Organization of African Unity
Scientific, Technical and Research Commission

Joint Project 31: Semi-Arid Food Grains Research and Development
SAFGRAD II

Maize and Cowpea Collaborative Research Networks for West and Central Africa

SAFGRAD II
FINAL REPORT

Funded by: United States Agency for International Development (USAID)

International Institute of Tropical Agriculture
Oyo Road
PMB 5320
Ibadan, Nigeria

June 30, 1991

CONTENTS

	Page
Preface	-v-
Abbreviations	-vi-
Acknowledgements	-vii-
Declaration	-ix-
Introduction	1
Executive Summary	3
1. Networks' Coordination Personnel	5
2. Objectives	6
3. Target Area	6
Major Ecologies	6
Collaborating Countries	7
Production Constraints	7
4. Strategy	10
5. Network Management and Scientific Leadership	12
6. Collaborative Research	13
Maize Network	14
Cameroon	14
Ghana	15
Côte d'Ivoire	16
Togo	16
Nigeria	17
Burkina Faso	18
Cowpea Network	19
Burkina Faso	19
Cameroon	21
Ghana	22
Nigeria	22
Niger	24
Senegal	25
7. Regional Trials	25
Maize	26
Cowpea	28

	Page
8. Workshops and Seminars	30
Joint Workshops and Seminars	30
9. Training	33
Maize	33
Cowpea	34
10. Provision of Research Materials and Funds	35
11. Improvement of Linkages Among National Programs	35
Monitoring Tours	35
Visits to National Programs	38
12. Network Impact	42
Management of Research Activities	42
Maize and Cowpea Research	42
Diffusion and Adoption of Varieties	43
Maize	43
Cowpea	44
13. Problems and Difficulties Encountered in Achieving Objectives	46
Inadequate Pool of Scientists	47
Need for Increased Government Funding of National Programs	47
Areas for Improvement in Network Management	48
14. Recommendations for Future Network Activities	48
15. Publications	49
Annexes	**55**
1. West and Central Africa Maize Network: Collaborating scientists in Network Member-countries (As of March, 1991)	56
2. West and Central Africa Cowpea Network: Collaborating scientists in Network Member-Countries (As of March, 1991)	58

Page

3. List of Maize Network Steering Committee Meetings (March 1987 - March 1991). 60

4. List of Cowpea Network Steering Committee Meetings (March 1987 - March 1991). 61

5. Number of sets of regional maize trials received by Network member-countries 1987-1991. 62

6. Number of regional maize trials whose data were returned to the Coordinator by the collaborating countries, 1987-1990. 63

7. Cowpea regional trials sent to member-countries in 1987. 64

8. Cowpea regional trials sent to member-countries in 1989. 65

9. Feedback received from member countries for the 1987-88 cowpea regional trials. 66

10. Feedback received from member countries for the 1989-90 cowpea regional trials. 67

11. Cowpea regional trials sent to member countries in 1991. 68

12. List of participants to the joint maize-cowpea-sorghum networks' seminar for research agronomists, IITA, Ibadan, 7-19 January, 1991. 69

13. List of participants at training course for maize research technicians (1988, 1989, 1990). 70

14. List of participants to the RENACO's seminar held in November 1988 at, IITA, Ibadan, Nigeria. 71

15. List of participants to the RENACO's group training course at the INERA Research Station, Kamboinse/Ouagadougou, in 1989. 72

16. List of participants to the 1988 Maize Monitoring Tour (September 12-20, 1988). 73

		Page
17.	List of participants to the 1990 Maize Monitoring Tour (September 8-22, 1990).	74
18.	List of participants to the 1988 Cowpea Monitoring Tour (September 5-21, 1988).	75
19.	List of participants to the 1990 Cowpea Monitoring Tour (August 27 - September 14, 1990).	76
20.	Utilization of maize technologies obtained through Network by NARS in West and Central Africa.	77
21.	Maize varieties cultivated in various countries in West and Central Africa.	78
22.	Promising maize varieties in the pipeline for release in West and Central African countries.	80
23.	Cowpea cultivars released or about to be released from the Network's efforts.	82
24.	List of varieties released by the different RENACO national cowpea programs since 1987.	83
25.	List of varieties in pre-extension stage in various RENACO national cowpea programs since 1987.	85

Preface

This report highlights the activities of the IITA/SAFGRAD Project Phase II (September, 1986 to August 1991) on the Maize and Cowpea Collaborative Research Networks for West and Central Africa.

In the first 18 months of the Project, the resident research initiated during the previous phase was continued. Final report on this component of Phase II had earlier been written and submitted to the Donors. The primary thrust of SAFGRAD II was to increase the efficiency and effectiveness of the National Agricultural Research Systems (NARS) by developing the capacity and initiative of national scientists to direct maize and cowpea collaborative research networks.

Abbreviations

ACPO	Accelerated Crop Production Officer.
BRA	Bureau de Recherche Agronomique, Tchad.
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo.
CIRAD	Centre de Coopération International en Recherche Agronomique pour le Développement.
CRPA	Centre Régional de Production Agro-Pastorale.
DPV	Direction de la Production Végétale.
GLIP	Grain Legume Improvement Program, IITA.
IARC	International Agricultural Research Center.
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics.
IDR	Institut de Développement Rural.
IDRC	International Development Research Center, Canada.
IITA	International Institute of Tropical Agriculture.
INERA	Institut d'Etudes et de Recherches Agricoles.
INRAN	Institut National de Recherches Agronomiques du Niger.
NARS	National Agricultural Research Systems.
RENACO	Réseau Niébé d'Afrique Centrale et Occidentale (West and Central Africa Cowpea Network)
SAFGRAD	Semi-Arid Food Grain Research and Development
SCO	SAFGRAD Coordination Office, Ouagadougou.
USAID	United States Agency for International Development.
WECAMAN	West and Central Africa Maize Network.

Acknowledgements

The IITA/SAFGRAD project gratefully acknowledges the 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-Bâ, 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 Networks' collaborative activities. The excellent cooperation of the Director of the "Institut d'Etudes et de Recherches Agricoles (INERA), Heads of Research Stations, and the Directors of the "Direction de la Production Végétale (DPV)" facilitated the successful execution of Network activities.

The enthusiastic support from the directors of agricultural research in the National Agricultural Research Systems (NARS) of the Networks' member countries is gratefully acknowledged. The 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, played a significant role in the successful implementation of the programs of the Collaborative Research Networks.

Other IARC's and organizations namely CIMMYT, ICRISAT, CIRAD, IDR (University of Ouagadougou) and many CRPA Directors, ACPO Program in Togo, IDRC through INERA/Burkina Faso and USAID/Burkina Faso 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, 1991

Joseph M. Fajemisin
Project Leader and
Coordinator, Maize
Research Network.

Declaration

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

Introduction

Subsequent to the decreasing per capita food production in sub-saharan Africa beginning in the 1960s and aggravated by the drought of the 1970s, the Semi-Arid Food Grains Research and Development (SAFGRAD) project was launched in 1977 at the meeting of the African Ministers of Foreign Affairs in the Mauritius Island. The United States Agency for International Development (USAID) agreed to fund it under the auspices of the Scientific, Technical and Research Commission of the Organization of African Unity (OAU/STRC). The purpose was to carry out research for improved productivity of five major staple grain crops of the semi-arid zone, namely sorghum, millet, maize, cowpea and groundnuts.

The International Institute of Tropical Agriculture (IITA) was given the responsibility for undertaking regionally-oriented research activities for maize and cowpea while the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) accepted responsibility for research on sorghum, millet and groundnuts. Purdue University, Indiana USA handled the farming systems research component. Results from the phase I of the project produced technologies that were tested in regional trials by scientists from the national agricultural research systems (NARS) of the 26 SAFGRAD member-countries of West, Central, Eastern, and Southern Africa.

SAFGRAD Phase II (1986-1991) is a re-orientation of the Project ; it phases out its direct agricultural research activities in Burkina Faso by the two international centers (IITA and ICRISAT) and emphasizes the promotion of a sustainable research system at the national level through the establishment of commodity specific research networks. IITA accepted the implementation responsibility for establishing the maize and cowpea collaborative research networks for West and Central Africa.

Under this arrangement, IITA accepted to (a) continue the resident research undertaken during Phase I during the first 18 months, beginning September, 1986, (b) assume leadership in creating the collaborative research networks for maize and cowpea by appointing coordinators for each network and (c) ensure that the NARS scientists play increasing role so that they will in future assume full leadership, with IITA providing support only.

In SAFGRAD II, resident research was supported for 18 months. During that period, IITA completed some research activities initiated during the previous phase of the project. The Final Report on this component of Phase II was written and submitted to the donors in 1988 (SAFGRAD-IITA, Final Report, Resident Research, Phase II, 1988).

This report summarizes the activities on the establishment and implementation of the maize and cowpea collaborative research networks. The report also contains sections on the problems encountered and recommendations for future network activities.

Executive Summary

The major preoccupation for SAFGRAD phase II is to increase the efficiency and effectiveness of research into some selected major staple food grain crops of semi-arid Africa by developing the capacity and initiative of national scientists to provide appropriate solutions to major researchable constraints, using the network approach.

The Maize and Cowpea Collaborative Research Networks for West and Central Africa were initiated in March 1987 with the prioritization of the major constraints to maize and cowpea by the assemblies of maize and cowpea scientists from the sub-region followed by the development of the network strategy. A Steering Committee of elected active scientists was elected for each Network. The Networks became fully operational in April 1988. The Steering Committees have, through their biannual meetings and visits to national programs, provided concerted leadership to the Networks.

The assignment of research responsibilities to Lead Centers (National Programs with requisite manpower and infrastructure) has permitted the development of improved techniques to resolve production constraints that are common to many countries in the sub-region. These technologies, and some other appropriate ones from IARC's (IITA, CIMMYT) were constituted into regional trials which were requested and conducted by all the member countries of each network. Three hundred and fifty-two sets of trials were requested by the maize network while 225 were requested by the cowpea network.

Biennial workshops were organized for the presentation of original scientific findings, review and planning of the collaborative research, and to promote intra-and inter-network interaction. Seminars were arranged by the Networks to discuss research strategies and appropriate research methodologies and resource persons were invited from the international and national

programs. For instance, the 2-week joint maize-cowpea-sorghum networks' seminar for research agronomists allowed 20 participants from 12 countries to discuss the low input technology strategy and appropriate technologies. Intensive (5-month) practical-oriented training courses were organized for 15 technicians from 11 countries to improve their field plot techniques and their skills in data management, varietal maintenance, and seed production.

Several acivities were organized by the networks to promote the development of linkages between NARS and IITA scientists. The monitoring tours organized in 1988 and 1990 allowed scientists from 5-8 countries (per crop/tour) to visit national maize/cowpea programs in selected countries. Also, members of the Steering Committee of each Network were assigned, on yearly basis, one or two countries each for visit in order to (i) share experiences with the scientists of the host countries and (ii) promote exchange of technologies, ideas and visits among the national scientists in the sub-region.

The re-orientation of the SAFGRAD Project as collaborative research networks has facilitated the identification and promotion of research leadership among NARS scientists. The enhanced interaction coupled with the training activities organized by the networks and the technical backstopping by IITA scientists and resource persons from Lead NARS, have increased the efficiency and effectiveness of research within individual national programs through sharper focusing on major constraints and better utilization of resources. The collaborative research activities initiated and coordinated by the Networks have resulted in the development of new technologies which are subsequently exchanged within the network. The development of closer link between the maize/cowpea scientists and the peasant farmers through the farming system research scientists and extension workers has resulted in the adoption of some varieties, and improved techniques generated through networking.

