within member countries, regional trials were designed from promising technologies and sent to national programs in 1987 for acquisition on request. National programs that conducted regional trials in 1987 were encouraged to repeat the same trials in 1988 for a better assessment of technologies, while those who did not conduct trials in 1987 were allowed to do so in 1988.

A total of 81 trials were sent to National Programs in 1987 and 25 in 1988. These trials included: Aphid, Bruchid and Virus resistant nurseries; cowpea drought and Striga resistant trials; maize-cowpea relay cropping, sorghum and millet-cowpea intercropping, and minimum insecticide trials.

All the 17 Cowpea Network member countries requested at least one trial during the 1987 and 1988 crop seasons. Some trials were not reported because of their poor establishment and performance caused mainly by bad climatic conditions namely; severe drought in 1987 and excess moisture in 1988.

Because of communication problems within the country, Mauritania's regional trials which arrived at Nouakchott (capital) well before the season started, were only delivered to the Kaedi Station, 700km south of Nouakchott, early in 1989.

3.5 Workshop

A Joint Maize and Cowpea Workshop was held in Lome, Togo, in March 20-24, 1989. The overall objective of the Workshop was to bring national and international scientists working on both crops together to exchange ideas, experiences and scientific information, in order to ensure the flow of relevant technologies capable of generating sustainable agricultural productivity and production of both crops within the sub-region. The Workshop was organised in two main sessions: (i) Scientific communication and (ii) Country reports.

i) Scientific Communication Session

During this session, 30 scientific papers were alternately presented by national and international maize and cowpea scientists, in the disciplines of: Agronomy, Pathology, Entomology, Physiology, Breeding and Grain processing and Utilization. Some aspects of breeding methodology for adaptation studies as well as *Striga gesnerioides* resistance were also covered.

ii) Country Reports Session

All RENACO member countries and IITA-Grain Legume Improvement Programs reported on their cowpea research activities, research findings and regional trials.

Beginning with RENACO Lead Centres, followed by other country reports, oral and written reports were discussed. Central Africa Republic was not represented at the Workshop and did not send a written report on their cowpea research activities to RENACO. No official information has been received to explain why they did not attend or contribute to the Workshop.

The official representative of Cameroon to the Workshop informed the Network Coordinator of problems with flight connections which prevented him from attending the Workshop. Cameroon's mandated research activity

report was, therefore not presented at the Workshop, but was sent to the Network Coordinator in April, 1989.

From the country reports, the performance of the 5 Lead Centers and 3 promising national programs, namely Mali, Benin and Ghana, were evaluated by the Cowpea Steering Committee which met shortly after the Workshop. Promising technologies of interest to member countries were identified, and utilized by the Steering Committee in the design of the 1989 regional trials which were proposed to member countries . (see Section 2.2) A total of 78 national and international maize and cowpea scientists attended the Workshop. About 50% of them were cowpea scientists.

The proceedings of the Scientific Communication of the Workshop and a summary of the country reports are being prepared for publication.



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