1. Networks' Coordination Personnel

At the end of the first 18 months of SAFGRAD phase II, the number of the IITA/SAFGRAD scientists was reduced from six to two in response to a shift of emphasis from resident research to networking. There was a corresponding drastic reduction in the number of local, permanent support staff. The entire IITA/SAFGRAD staff for the coordination of the two networks are as follows:

Name	**Designation**
Dr. J.M. Fajemisin	Maize Network Coordinator (May 1988 to date) and Project Leader, IITA/SAFGRAD
Dr. A.O. Diallo	Maize Network Coordinator (September 1986 - May 1988)
Dr. N. Muleba	Cowpea Network Coordinator
Mr. J. Ouedraogo	Research Associate (Cowpea Breeder)
Mr. B. Bandaogo	Accountant and Store Supervisor
Mrs. R. Ouedraogo	Secretary
Mr. B. Morgan-Kamboke	Secretary
Miss. A. Bohena	Secretary
Mr. R. Sanduidi	Field Technician (Maize)
Mr. V. Tapsoba	Field Technician (Cowpea)
Mr. J. Bationo	Field Assistant (Maize)
Mr. S. Ouedraogo	Mechanic-Driver
Mr. M.N. Akpaloo	Driver-Mechanic
Mr. I. Cisse	Driver
Mr. D. Ouedraogo	Office Assistant

The names of the maize and cowpea scientists in the networks' member-countries are listed in Annexes 1 and 2.

2. Objectives

The major objective of SAFGRAD II is to develop the capacity and initiative of the national program scientists to direct collaborative research networks on identified staple food crops (maize and cowpea for IITA; sorghum and millet for ICRISAT) themselves. The purpose is to enable national maize and cowpea programs of West and Central Africa to pool their resources to tackle production problems common to countries in the subregion through the development of appropriate technologies. The interaction in Networks is expected to help the NARS avoid unnecessary duplication and to focus their research priorities. The ultimate goal is to increase the productivity of maize and cowpea in West and Central Africa.

3. Target Area

Both the maize and cowpea collaborative research networks target the semi-arid zones of West and Central Africa.

Major Ecologies

Based on the amount of rainfall and the length of the growing season, the semi-arid tropics (SAT) of West and Central Africa can be separated into four major ecologies: the Sahel, the Sudan savanna, the Northern Guinea savanna, and the Coastal savanna. Although there is variability in the amount and distribution of the annual rainfall within each ecology, some limits can be defined (Table 1).

Table 1. Rainfall characteristics of the semi-arid zones of West and Central Africa.

Ecology	Rainfall characteristics	Annual rainfall(mm)	Length of growing season (months)
Sahel	Monomodal	200-600	2 - 3
Sudan savanna	Monomodal	600-900	3 - 4
Northern Guinea savanna	Monomodal	900-1200	4 - 5
Coastal savanna	Bimodal	700-1200	3-4 and 2-3

The soils of the SAT of West and Central Africa are variable. In the Northern Guinea savanna, the weakly ferrallitic soils (Eurustox, Halplustalfs, Ustorthants, and Palenstalfs) predominate followed by tropical ferruginous and the hydromorphic (ustorthents and tropaquepts). They are mostly sandy-clay loam. The soils of the Sudan savanna are mostly tropical ferruginous; others are the hydromorphic and the ferrallitic soils. They are sandy loam to sandy clay loam. Ferruginous tropical soils predominate also in the Sahel ecology. They are sandy to sandy loams.

Collaborating Countries

The collaborating countries in the Networks are Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, and Togo (Fig. 1). There is enormous variability from country to country regarding the proportion of total land area occupied by the different semi-arid ecologies.

Production Constraints

In separate meetings of the maize and cowpea scientists during a Workshop of the national scientists from West and Central Africa at Ouagadougou, Burkina Faso, 23-27 March, 1987, the constraints to efficient production of the crops were inventorized:

(a) Maize

. Unavailability of maize varieties appropriate to the different ecologies and cropping systems or either.

. Biological stresses.
- diseases (maize streak, rust, blight, *Curvularia* leaf spot, stalk and ear rots)
- insect pests especially stem borers, termites, and storage insects
- parasitic weed, *Striga* spp.

. Drought stress

. Agronomic or crop management constraints
- low soil fertility
- soil-water management problems

. Socio-economic constraints
- unavailable and expensive inputs, or either.
- low and unstable prices of maize, or either.
- inadequate or poor seed production and distribution, and
- lack of or inappropriate on-farm testing.

. Inadequate number of trained research scientists, technicians and extension personnel.

(b) Cowpea

. Climatic constraints
- drought (inadequate, poorly distributed and erratic rainfall)
- heat stress (high air and soil temperatures)
- sandblasts due to high wind velocity.

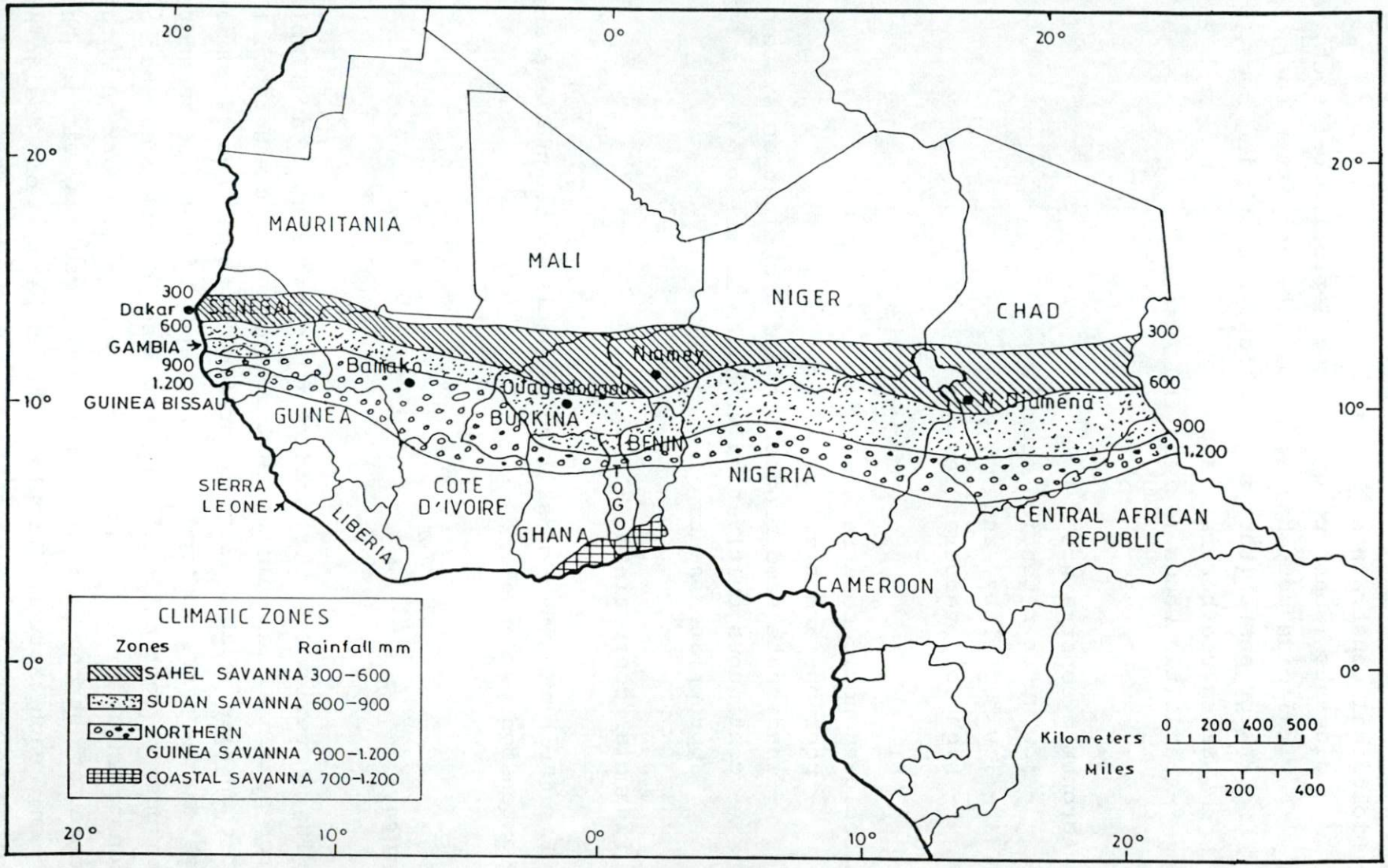

Figure 1. WEST AND CENTRAL AFRICA SEMI ARID CLIMATIC ZONES

. Biological constraints
  - diseases (scab, brown blotch, *Septoria* leaf spot, viral diseases, bacterial blight, ashy stem rot),
  - insect pests (thrips, bruchids, pod sucking bugs, *Maruca* pod borers), and
  - parasitic weeds (*Striga* and *Alectra*)

. Agronomic constraints
  - low water retention capacity,
  - low fertility, and
  - high soil temperatures.

. Socio-economic constraints
  - poor on-farm testing,
  - inadequate seed production and distribution system,
  - continuous cultivation without the use of appropriate inputs.

. Financial constraints

. Insufficient number of skilled scientists, technicians and extension personnel.

4. Strategy

Following a review of the production constraints, available research personnel, and infrastructure of each of the Network 17 member-countries, each Network identified the problems of common interest to the participating countries and the areas of strength and weakness of each national program. Based on the occurence of the constraints across countries within each network and the existence of strong and weak national programs within the subregion, each Network adopted the strategy of assigning technology development responsibilities to strong national

programs (Lead Centers). There was an understanding that each Lead Center would make available to other national programs the technologies forthcoming from its efforts. The topics below are the research responsibilities assigned to the Lead Centers.

(a) Maize

i. Breeding varieties of different maturities for the semi-arid zone with emphasis on early and extra-early varieties : Burkina Faso, Cameroon, Côte d'Ivoire, Ghana and Togo;

ii. Breeding for drought tolerance : Burkina Faso and Cameroon;

iii. Breeding for streak resistance : Togo and Ghana;

iv. Stem borer control : Côte d'Ivoire;

v. *Striga* control : Cameroon;

vi. Agronomic research for maize varieties of different maturity groups : Cameroon and Nigeria.

(b) Cowpea

i. Breeding for drought resistance : Burkina Faso, Niger, Nigeria and Senegal;

ii. Breeding for *Striga* resistance : Burkina Faso, Niger, Nigeria;

iii. Breeding for adaptation to forest-savanna transitional zone : Ghana;

iv. Insect pests : Burkina Faso, Cameroon (with emphasis on storage pest), Nigeria, and Senegal;

v. Diseases : Burkina Faso (especially viruses), Niger (especially *Macrophomina*), Nigeria, and Senegal;

vi. Agronomic studies : Niger and Nigeria.

For each Network, a Steering Committee examines the work plans, monitors the activities and reviews progress on the assigned research responsibilities. The Committee comprises six scientists, elected during the biennial workshops, and observers from SAFGRAD Coordination Office (SCO), IITA and USAID. The Coordinators of both Networks are scientists seconded from IITA. IITA also provides other technical backstopping especially in research areas where NARS are deficient.

5. Network Management and Scientific Leadership

The re-orientation of SAFGRAD Phase II as collaborative research networks was approved by the Council of National Directors of Agricultural Research of SAFGRAD member countries during their meeting of 23-27 February, 1987. This decision was received and implemented by the assembly of national scientists at the March 23-27, 1987 Workshop with the elaboration of a strategy and the election of Steering Committees.

The establishment of the Maize and Cowpea Collaborative Research Networks for West and Central Africa and their coordination through their respective steering committees have facilitated the identification and promotion of research leadership among NARS scientists in the subregion.The steering committee of each Network met biannually, as stipulated in the Project Paper,from 1987 to date (Annexes 3,4). In all, nine meetings were held to date, four in Burkina Faso (Ouagadougou), two in Togo (Lome), and one

each in Nigeria (Zaria), Benin (Cotonou) and Niger (Niamey). Deliberations at each meeting are promptly documented in the form of Meeting Reports which are distributed to national coordinators in all the network member countries.

The Steering Committee provided concerted leadership and direction to the Network by deciding agendas for meetings, monitoring tours, seminars and workshops as well as allocating research responsibilities among participating member countries. The Committee monitored the performance of member countries including sponsoring consultation visits by its members to assigned countries. Apart from spearheading in the resolution of problems affecting network operation such as the CORAF-SAFGRAD Maize Networks harmonization, the steering committee participated actively in matters concerning the entire SAFGRAD Project such as in the preparation of the SAFGRAD Strategic Plan document. Indeed, the findings that are presented in the subsequent pages of this report are the results of the activities initiated and monitored by the Steering Committee as can be confirmed from the reports of all its semi-annual meetings.

6. Collaborative Research

The purpose of collaborative research is to exploit the strength of the strong NARS (Lead Centers) in research personnel, infrastructure, and ecological potentialities for the generation of technologies that can be shared by the other network member countries, particularly the weaker (Technology-adapting) NARS. The progress made by the Lead Centers of each Network towards the attainment of this objective is reported in the following pages.

Maize Network

Cameroon

Development of early maturing varieties. Through selection, line extraction, and crossing of promising early and intermediate germplasm, two early maturing synthetics have been created.

Development of drought tolerant maize. Drought tolerant synthetics were created from a Drought tolerant pool developed from Pool 16 DR and Drought Resistant Synthetic obtained from SAFGRAD and IITA, respectively. Also, several other introductions have been used to form drought tolerant heterotic pools.

Development of *Striga* resistant maize. Inbred lines developed from IITA *Striga* tolerant germplasm were evaluated under *Striga* stress to form a *Striga* resistant population.

Seed treatment for improved plant establishment and yield. From results of over 20 on-station and on-farm trials, it was established that seed treatment with Marshall 25 ST (Carbosulfan) produced better emergence, improved seedling vigor, and 100% more grain yield than untreated seed. Economic analysis showed a 33:1 benefit/cost ratio in favor of the use of Marshal over that of Thioral (current recommendation) as seed treatment. The advantage of Marshal 25 ST has been attributed to its effect on soil insects, especially termites.

Contribution of technology components to maize performance. In the Sudan savana, the contributions of improved technological components to total maize yield were as follows : 5% for tillage, 27% for seed treatment and 38% for fertilization.

Management practices for early and extra-early maize. Across various locations, the highest yields of early (DMR-ESRY and Pool 16 DR) and extra-early (TZEF-Y) varieties were obtained when N

was topdressed 20-25 days after plant emergence as compared with the 30-35 days, the current recommendation for medium to late varieties. A combination of 80 x 20 cm spacing and 90-135 kg N/ha was found necessary to allow the early and extra-maize to express their yield potential.

Ghana

Development of maize varieties of different maturities. For systematic, simultaneous population improvement and extraction of different varieties for the various ecological zones and grain color preferences, five breeding populations (120-day, 105-day, 95-day white dent, 120-day yellow flint/dent, and 95-day yellow flint populations and two back-up gene pools (120-day and 105-day white dent) have been created. Also, the high yielding white dent maize, EV 8443-SR has been converted to yellow grain color through backcrossing using Golden crystal as the yellow-color donor.

Improvement of streak resistance levels of elite varieties. The streak resistance level of three elite maize varieties developed in Ghana was improved through evaluation and selection utilizing IITA streak resistance screening facilities during the 1-year visiting scientist tenure of Dr. Badu-Apraku at IITA. The varieties are (i) Dorke (early, white extracted from Pool 16 SR) (ii) Abeleehi (intermediate, white extracted from Ikenne 8149 SR) and (iii) GH 8363 SR (a high quality protein maize from EV 8363-SR BC4).

Inbred line and hybrid development. Tropcially adapted, disease-resistant lines were produced and tested in hybrid combination using elite inbreds from IITA. Hybrids GH 17 x 9071 and GH5 x B73 outyielded Okomasa, the best Ghanian open-pollinated varieties by 31 and 30%, respectively. Both hybrids yielded as much or higher than IITA hybrid 8321-21. Work has been initiated on the formation of two heterotic pools for systematic hybrid development.

Inheritance of floury endosperm in local maize. The inheritance of the soft and floury endosperm of some local maize varieties from Ghana, Togo and Cameroon was studied using five generations derived from a cross between each local variety and a normal endosperm variety (F1, F2, and the reciprocal backcrosses). Results showed that Ghana and Togo locals possess seemingly identical recessive gene for the floury endosperm. The Cameroon local, however, possesses a different single recessive gene for the floury endosperm.

Côte d'Ivoire

Local maize germplasm evaluation. One hundred and two maize accessions collected from the central region of Côte d'Ivoire, where farmers grow 90-day maize, were evaluated for twenty different characteristics. In addition to conserving these accessions, promising cultivars have been utilized in developing an early maturing maize population.

Stem borer control research. Three species of stem borers were identified in the central and northern parts of the country, namely *Eldana saccharina*, *Sesamia calamistis*, and *Busseola fusca*. Using insecticide control, yield losses of up to 56.9% were attributed to stem borer damage on maize sown in June in the central-south part of the country. A mass screening laboratory is under construction at Bouake to facilitate uniform and reliable screening of germplasm for stem borer resistance.

Togo

Development of streak resistant maize. Streak resistance screening facilities have been established at Ativeme near Lome, Togo. Over 24,000 *Cicadulina* leaf hoppers can be raised per week in the screenhouse, enough to infect about 5,000 plants. Two

maize populations, AB12 (Togo local floury x Pop 49-SR) and AB13 (Togo floury x Pop 43-SR) are being improved for streak resistance, good husk cover, soft endosperm and prolificacy. ZL2-BD, another local-based maize population, is being improved for its preferred grain type. It has been crossed with Pool 16-SR for the generation of early maturing varieties.

Nigeria

Fertilizer requirement for maize/cowpea mixture. At Samaru (northern Guinea savanna), maize grain yield increased up to 75 kg N/ha. Maize responded significantly to P up to 40 kg P_2O_5 but there was no response to K. For cowpea, N application depressed grain yield significantly but there was a positive response to P at 80 kg P_2O_5/ha.

Response of maize to zinc. Field trials conducted at five locations in the semi-arid zone of Nigeria during 1988-90 showed that maize grain and dry matter yields increased with increasing zinc (1, 2, 3 kg Zn/ha) across all locations. The optimum Zn fertilizer rates for the soils studied ranged between 1-2 kg Zn/ha.

Field evaluation of Nigerian made granular urea. There were no significant differences among the sources of N at all the five semi-arid locations studied. Generally, the Nigerian made urea gave higher grain and straw dry matter yields than imported prilled urea but slightly lower yields than CAN at all locations. The optimum N requirement for maize in all the locations were

between 100 and 150 kg/ha. All the three N fertilizer sources, at rates higher than 100 kg N/ha, had varying acidifying effects on the soil pH; the order of magnitude being CAN < granular urea < prilled urea.

Burkina Faso

The following activities were carried out by the Network Coordinator in collaboration with the National Program of Burkina Faso.

Development of drought resistant/tolerant maize. Pool 16 DR has been taken through three cycles of full-sib recurrent selection. Emphasis was placed on family selection under two levels of soil-moisture stresses created by planting in tied and simple (open) ridging systems at Kamboinse (Sudan savanna) at every cycle. Also, there was selection on the set of families subjected to high plant population (133,000 plants/ha) at Farako-Bâ (northern Guinea savanna). Three sets of experimental varieties have been developed from the 1986, 1988 and 1990 full-sib family trials. The population and the 1988 varieties were subjected to improvement for streak resistance under controlled leaf hopper

infestation at IITA, Ibadan. Pool 16 DR varieties performed very well in the 1987-1990 regional uniform variety trials. Many national programs are using this germplasm for release to farmers and/or for breeding purposes.

A drought resistant pool has been created from some local and introduced varieties previously identified to show good performance under drought stress. This pool will be used to create yellow drought resistant varieties and to widen the genetic base of Pool 16 DR.

Development of extra-early maize. Several extra-early maturing maize varieties (less than 82 days to maturity) were developed from crosses between locals and improved germplasm. In the past 4 years, emphasis had been placed on improved plant type and producing higher grain yield, while retaining the earliness trait and disease resistance. Susceptibility to foliar fungal diseases (*Helminthosporium* leaf blight and *Curvularia* leaf spot) has also

been reduced. Streak resistance has also been incorporated into varieties of TZEE-W, TZEE-Y and CSP-Early.

Incorporation of streak resistance into some elite early varieties. Two early maturing local varieties, well appreciated for their grain type and/or adaptation, were converted to streak resistant forms. They are Blanc Deux Précoce (BDP) from Bénin Republic and Maka from Mauritania. The original crosses were made at Kamboinse (Burkina Faso) and advanced to BC1F2 before forwarding them to IITA, Ibadan, for selection under streak pressure and advancing them to BC3 F3. These are included in the 1991 regional variety trials.

Cowpea Network

Burkina Faso

Breeding for adaptation and resistance to insect pests and diseases. Using the approach of sowing at different locations and at two dates, progenies of crosses created from resistant parents were evaluated for adaptation and combined resistance to naturally occurring insect pests and diseases. Lines KVx 402-5-2, KVx 402-19-1 and KVx 402-19-5 were found promising.
KVx 396-4-5-2D performed best across locations in advanced yield trials and KVx 165-14-1 gave good yield under no insect protection. Introduced lines IT86D-714, IT86D-3428-4, IAR7/180-4-5/IAR7/180-4-5-1 were confirmed promising for grain and fodder yields across locations.

Development of *Striga* resistant cowpea. KVx 396-16-10-1 from Burkina Faso and TN27-80 from Niger induced the death of *Striga* shoots before they flowered or set seed. Evaluation in *Striga* sick plot revealed 13 lines which combined *Striga* resistance with resistance to aphids or bruchids or both. KVx402-5-2 is high-yielding. Other promising lines are KVx164-65-5, KVx164-41-64, KVx 295-2-124-52, KVx 295-2-124-121 and KVx 305-118-31.

Effect of solarization and nitrogen on *Striga* control. Solarization obtained by spreading transparent polyethylene sheet was found to significantly delay *Striga* emergence, density and dry weight. This is likely due to the sterilizing effect of the high temperatures (45-50°C) generated in the plastic-covered soil. There was no significant effect of N rates (O, 15, 30 kg N/ha as urea) on *Striga* emergence, density or dry weight. There were, however, increased yields of cowpea with increasing N rates.

Identification of insect pest resistant cowpea cultivars lines. Lines KVx402-19-2 and TN93-80-6 showed low infestation for aphids in Sudan savanna (Kamboinse) and northern Guinea savanna (Farako-Bâ). KVx396-18-10, KVx397-9-11, KVx398-7-1 and KVx401-31-1 had the lowest thrips infestation in the Sudan savanna zone. Regarding bruchid resistance, lines KN-1, KVx396-16-12 IT87D-849 and B301 showed good resistance at the pod stage whereas IT56D-498, IT84S-2246, IT87D-1827 and IT86D-560 were resistant to bruchids at the grain stage only.

Effect of plant population on insect pest infestation. Results of 1989 and 1990 experiments showed that low plant population cowpeas grew more vigorously, produced higher number of flowers, gave higher grain yields, and resisted insect damage better than high plant populaion ones.

Importance of brown blotch (*Colletotrichum capsici*). Brown blotch was found to be important in all the ecological zones but particularly in the northern Guinea savanna. Local varieties were less susceptible than the improved cultivars of which TVx 3236 and KN-1 were least infected. Benlate T20 was found to be very effective as seed treatment in controlling brown blotch and the disease induced by *Macrophomina phaseolina*.

Soil and water management. In trials conducted on Alfisol at Kamboinse, cowpea grain yields increased significantly with early ridging and tied ridging compared to sowing on flat. KVx396-4-4 gave high yields under low and high levels of soil water management.

Effect of spacing on cowpea-cereal intercropping. Cowpea inter-row spacing of 20 cm gave highest yield at all locations (Sahel, Sudan savanna and northern Guinea savanna) but not significantly different from the 60 cm spacing. The best intercrop performance (combined yield of cereal and cowpea) was obtained from the 60 cm inter-row spacing.

Cameroon

Development of cowpea grain storage technologies. Cowpea experiences severe grain losses during storage. Losses can be as high as 50% three months after harvest. The Cameroon National Program has developed a number of affordable grain storage options:

- the use of clear plastic covers on top of black plastic laid over an insulating cushion made of cowpea pod husks or any other plant material permits temperature to rise up to 65°C and kill the bruchids.

- use of ash : cowpea grain stored with 3 volumes of ash to 4 volumes of cowpea destroyed weevil population completely and a 3-4 cm layer of ash on top of the container of stored cowpea grain stops reinfestation of adult weevils.

- use of botanical products: neem seed oil protects cowpea grain from bruchids.

. use of sealed containers/drums.

. use of double bagging.

Ghana

Local germplasm collection. In cooperation with the Germplasm Unit of IITA, Ibadan, 90 landraces and 169 wild cowpea varieties were collected. Studies have been initiated in collaboration with an entomologist to screen the germplasm against major insect pests of cowpea.

Development of cowpea for humid and subhumid zones. Line CR-06-67 from a cross between Amantin and Asontem (IT82E-32) was found to be the most promising in multilocation tests in the humid and subhumid ecologies.

Plant products for cowpea storage. Four plant products: neem seed oil, Jatropha seed oil, groundnut oil and black pepper powder were as effective as Actellic 2% dust in protecting cowpea grain from weevils for at least 6 months.

Nigeria

Development of improved cowpea cultivars. Several lines (31 at Samaru, northern Guinea savanna and 14 at Minjibir, Sudan savanna) outyielded Sampea 7. Line 7/180-5-1 was the best performing dual purpose cultivar at all the test-sites ; other lines of interest are 7/180-4-5B and 4/48-15-1.

Insect resistant cowpea landraces. The following cowpea landraces were found to be resistant to flower thrips and *Maruca* pod borers : Achishuru (red), Dan-Alokowa, Achishuru (purple), and Dan-Karaduwa. Dan-Illa, with a creeping growth habit, had the lowest pod damage caused by bugs in the Sudan savanna.

Effects of phosphorus and seed size on cowpea. Increasing levels of phosphorus, up to 60 kg P_2O_5/ha, increased cowpea yields. Seed size had no significant effect on cowpea yield and yield components.

Effect of rate and time of nitrogen application on cowpea yield. Results of 1989 and 1990 trials were consistent in showing that both rates (0, 20, 40, 60 kg N/ha) and time of N application had no significant effect on cowpea grain yield.

Herbicide evaluation of weed control in cowpea. Several herbicide treatments were evaluated in 1989 and 1990 at several locations. Promising treatments were formulated or tank-mixture of metolachlor + Imathapyr (1.25 + 0.05 kg a.i./ha) applied pre-emergence; metolachlor + metobromuron (Galex) followed by supplementary weeding ; Squadron i.e. Imazaguin (1.02 kg a.i./ha); and Pursuit plus i.e. Imazethapyr (1.02 kg a.i./ha).

***Striga* control through crop management.** Nitrogen sources and N levels have no effects on *Striga* attack as revealed by results of 1989 and 1990 experiments. However, it appeared that N application (60 kg/ha, especially Calcium ammonium nitrate more than urea) improved cowpea nutrition and enabled it to tolerate *Striga* attack.

Chemical control of insect pests. Fastac (alpha cypermethrin) at 0.3 l/ha gave the highest protection from thrips and *Maruca* pod borers. Karate Super ED and Fastac at 0.3 l/ha were effective against pod sucking bugs. Cymbush super ED, Sherpa plus, and Polythrin were also effective against flower thrips.

Chemical control of seed-borne scab disease. Benomyl (benlate) and Carbendazim were more effective than any of the other seed treatments tested (including the popularly used Fernasan D) in controlling the seed-borne scab disease. Apron Plus (metalaxyl + Caboxin) was found to be the least effective.

Control of scab and *Septoria* leaf spot diseases. The best scab control and highest cowpea grain yield were obtained with the treatment "spraying the fungicidal mixture (Benomyl + Mancozeb) 5 weeks after sowing and at 7-day interval".

Cowpea lines with multiple disease resistance. Extra-early line IT86D-1056 was found to combine resistance to *Septoria* leaf spot and scab but highly susceptible to bacterial blight. The medium maturing line IT84S-2246-4 had moderate resistance to both *Septoria* leaf spot and scab but was also susceptible to bacterial blight.

Screening of germplasm for resistance to *Alectra vogelii*. Lines B301, IT86D-472, and IT86D-534 were found to be resistant to *Alectra*, and supported the emergence of only few *Alectra* plants.

Inheritance of resistance to *Alectra* in B301. Results from evaluation of F1, F2 and parents in artificially infested pot culture indicate that resistance in B301 to *A. vogelii* is most probably controlled by two complementary dominant genes.

Niger

Evaluation of local varieties. The following local cowpea varieties yielded similarly or better than the commercial varieties when yield-tested at Ouallam (Sahel and at Kollo and Tarna (both in Sahelian-Sudanian zone): TN87-28, TN87-127, TN87-41B for grain yield and TN87-256A, TN87-182, TN87-28 and TN87-127 for fodder yield.

Senegal

Promising multiple disease resistant lines. Three lines (IS87-416, IS87-432, and IS87-437) were identified to combine tolerance to thrips with resistance to bacterial blight and viruses. Lines IS86-275 and B89-504 were also free from infections caused by viruses and bacteria.

Effect of fungicidal seed treatment on cowpea germination. Granox, mixture of copper oxyguinoleate (15%) and lindane (20%) was more effective than Sumi 8 (Diniconazote) at all the 4 rates tested.

Effect of a new strain of Rhizobium on cowpea performance. A new strain of Rhizobium (MA0286), isolated from line IS86-279 and selected for its efficacy in the laboratory, significantly increased nodule dry weight of all cowpea entries and the grain yields of IS86-283 and Ndiambour.

7. Regional Trials

The objectives of regional trials are :

(i) to provide a forum for national program scientists to test their nationally proven elite varieties and other technologies systematically region-wide and at the same time expose them to other national programs addressing similar ecologies or problems,

(ii) to promote exchange of improved germplasm and technologies within the subregion, and

(iii) to evaluate regional variation in diseases and insect pests of maize and cowpea.

Maize

The Maize Network offered three types of regional uniform variety trials to the network-member countries from 1987 to 1989 namely: (i) RUVT 1 comprising early maturing, drought resistant/tolerant varieties (85-90 days) (ii) RUVT 2 consisting of late and intermediate maturing varieties (105-120 days) and (iii) RUVT-3, the extra-early varieties (less than 82 days).

The composition of each trial varied from year to year by introducing promising varieties from the NARS and IITA and eliminating the least performing ones. Generally, a variety is tested for two years before it is withdrawn. In 1990, following an arrangement with the IITA Maize Program to harmonize germplasm delivery to NARS to prevent duplication and overburdening of the national scientists, the coordination of the late/intermediate variety trials was left with IITA. IITA also handed over to SAFGRAD the organization of the international testing of all early and extra-early maturing varieties in the subregion.

Three hundred and fifty-two sets of regional maize trials were sent, on request, to the 17 member-countries of the Network between 1987 and 1991. Table 2 presents the distribution of the trials and data recovery within the same period. It is evident that the percentage of data recovery has increased remarkably over the past 3 years. Yearly, the data received were promptly analysed and a compilation of the summary of the analyzed data across locations and countries, for all the trials, was prepared by the Network Coordinator and forwarded to all the national maize coordinators in West and Central Africa. There has been considerable improvement in the quality of the data over the years as reflected by the tendency for low CV values. Further details on the composition and distribution of the trials are presented in Annexes 5 and 6.

Table 2. Number of regional uniform maize variety trials requested by NARS and data recovery (1987-1991).

Country	No. of trials received					Data recovery*			
	1987	1988	1989	1990**	1991	1987	1988	1989	1990
Benin	6	10	9	6	5	0(0)	6(60)	6(67)	6(100)
Burkina Faso	4	8	7	6	6	4(100)	8(100)	7(100)	6(100)
Cameroon	2	7	8	6	6	0(0)	6(86)	8(100)	6(100)
Cape Verde	2	2	1	1	1	0(0)	0(0)	0(0)	0(0)
Cent. Afr. Rep.	4	4	4	3	4	0(0)	2(50)	2(50)	2(67)
Côte d'Ivoire	1	6	6	3	5	0(0)	0(0)	2(33)	2(67)
Gambia	4	4	4	4	4	2(50)	0(0)	4(0)	2(50)
Ghana	2	2	6	3	6	2(100)	2(100)	6(100)	3(100)
Guinea	5	4	8	4	3	5(100)	0(0)	2(25)	3(75)
Guinea Bissau	1	7	5	2	4	0(0)	0(0)	0(0)	0(0)
Mali	2	0	3	5	5	1(50)	-	3(100)	4(80)
Mauritania	0	0	2	2	2	-	-	2(100)	2(100)
Niger	1	3	3	2	3	1(100)	1(33)	2(67)	2(100)
Nigeria	3	4	3	5	6	2(67)	3(75)	3(100)	4(80)
Senegal	5	9	8	0	4	5(100)	0(0)	5(63)	-
Chad	3	3	2	4	4	0(0)	0(0)	2(100)	4(100)
Togo	8	9	6	4	4	3(38)	6(67)	6(100)	4(100)
TOTAL	53	82	85	60	72	25(47)	34(42)	56(66)	50(83)

* Figs in parentheses represent % recovery.

** In 1990, there was an arrangement between IITA and SAFGRAD to harmonize trials (germplasm) delivery to NARS. SAFGRAD handed over late variety trials (RUVT 2) to IITA and the latter ceases to deliver early variety trials (RUVT 1).

Cowpea

Since 1987, the Cowpea Network has been organizing regional trials which are reconstituted biennially. The 1987-88 regional testing consisted of a total of 7 trials categorized as (i) drought resistance (ii) *Striga* resistance, (iii) sorghum-cowpea intercropping, (iv) millet-cowpea intercropping, (v) maize-cowpea relay cropping, (vi) observation nursery, and (vii) minimum insecticide. The inputs for the trials were obtained from IITA-SAFGRAD research in Kamboinse (Burkina Faso) and from IITA headquarters at Ibadan, Nigeria. A total of 92 sets were dispatched to member countries.

In 1989, another set of 7 trials were assembled for the biennial (1989-90) regional testing. They comprised (i) resistance to aphids, (ii) resistance to bruchids, (iii) resistance to viruses, (iv) resistance to *Striga*, (v) adaptation to transition zones, (v) adaptation to Sudano-Sahelian zone and (vii) adaptation to Northern Guinea savanna zone. Sixty-three sets were dispatched. Lines included in the trials were developed by Burkina Faso, Niger, Nigeria, Ghana and IITA-GLIP. The 1991-92 biennial regional testing consisted of four trials and one observation nursery as follows : (i) adaptation to transition zone, (ii) adaptation to northern Guinea savanna zone, (iii) adaptation to Sudan savanna and the Sahel, and (v) observation nursery. The entries included in the trials were developed by Burkina Faso, Niger, Nigeria, Ghana, Senegal and GLIP-IITA. Seventy sets were dispatched, on request, to network member countries. The distribution and feedbacks of the trials are summarized by country in Table 3. Further details are provided in Annexes 7-11. The feedbacks were analysed and data compiled across locations wherever possible. Progress reports on regional testing were distributed to member countries.

Table 3. Number of regional cowpea trials requested by NARS and data recovery (1987-1991).

Country	No. of rials received			Data recovery*	
	1987/88	1989/90	1990/91	1987/88	1989/90
Benin	4	2	2	4(100)	1(50)
Burkina Faso	10	6	7	10(100)	4(60)
Cameroon	3	4	-	2(67)	2(50)
Cape Verde	1	2	2	1(100)	1(50)
Cent. Afr. Rep.	1	-	3	0(0)	1(100)
Côte d'Ivoire	1	1	2	0(0)	1(100)
Gambia	6	1	2	2(33)	1(100)
Ghana	4	1	4	4(100)	1(100)
Guinea	6	13	4	4(67)	6(46)
Guinea Bissau	3	3	5	1(33)	0(0)
Mali	8	3	7	4(50)	3(100)
Mauritania	1	2	3	1(100)	2(100)
Niger	9	4	6	6(67)	1(25)
Nigeria	13	6	7	6(46)	5(83)
Senegal	8	1	-	2(25)	1(100)
Chad	7	5	7	2(29)	5(100)
Togo	7	9	6	7(100)	9(100)
Sierra Leone	-	-	3	-	-
TOTAL	92	63	70	56(61)	43(68)

* Figs. in parentheses represent % recovery.

It is remarkable that RENACO Lead Centers have capitalized on the multiple insect-pest and disease resistances developed by GLIP-IITA by introducing them into agronomic backgrounds acceptable to peasant farmers in the various countries. This is reflected in the increasing contribution of NARS-developed entries to the regional trials over the years. The trials also allowed monitoring of the variation of the common diseases including *Striga* strains across the subregion for the development of stable cowpea varieties.

8. Workshops and Seminars

The maize and cowpea networks organized many workshops, seminars and in-service trainings to strengthen the research capabilities of the NARS and promote an exchange of information and a sense of friendship and common purpose among the national scientists. Thus, a major accomplishment of the Project has been the breaking of barriers between anglophone and francophone NARS scientists. This has allowed for closer interaction.

Joint Workshops and Seminars

Three biennial joint workshops and one special purpose seminar were organized jointly for the maize and cowpea scientists from the national programs in West and Central Africa.

The 1987 Workshop permitted the national scientists to assemble as Maize and Cowpea groups and to (i) check-list and prioritize the constraints to the successful production of maize and cowpea and the resources and needs of the different NARS to carry out effective research, (ii) develop strategy for the networks, and (iii) elect the first steering committee for each network.

One of the major achievements of the Project is that the 1989 and 1991 Workshops emphasized the presentation of original scientific papers and discussions on collaborative research (Table 4). This is a progressive step in professionalism compared with the workshops during SAFGRAD Phase I which were limited to country reports. In 1989, the Workshop was a joint effort of both the Maize and Cowpea Networks. In 1991, the SAFGRAD Coordination Office got involved and included the Sorghum Network for West and Central Africa and representation from the East African Sorghum and Millet Network. Most of the scientific papers derived from the three West and Central African Networks, were presented in joint plenary sessions. Other activities carried out during the 1989 and 1991 biennial workshops (in separate sessions for each network), were presentation of country reports, review of work on collaborative research, formulation of regional trials and the re-constitution of steering committees. From the number and quality of papers presented by the NARS maize, sorghum and cowpea scientists and the great interaction generated among the networks, the participants were unanimous in advocating that the biennial inter-network workshops should be encouraged.

A seminar for research agronomists was organized jointly by the SAFGRAD maize, cowpea and sorghum networks from 7 to 19 January, 1991 at IITA, Ibadan, Nigeria. The objectives of the seminar were:

(i) improvement of research capabilities of research agronomists through exchange of ideas.

(ii) elucidation of the major constraints to agricultural production in the subregion to identify areas that require research emphasis, and

(iii) understanding of the concept of low input technology to identify appropriate technologies compatible with farmers' needs and requirements and the sustainability of agricultural production and the ecosystem.

Table 4. Joint Biennial Workshops (1987, 1989, 1991): some important statistics.

	1987	1989	1991
Date	March 23-27	March 20-24	March 8-14
Venue	Ouagadougou, Burkina Faso	Lome, Togo	Niamey, Niger
Maize Network			
- No. NARS Scientists	18	22	40
- No. of countries	15	15	17
- Scientific papers	-	20	20
Cowpea Network			
- No. NARS Scientists	19	30	49
- No. countries	15	16	17
- Scientific papers	-	15	15
No. General Papers	10	10	13
International Organizations (Scientists/Representatives)	17	19	37
West & Central Sorghum Network			12
East Africa Sorghum & Millet Network			2

The seminar was attended by 20 national program research agronomists from 12 countries (Annex 12) and 13 resource persons from IITA, ICRISAT and some national research institutions. Talks were given by subject-matter specialists from both the national and international research systems. An interesting feature of the seminar was that emphasis was placed on discussion. This enabled participants and presenters to exchange views on new concepts and how to approach seemingly difficult problems in the subregion.

9. Taining

Realizing that inadequacy of skilled research workers is one of the major constraints to the production of maize and cowpea in the subregion, each Network designed appropriate training programs from the rather limited training funds.

Maize

From 1988 to 1990, the Network organized a 5-month residential training annually at Kamboinse for technicians. The course was practical-oriented lasting the whole planting season and emphasizing field plot techniques, trials management, variety maintenance, seed multiplication, statistical analysis, data interpretation and report writing. Fifteen technicians (Annex 13) from the following countries were trained : Benin (2), Burkina Faso (2), Cameroon (1), Chad (2), Central African Republic (1), The Gambia (1), Ghana (1), Guinea (1), Guinea Bissau (1), Mali (2), and Togo (1). These technicians have been contributing effectively to their respective national programs. For example, Dr. Charles Thé of Cameroon observed, during his visit to the Central African Republic and Benin Republic, tremendous improvement in seed multiplication and trial management by former trainees. Dr. Fajemisin, the Network Coordinator, made similar observations in Mali in 1989 and Guinea in 1990 on former

trainees from these two countries. Mr. Dossou of Benin commended the impressive way that a former trainee, Mr. Mohammed Soumanou, managed his trials when he was away to Yugoslavia for a course to the extent that his country (Benin) made a request to nominate a second technician for training by the network.

Cowpea

A seminar was organized by RENACO in November 1988 at IITA for 12 scientists from Lead Centers and Ghana (Annex 14). The scientists included breeders, agronomists, pathologists, and entomologists. The discussion centered mainly on appropriate research methodologies and the usefulness of multidisciplinary research team work.

In 1989, a group training course was organized at Kamboinse, Burkina Faso in cooperation with the national cowpea program of Burkina Faso. Ten scientists and technicians from Côte d'Ivoire, Niger, Guinea, Mali, Benin, Guinea-Bissau and Chad participated (Annex 15). Issues discussed were mainly on appropriate technology development.

This activity permitted cowpea scientists to rapidly advance lines from F1 to F6, using the "single seed descendant" method in pot and box cultures in less than 3 years. Also, through the use of three-way and double crosses and of successional sowings for screening lines for adaptation, the scientists were able to combine resistance to *Striga*, aphids, bruchids, and diseases in good agronomic background, well adapted to the semi-arid zones.

10. Provision Of Research Materials And Funds

The Networks supplied several national maize and cowpea programs with some small but essential equipment such as moisture testers, balances, measuring tapes, sprayers, pesticides pollination papers etc. Funds were provided to supplement national budget to Lead Centers for collaborative research and to technology adapting NARS for essential activities like variety maintenance and seed production. The assistance given to the various national programs is summarized in Tables 5 and 6.

11. Improvement Of Linkages Among National Programs

Both Networks sponsored several activities to promote the development of linkages among NARS scientists and with scientists from IITA.

Monitoring Tours

The primary purpose of monitoring tours, usually conducted during the growing season, is to bring together national scientists from 5-8 countries (per crop) and IITA scientists to visit national maize or cowpea programs in 2-3 countries. Such tours allow the scientists to interact on the field with regard to production constraints, research methodologies and appropriate new technologies. During monitoring tours, the relative performance of entries and/or management practices included in the regional testing are evaluated, as well as the performance of any other maize, cowpea or agronomic trial. The tour enables participants to gain experience on how research activities are linked with development agencies.

Table 5. Financial assistance to National Maize programs ($) (1987-91).

Countries	1987*	1988	1989	1990	1991**	Total
Benin	180	4,000	4,000	3,000	2,000	13,180
Burkina Faso	2,223	4,000	4,000	3,000	2,000	15,223
Cameroon	-	-	3,000	3,000	2,000	8,000
Cape Verde	180	-	-	-	1,000	1,180
Central Afr.Rep	1,540	-	-	2,000	2,000	5,540
Chad	180	4,000	-	2,000	1,000	7,180
Côte d'Ivoire	-	-	3,000	-	2,000	5,000
Gambia	-	-	-	1,000	1,000	2,000
Ghana	-	-	-	3,000	2,000	5,000
Guinea	1,037	4,000	-	2,000	1,000	8,037
Guinea Bissau	180	-	-	-	1,000	1,180
Mali	1,577	-	3,000	3,000	2,000	9,577
Mauritania	-	-	-	-	1,000	1,000
Niger	-	-	-	-	1,000	1,000
Nigeria	-	-	3,000	3,000	2,000	8,000
Senegal	180	4,000	3,000	-	2,000	9,180
Togo	-	-	3,000	3,000	2,000	8,000
Total	7,277	20,000	26,000	28,000	27,000	108,277

* In 1987, the assistance was in kind through provision of research materials and equipment.
** Funds planned for release in 1991.

Table 6. Assistance to National Cowpea Programs in cash and cash equivalent of materials/equipment ($) (1987-91).

Country	1987/88	1989	1990	1991*	Total
Benin	667	580	-	-	1,247
Burkina Faso	9,800	6,500	5,327	8,000	29,627
Cameroon	1,950	1,900	1,000	2,000	6,850
Cape Verde	700	600	-	580	1,880
Central Afr. Rep.	-	-	527	580	1,107
Côte d'Ivoire	-	585	527	580	1,692
Gambia	-	580	-	580	1,160
Ghana	-	580	1,928	2,000	4,508
Guinea	700	1,180	-	580	2,460
Guinea Bissau	700	600	-	580	1,880
Mali	-	-	1,909	2,000	3,909
Mauritania	-	600	-	580	1,180
Niger	1,950	-	1,000	2,000	4,950
Nigeria	4,700	4,000	2,000	4,000	14,700
Senegal	2,923	2,923	2,862	2,000	10,708
Togo	-	600	-	2,000	2,600
Total	24,090	21,228	17,080	28,060	90,458

* Funds planned for release in 1991.

Monitoring tours were organized in 1988 and 1990 (that is, years alternating with the biennial workshops) to selected countries in the subregion. For maize, scientists from two different sets of 7 countries visited Burkina Faso and Ghana in 1988 and Cameroon and Nigeria in 1990 (Table 7, Annexes 16, 17). The cowpea network monitoring tours involved scientists from 5 countries in 1988 and 7 countries in 1990, respectively to Burkina Faso, Niger, and Nigeria (Annexes 18, 19).

Visits to National Programs

In order to increase the chances for increased interaction and follow-up activities, visits were undertaken by the Coordinators and members of the steering committees to many countries yearly. The objectives of the visits were (i) to assess the activities of the various national programs and thus increase the effectiveness of their participation in the network, (ii) to assess training needs in order to promote the development of effective and sustainable national maize and cowpea programs, (iii) to find out how maize/cowpea produce is utilized locally and, where necessary, advise on how to increase consumption/utilization and therefore enhance farmers' incentive to produce, and (iv) to promote interaction between research institutions and development agencies including small scale farmers for realistic conception and implementation of research goals.

The involvement of members of the steering committees in visits to assigned countries enabled them to learn more about the subregion and enhanced the gradual development of self-driven and sustainable networks. Other objectives were (i) to share experience with the scientists of the host countries, and (ii) to promote exchange of technologies, ideas and visits among national scientists in the subregion.

Table 7. Monitoring Tours organized by the Maize and Cowpea Networks (1988, 1990).

Year	Network	Countries visited	Number of Participants		
			SAFGRAD NARS		IITA & SCO
1988	Maize	Burkina Faso, Ghana	7	(Benin, Burkina Faso, Guinea, Nigeria, Senegal, Tchad, Togo).	-
	Cowpea	Burkina Faso, Niger,	6	(Burkina Faso, Cape Verde, Guinea, Guinea-Bissau, Niger, Senegal).	1
1990	Maize	Cameroom, Nigeria	7	(Cameroon, Central African Republic, Côte d'Ivoire, Gambia, Ghana, Mali, Niger).	3
	Cowpea	Burkina Faso, Niger, Nigeria	9	(Benin, Burkina Faso, Cameroon, Gambia, Ghana, Niger, Nigeria).	1

The countries visited are listed below.

(a) Maize

1987: Coordinator: Burkina Faso, Central African Republic, Guinea, Mali.

1988: Coordinator: Benin, Burkina Faso, Central African Republic, Ghana, Guinea, Nigeria, Senegal, Togo.

Steering Committee:

- Esseh-Yovo Mawule (Togo) : Senegal
- Hema Idrissa (Burkina Faso): Cape Verde and Guinea Bissau
- Charles Thé (Cameroun): Chad and Central African Republic
- Badu-Apraku (Ghana): Gambia

1989: Coordinator: Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Gambia, Guinea-Bissau, Chad, Togo.

Steering Committee:

- Attiey Koffi (Côte d'Ivoire): Cape Verde
- Charles Thé (Cameroon): Chad, Central African Republic
- Esseh-Yovo Mawule (Togo): Senegal

1990: Coordinator: Burkina Faso, Cameroon, Côte d'Ivoire, The Gambia, Guinea, Mali, Nigeria.

Steering Committee:

- Badu-Apraku (Ghana): Togo
- Charles Thé (Cameroon): Benin

1991 (Planned): Coordinator: Burkina Faso, Cape Verde, Côte d'Ivoire, Ghana, Mauritania, Togo

Steering Committee:

- Romuald Dossou (Benin): IITA & Nigeria
- Abdou Ndiaye (Senegal): Mali
- Charles Thé (Cameroon): Ghana.

(b) Cowpea

1987: Coordinator : Burkina Faso, Guinea, Mali, Mauritania, Niger, Nigeria, Senegal and Togo.

1988: Coordinator: Burkina Faso, Cameroon, Cape Verde, Chad, Niger, Nigeria, Senegal, Chad, Togo.

1989: Coordinator: Benin, Burkina Faso, Côte d'Ivoire, Ghana, Guinea-Bissau, Mali, Niger, Nigeria, Togo.

1990: Coordinator: Burkina Faso, Mali, Niger, Nigeria, Senegal, Chad.

Steering Committee:

- J. Detongnon (Benin): Cameroon
- O. Olufajo (Nigeria): Cape Verde, Gambia
- G. Ntoukam (Cameroon): Central African Republic, Chad.

1991 (Planned): Coordinator: Benin, Burkina Faso, Cameroon, Ghana, Guinea, Guinea-Bissau, Mali, Niger, Nigeria.

Steering Committee:

- C. Dabire (Mme) (Burkina Faso): Ghana
- O. Olufajo (Nigeria): Niger
- G.A. Amankwa (Ghana): Chad, Mauritania.

12. Network Impact

The Networks have significantly influenced the scope and quality of maize and cowpea research in regional and national terms with some obvious or potential impact in terms of diffusion of improved production technologies to farm level.

Management Of Research Activities

A strong link has been established between the SAFGRAD Coordination Office (SCO) and the Directors of Agricultural Research of the participating countries.This has facilitated the mobility of germplasm and scientists in the subregion. The Council of Directors meets biennially and the Oversight Committee of proven research administrators, academicians and researchers set up by the Council provides policy direction for all the SAFGRAD Networks; it also monitors and evaluates their activities regularly. The directors have thus been very active and responsive to the activities of the network by encouraging the contribution and participation of their scientists and/or hosting such activities (steering committee meetings, monitoring tours, workshops, training and regional trials). The Network activities and the benefits derived by the participating countries have reduced linguistic barrier to scientific interaction in the subregion.

Maize And Cowpea Research

The Networks have promoted interest in maize and cowpea research and the linkages developed within and among NARS scientists have greatly increased the morale of individual scientists. The enhanced interaction coupled with the training activities organized by the networks and the technical back-stopping by IITA scientists and resource persons from Lead NARS have increased the efficiency and effectiveness of research within individual

national programs through sharper focusing on major constraints and better utilization of resources. The collaborative research activities initiated and coordinated by the Networks have resulted in the development of new technologies which are subsequently exchanged within the Network. An indicator of this impact is the progressive increase in the number of improved varieties and technologies contributed by national programs into the Networks' regional trials. In the past, these trials were composed of only entries from international research centers (IITA and CIMMYT).

Diffusion And Adoption Of Varieties

The collaborative research and regional trials coordinated by the Networks have allowed national programs to identify promising varieties and technologies. From the request for seed and further testing of these selected varieties in several locations across each country, new varieties have been proposed to and adopted by farmers.

Maize

The improved technologies available to farmers have helped in extending maize hectarage in all the 17 Network-member countries. The savanna belt across West Africa has witnessed tremendous increase in maize production. The early and extra-early varieties promoted by the Network have contributed significantly through movement of maize into new frontiers ; they escape drought and help to break the hunger period since they mature before any grains or root crop in any given year. Some of the maize varieties either released or that have passed through on-farm testing and are in the process of release to farmers in various countries are presented in Annexes 20-22.

In Cameroon, the total maize production has doubled in 10 years. Over 60% of this increase is attributable to increase in maize area in the savanna which is planted almost exclusively to

improved varieties. The intensity of maize cultivation in the savanna is also true of Benin. Data from a 1986-1989 survey showed that there has been a 3.4% increase in land area/year under maize production in the southern province and a 10% increase in the northern province. It further revealed a replacement rate of 1.0% local with improved varieties for the south and 4.8% for the north per year.In a survey on diffusion of maize technology of all the major maize producing areas in Ghana in 1990, it was found that 57.8% of the farmers used improved varieties, 52.6% practised row-planting, 26.8% applied fertilizer and 19.0% protected their stored maize against weevils.

Cowpea

New varieties have been developed with the following attributes:

. *Striga* resistant varieties: The varieties shown in Table 8 were identified as resistant to *Striga gesnerioides* and are being incorporated into good agronomic backgrounds.

. Drought resistant varieties

- Gorom Local (SUVITA-2) (Burkina Faso)
- 58-57 (Senegal)
- TN88-63 (Niger)
- KVx 30-309-6G (Burkina Faso)
- KVx 396-4-2 (Burkina faso)
- IS86-275N (Senegal)

. Varieties adapted to drought and excess moisture

- KVx 396-18-10 and KVx 396-4-2 (Burkina Faso)

. Aphid resistant varieties

- IT82E-25, IT83S-742-2, IT85D-3577 (IITA, Ibadan)

. Bruchid resistant varieties

- IT84S-275-9, KVx 30-G467-5-10K, IT84S-2246-4 (IITA, Ibadan and Burkina Faso).

Table 8. *Striga* resistant cowpea varieties in West and Central Africa

Name of variety	Origin	Pedigree	Country for which it is resistant to *Striga*	National Programs incorporating it into good agronomic background
Gorom Local (SUVITA-2)	Burkina Faso	A selection from a Landrace	Burkina Faso, Mali, Senegal	Burkina Faso, Mali
B301	Botswana	-	Burkina Faso, Mali, Senegal, Niger, Nigeria, Benin	Burkina Faso, Mali, Niger, Nigeria
IT82D-849	IITA-Ibadan	-	Burkina Faso, Mali, Senegal, Niger, Nigeria, Benin	Burkina Faso
TN93-80	Niger	Landrace	Burkina Faso, Mali, Senegal, Niger, Nigeria	-
TN121-80	Niger	Landrace	Burkina Faso, Mali, Senegal, Niger, Nigeria	-
KVx61-1	Burkina Faso	-	Burkina Faso, Mali	Burkina Faso
IT81D-994	IITA-Ibadan	-	Burkina Faso, Nigeria	-

Within each country, an unprecedented strong link has been established between cowpea scientists and peasant farmers through the farming system research scientists and extension workers. This has resulted in the conduct of multilocational trials and on-farm testings and release of new cultivars with several others in the pipeline for release (Annexes 23-25). Cultivars SUVITA-2, drought and *Striga* resistant, is widely used as commercial variety in the Seno province of Mali, and in Yatenga, Bam, Soum and Seno provinces of Burkina Faso. IT82E-9 is widely grown in the eastern province of Guinea Bissau. In Ghana, IT82E-32 is widely used in the transition zones and IT82E-16, in Guinea savanna. Adoption studies conducted in 1990 in northern Ghana have shown an overall acreage of 34% being planted with new improved cowpea varieties.

In conclusion, the impact of the Networks on agricultural production and development will largely depend on the extent to which technologies developed by the Networks' Lead Centers and International Agricultural Research Centers are transferred to local farmers. Technology transfer is more than moving technologies from Point A (Experiment Station) to Point B (Farmers' fields). Many other factors are involved which are social, economic and policy related.

13. Problems And Difficulties Encountered In Achieving Objectives

Both the Maize and Cowpea Collaborative Research Networks for West and Central Africa have made remarkable progress towards the attainment of the Project objectives. For each Network, production constraints have been identified, research priorities established and responsibilities allocated among national programs. Both Lead and Technology Adapting NARS are now better convinced of the importance and benefits of this collaborative approach--networking. Lead Centers, by widely testing their new technologies through regional trials within the network, have the

opportunity to identify the strengths and weaknesses of their technologies and can subsequently make necessary adjustments. Technology Adapting Centers, by conducting regional trials are in a position of identifying new relevant technologies which they can pass on to their farmers, either directly or after appropriate local refinement.

Nevertheless, certain prevailing problems need to be addressed if sustainable and effective NARS-managed Networks are to emerge soon.

Inadequate Pool Of Scientists

In both Networks, most of the member-countries do not have the basic minimum or critical mass of scientists and technicians to carry out research appropriate to the increasing socioeconomic importance of these two staple food crops in the subregion. Although both Networks have taken some palliative measures in terms of Seminars for Scientists and short-term training for technicians, a vigorous higher degree training is absolutely and urgently required, preferably as a component of the next phase of the Project.

Need For Increased Government Funding Of National Programs

Many national governments do not support agricultural research adequately. Remunerations are low, research equipments are scarce and operating funds are chronically inadequate. All these result in difficulties to attract, motivate and retain capable scientists and technicians within the national programs.

Areas For Improvement In Network Management

(i) Late dispatch of regional trial results by some national programs.

(ii) Late feedback from national scientists on collaborative research activities: workplans and annual reports.

(iii) Lack or untimely justification of funds allocated to national programs.

(iv) High operating costs, particularly, electricity.

(v) Inadequate cold room facilities.

(vi) Non-fencing of the research station resulting in losses of seed multiplication and breeding nurseries.

14. Recommendations For Future Network Activities

It is recommended that the Project continues with the same strategy in assuring that national scientists assume increasing decision-making roles in the collaborative research networks for maize and cowpea in the subregion.

The development of maize and cowpea varieties and of improved techniques for increased and stable production in the semi-arid ecologies of West and Central Africa will continue. Emphasis will be on the generation of affordable, low-input technologies; for example, by minimizing the use of chemicals to control insect pests in cowpea but maximising the exploitation of opportunities for the development of multiple insect - and disease - resistant and acceptable cultivars.

While continuing to address the crop improvement aspects of both maize and cowpea as far as the bio-climatic constraints are concerned, there will be increased activities on agronomic research for the identification of appropriate cropping systems and of ecologically sustaining production technologies.

It is essential to encourage multidisciplinary team work in the generation of improved technologies. This effort can only succeed if there is a serious and urgent attempt to train more scientists in every national program in the major disciplines: agronomy, breeding, entomology, pathology, economics, etc.

15. Publications

A. Network Documents

A.1. Maize Network

I. Steering Committee Meeting Reports

1. First Steering Committee Meeting, In. Proceedings of Workshop for Establishment of SAFGRAD Maize Network, Ouagadougou, Burkina Faso, 23-27, March 1987. 26p.

2. Second Steering Committee Meeting, Ouagadougou, Burkina Faso, 9-12 Nov, 1987, 29p.

3. Third Steering Committee Meeting, Lome, Togo, 7-9 Apr, 1988. 28p.

4. Fourth Steering Committee Meeting, Zaria, Nigeria, 8-10 Nov, 1988. 38p.

5. Fifth Steering Committee Meeting, Lome, Togo, 23-24 Mar, 1989. 9p.

6. Sixth Steering Committee Meeting, Ouagadougou, Burkina Faso, 6-10 Nov, 1989. 40p.

7. Seventh Steering Committee Meeting, Ouagadougou, Burkina Faso, 26-30 Mar, 1990, 50p.

8. Eighth Steering Committee Meeting, Cotonou, Benin, 5-9 Nov, 1990. 45p.

9. Ninth Steering Committee Meeting, Niamey, Niger, 13-14 Mar, 1991. (Draft) 15p.

II. Compilation of Regional Trials' Results

10. 1987 Regional Trials' Results, Feb 1989, 34p.

11. 1988 Regional Trials' Results, Feb 1989, 41p.

12. 1989 Regional Trials' Results, Feb 1990, 60p.

13. 1990 Regional Trials' Results, Feb 1991, 58p.

III. Reports by Trainees (Maize Technician 5-month Training)

14. Soumanou, M. (Benin Republic), Nov. 1988. 46p.

15. Zoure, G. (Burkina Faso), Nov. 1988. 57p.

16. Badahoro-Zaromo A. (Central Afr. Rep), Nov. 1988. 45p.

17. Sow, A. (Guinea), Nov. 1988. 51p.

18. Sidibe I. (Mali), Nov. 1988. 47p.

19. Romtitingar, D. (Chad), Nov. 1988. 55p.

20. Dawuni, A. (Ghana), Nov. 1989. 39p.

21. Fernandez, A. (Guinea-Bissau), Nov. 1989. 43p.

22. Ali Iman, A. (Chad), Nov. 1989. 35p.

23. Denagnon, G. (Benin), Nov. 1990. 72p.

24. Noba, R. (Burkina Faso), Nov. 1990. 52p.

25. Faikreo, J. (Cameroon), Nov. 1990. 64p.

26. Bojang, A. (Gambia), Nov. 1990. 38p.

27. Maiga, M.D. (Mali), Nov. 1990. 76p.

28. Attiley, K. (Togo) Nov. 1990. 78p.

IV. Other Maize Network Documents

29. 1990 Maize Monitoring Tour Report, 8-22 Sept, 1990. 17p.

30. Fajemisin, J.M. 1991. Maize varieties in SAFGRAD Regional Trials, 1979-1989. Ouagadougou, Burkina Faso. 71p.

A.2. Cowpea Network (RENACO)

I. Steering Committee Meeting Reports

31. First Steering Committee Meeting, In. Proceedings of Workshop for Establishment of SAFGRAD Cowpea Network, Ouagadougou, Burkina Faso, 23-27 Mar, 1987. 27p.

32. Second Steering Committee Meeting, Ouagadougou, Burkina Faso, 9-12 Nov, 1987. 27p.

33. Third Steering Committee Meeting, Ouagadougou, Burkina Faso, 28-31 Mar, 1988. 14p.

34. Fourth Steering Committee Meeting, Zaria, Nigeria, 8-10 Nov, 1988. 13p.

35. Fifth Steering Committee Meeting, Lome, Togo, 23-24 Mar, 1989. 12p.

36. Sixth Steering Committee Meeting, Ouagadougou, Burkina Faso, 6-10 Nov, 1989. 22p.

37. Seventh Steering Committee Meeting, Ouagadougou, Burkina Faso, 26-30 Mar, 1990. 41p.

38. Eighth Steering Committee Meeting, Cotonou, Benin, 5-9 Nov, 1990. 23p.

39. Ninth Steering Committee Meeting, Niamey, Niger, 13-14 Mar, 1991. (Draft) 25p.

II. Compilation of Regional Trials' Results

40. 1987-88 Regional Trials' Results. 42p.

41. 1989 Regional Trials' Results. 47p.

III. Other RENACO Documents

42. Muleba, N. and J. Detongnon, 1989. Proceedings of the Cowpea workshop : Country reports and other activities, Lome, Togo, 20-24 Mar, 1989. 27p.

43. 1990 Cowpea Monitoring Tour Report. 27 Aug-14 Sept, 1990. 25p.

44. Muleba, N. and J. Detongnon, 1991. Expérimentation agricole et transfert de technologies avec le niébé comme exemple. Compte rendu du stage de perfectionnement tenu à Ouagadougou, Burkina Faso du 10-24 septembre, 1989.

45. Muleba, N. and A.M. Emechebe, 1991. State of cowpea research in West and Central Africa. Proceedings of a seminar for cowpea scientists from Lead Centers, IITA, Ibadan, Nigeria, 14-25 Nov, 1988.

A.3. Joint Maize-Cowpea Network' Reports

I. Annual Reports

46. IITA/SAFGRAD. 1989. Maize and Cowpea Collaborative Research Networks for West and Central Africa. Annual Report 1988/89, Ouagadougou, Burkina Faso. 37p.

47. IITA/SAFGRAD. 1990. Maize and Cowpea Collaborative Research Network for West and Central Africa. Annual Report 1989/90. Ouagadougou, Burkina Faso. 59p.

48. IITA/SAFGRAD, 1991. Maize and Cowpea Collaborative Research Networks for West and Central Africa. Annual Report 1990/91. Ouagadougou, Burkina Faso. 107p.

II. Other Documents

49. IITA/SAFGRAD, 1988. Final Report. Resident Research SAFGRAD Phase II. Ouagadougou, Burkina Faso. 69p.

50. Fajemisin, J.M., N. Muleba, A.M. Emechebe, and C. Dabire, 1990. Towards Production Technologies for Maize and Cowpea in Semi-Arid West and Central Africa. Edited scientific papers presented at a Joint Workshop of SAFGRAD Maize and Cowpea Networks, Lome, Togo, 20-24 Mar, 1989, 277p.

B. Journal Papers

51. Hulugalle, N.R., 1988. Effect of cover crop on soil physical and chemical properties of an Alfisol in Sudan savannah of Burkina Faso. Arid Soil Research and Rehabilitation 2, 251-267.

52. Hulugalle, N.R. & Rodriguez, M.S. (1988). Soil physical properties of tied ridges in the Sudan savannah of Burkina Faso. Experimental Agriculture, 24, 375-384.

53. Hulugalle, N.R. (1990). Alleviation of soil constraints to crop growth in the upland Alfisols and associated soil groups of West African Sudan savannah by tied ridges Soil & Tillage Research, 18, 231-247.

54. Muleba, N. & Brockman, F. (1991). Effect of seedbed preparation methods on cowpea yield in Alfisols and Oxisols in semi-arid West and Africa. Tropical Agriculture, 68, 45-49.

55. Muleba, N.; Mwanke, M. & Drabo, I. (1991). Use of successional sowing in evaluating cowpea (*Vigna unguiculata*) adaptation to drought in Sudan savannah zone: 1. Seed yield response. Journal of Agricultural Science, Cambridge, 116, 73-81.

56. Muleba, N., Mwanke, M. & Drabo, I. (1991). Use of successional sowing in evaluating cowpea (*Vigna unguiculata*) adaptation to drought in Sudan savannah zone: 2. Response of reproductive traits. Journal of Agricultural Science, Cambridge, 116, 81-93.

C. Conference/Workshop Papers

57. Fajemisin, J.M; 1989. Development of early maturing varieties of maize and potential for increased production in West African semi-arid savanna zones. Presented at a Farming Systems Research Workshop on Appropriate Technologies for Achieving Sustainable Food Crop Systems in the Semi-Arid Tropics of Africa. Ouagadougou, Burkina Faso, 11-14 Apr, 1989.

58. Fajemisin, J.M. 1990. Improving national maize research capability for semi-arid West and Central Africa: An overview of the SAFGRAD Maize Research Network. In Cereals of the Semi-Arid Tropics pp. 17-20. Proc. of a Regional Seminar held by the International Foundation for Science (IFS). Garoua, Cameroun, 12-16 Sept, 1989.

59. Fajemisin, J.M. 1990. Analysis of constraints and focusing research for maize production in the Semi-Arid tropics of West and Central Africa. In. Cereals of the Semi-Arid Tropics pp. 21-25. Proc. of a Regional Seminar held by the International Foundation for Science (IFS). Garoua, Cameroun, 12-16 Sept, 1989.

60. Rodriguez, M.S. 1990. Effects of planting depth and ridging on maize germination and grain yield at Kamboinse, Burkina Faso. In. Towards Production Technologies for Maize and Cowpea in Semi-Arid West and Central Africa (Eds. Fajemisin J.M., N. Muleba, A.M. Emechebe, and C. Dabire) pp 143-155.

61. Rodriguez, M.S. 1990. Effects of simple and tied ridging and earthing on grain yield and lodging of maize in an oxisol at Farako-Bâ, Burkina Faso. In. Towards Production Technologies for Maize and Cowpea in Semi-Arid West and Central Africa (Eds. Fajemisin, J.M., N. Muleba, A.M. Emechebe and C. Dabire) pp. 165-177.

62. Muleba, N. & Mowarwe, E. (1991). Management of cowpea under *Striga* infestation: 1. Responses of daylength sensitive cultivars. Presented at the SAFGRAD-OAU-STRC's Inter-Network Conferences, Niamey, Niger, 8-14 Mar, 1991 (In Press).

63. Ouedraogo, T.J.; Muleba, N. & Tignegre, J.B. (1991). Critère d'évaluation au champ de la résistance du niébé au *Striga gesnerioïdes*. Presented at the SAFGRAD-OAU-STRC's Inter-Network Conferences, Niamey, Niamey, 8-14 Mar, 1991 (In press).

ANNEXES

Annex 1. West and Central Africa Maize Network : Collaborating scientists in Network member-countries (as of March, 1991).

Country	Collaborating scientist	Qualification	Specialization	Location	% Time on maize
Benin	1. Yallou, Ch. G.	Ing. Agron.	Breeder	Niaouli	100
	2. Akomedi, T.M. (Mme)	M.S.	Seed Tech.	Niaouli	50
	3. Dossou, R.A.	Ing. Agron.	Breeder	Ina	100
	4. Adomou, M.	M.S.	Agronomist	Ina	25
Burkina Faso	1. Hema, I.	3e Cycle	Breeder	Kamboinse	100
	2. Konaté, G.	Ph.D.	Virologist	Kamboinse	30
	3. Sanou, J.	Ing. Agron.	Breeder	Farako-Bâ	100
	4. Traoré, S.	3e Cycle	Entomologist	Saria	50
	5. Paco Sereme	3e Cycle	Pathologist	Kamboinse	25
Cameroon	1. Ayuk-Takem, J.A.	Ph.D.	Breeder	Nkolbisson (IRA Director)	10
	2. Thé, Charles	Ph.D.	Breeder	Nkolbisson	100
	3. Zangue, J.B.	M.S.	Breeder	Nkolbisson	100
	4. Ngoumou, T.N.	M.S.	Agronomist	Garoua	40
	5. Ebete, A.M.	Ing. Agron.	Agronomist	Garoua	100
	6. Tchamo, P.	3e Cycle	Breeder	Bambui	60
	7. Eta-Ndu, J.T.	M.S.	Breeder	Bambui	100
	8. Nankam, C.	M.S.	Pathologist	Bambui	50
	9. Aroga, R. (Mme)	M.S.	Entomologist	Nkolbisson	50
	10. Fobasso, M.	M.S.	Extention Agronomist	Maroua	40
	11. Mongmong, B.	Ing.Agron.	Breeder	Garoua	100
	12. Ondoa, N.M.	Ing.Agron.	Breeder	Nkolbisson	100
Cape Verde	1. Silva, C.	Ing.Agron.	Agronomist	Praia	40
Cent. Af.Rep	1. Ganglaou, C.	Ing.Agron.	Agronomist	Bangui	60
Chad	1. Gaye-Sene, Y.	Ing.Agron.	Breeder	Gassi	
	2. Yagoua, R.	Ing.Agron.			
Côte d'Ivoire	1. Attiey, K.	M.S.	Breeder	Bouaké	100
	2. Acle Dadié	M.S.	Entomologist	Bouaké	60
	3. Akanvou, R.	M.S.	Agronomist	Ferke	50
	4. Akanvou, L. (Mme)	M.S.	Breeder	Ferke	50
	5. Ngoran, A (Mme)	M.S.	Breeder	Bouake	75
Gambia	1. Mbenga, M.S.	M.S.	Breeder	Sapu	75

Annex 1. Cont'd

Country	Collaborating scientist	Qualification	Specialization	Location	% Time on maize
Ghana	1. Badu-Apraku, B.	Ph.D.	Breeder	Kumasi	100
	2. Twumasi-Afriyie, J.	Ph.D.	Breeder	Kumasi	100
	3. Sallah, P.Y.K.	Ph.D.	Breeder	Nyankpala	100
	4. Asiedu, E.A.	M.S.	Seed Tech.	Kumasi	75
	5. Owusu-Akyaw, M.	Ph.D.	Entomologist	Kumasi	25
	6. Bolfrey, G. (Mme)	M.S.	Agronomist	Kumasi	75
	7. Aflakpui, G.K.S.	M.S.	Agronomist	Nyankpala	75
	8. J.N. Asafu-Agyei	M.S.	Agronomist	Kumasi	40
	9. K.A. Marfo	M.S.	Ext. Agr.	Kumasi	50
	10. S. Ohemeng-Dapaah	M.S.	Agronomist/ Meteorologist	Kumasi	40
Guinea	1. Camara, S.	Ing.Agron.	Breeder	Kilissi	100
	2. Diallo, P.	Ing.Agron.	Agronomist	Kilissi	100
	3. Bah, I.	Ing.Agron.	Agronomist	Kilissi	100
Guinea Bissau	1. Domingo, F.	Ing.Agron.	Agronomist	Contobuel	100
Mali	1. Coulibaly, N.	M.S.	Agronomist	Sotuba	100
	2. Assa-Kanté, B. (Mme)	M.S.	Food Tech.	Sotuba	100
	3. Dolo, A.B.	Ing.Agron.	Agronomist	Bamako (CMDT)	75
Mauritania	1. Sidi R'Chid	3e Cycle	Agronome	Kaedi	30
Niger	1. Naino, J.	M.S.	Breeder	Kolo	40
Nigeria	1. Obajimi, A.O.	Ph.D.	Breeder	Ibadan	100
	2. Iken, J.E.	Ph.D.	Breeder	Ibadan	100
	3. Fakorede, M.A.B.	Ph.D.	Breeder	Ife	100
	4. Alofe, C.	Ph.D.	Agronomist	Ife	100
	5. Akintunde, Y.	Ph.D.	Agronomist	Ibadan	100
	6. Elemo, K.A.	Ph.D.	Agronomist	Zaria	60
	7. Iwuafor, E.N.O.	Ph.D.	Agronomist	Zaria	50
	8. Chude, V.O.	Ph.D.	Agronomist	Zaria	50
Senegal	1. Ndiaye, A.	3e Cycle	Breeder	St. Louis	100
Togo	1. Esseh-Yovo, M.	Ph.D.	Breeder	Lome	100
	2. Agbobli, C.A.	Ph.D.	Agronomist	Lome	60
	3. Adri, K.	3e Cycle	Agronomist	Lome	75
	4. Gumedzoe, M.	M.S.	Virologist	Lome	30

Annex 2. West and Central Africa Cowpea Network (RENACO): Collaborating scientists in Network member-countries (as of March 1991).

Country	Collaborating scientist	Qualification	Specialization	% Time on cowpea
Benin	1. Detongnon J.	Ph.D.	Breeder	100
	2. Adomou M.	Ing. Agr.	Agronomist	40
	3. Aihou K.	Ing. Agr.	Agronomist	30
	4. Arodokoun D.	Ing. Agr.	Entomologist	30
Burkina Faso:	1. Drabo I.	M.Sc.	Breeder (On-Ph.D study leave)	100
	2. Dabire C.	Dr. 3eme C.	Entomologist	100
	3. Ouedraogo J.	Ing. Agr.	Breeder	100
	4. Sereme P.	Dr./Ing.	Phytopathologist	30
	5. Konate G.	Dr. D'Etat	Virologist	40
Cameroon	1. Ntoukam G.	M.Sc.	Entomologist (On-Ph.D study leave)	100
	2. Chevalier E.	M.Sc.	Agronomist	100
Cape Verde:	1. Silva C.	Ing. Agr.	Agronomist/Breeder	40
Cent. Afr.Rep.	1. Yandia A.	Ing. Agr.	Entomologist	50
Chad	1. Valenghi D.	-	-	-
Côte d'Ivoire	1. Adou Amalaman	Diploma	Agronomist	100
The Gambia:	1. Bojang M.	B.Sc.	Agronomist	100
Ghana:				
(a) Nyankpala Station				
	1. Marfo K.O.	Ph.D.	Breeder	100
	2. Assibi M.A.	B.Sc.	Breeder (On-M.Sc study leave)	
	3. Tanzubil P.B.	M.Sc.	Entomologist	100
(b) Kwadasso/Kumasi Station				
	4. Asafu Agyei B.	Legume Breeder	Breeder (On study leave)	
	5. Amankwa G.A.	M.Sc.	Breeder	100
	6. Ennin S.	M.Sc.	Agronomist	
	7. Owusu-Akyaw M.	Ph.D.	Entomologist	75
	8. Twumasi J.K.	Ph.D.	Pathologist	-
	9. Affun V.J.	M.Sc.	Entomologist	-
	10. Agyei J.N.A.	M.Sc.	Agronomist	50
Guinea Bissau	1. Biai A.	Diploma	Agronomist	100
Guinea Conakry	1. Guilavogui F.L.	M.Sc.	Entomologist	100

Annex 2. Cont'd

Country	Collaborating scientists	Qualification	Specialization	% Time on cowpea
Mali	1. K. Odie	Ing. Agr.	Breeder (On-M.Sc study leave)	100
	2. Toure M.	Ing. Agr.	Breeder (On-Ph.D study leave	100
	3. Traore A.	Ing. Agr.	Breeder	100
	4. Yaro D.N.(Mrs)	M.Sc.	Entomologist	80
	5. Seriba O. Katile	Ing. Agr.	Pathologist	40
	6. Sogodogo D.	Ing. Agr.	Agronomist	40
Mauritania	1. Sidi Fall	Ing. Agr.	Breeder (On-M.Sc study leave)	-
	2. Sidi R'Chid	Diploma	Agronomist	40
Niger	1. Issaka Maga	Ing. Agr.	Breeder (On-Ph.D study leave)	100
	2. Adamou Moutari	Ing. Agr.	Breeder	100
	3. Maman Nouri	Ing. Agr.	Agronomist	40
	4. Ahamadou N'Diay	Ing. Agr.	Entomologist	40
	5. Adam Toudou	Ph.D.	Pathologist	75
	6. Hassane Hamma	Ph.D.	Pathologist	50
	7. Alzouma Indezdane	Ph.D.	Entomologist	50
	8. Oumarou Moussa	Ing. Agr.	Seed technologist	40
	9. Seyni D. Maïga	Ph.D.	Entomolgist	50
Nigeria	1. Zaria A.A	M.Sc.	Breeder	100
	2. Emechebe A.M.	Ph.D.	Pathologist	100
	3. Odion E.C.	M.Sc.	Agronomist	100
	4. Amatobi C.	Ph.D.	Entomologist	100
	5. Olufajo O.O.	Ph.D.	Agronomist	100
	6. Adu J.K.	Ph.D.	Microbiologist	40
	7. Sheybayan J.A.Y.	M.Sc.	Weed scientist	40
	8. Lagoke S.T.O.	Ph.D.	Weed scientist	20
Senegal	1. Ndiaga Cisse	M.Sc.	Breeder	100
	2. Samba Thiaw	M.Sc.	Agronomist	100
	3. Mamadou Gaye	Dr./Ing.	Microbiologist	40
Togo	1. Poda Assiongbo	Ing. Agr.	Seed multiplication	-
	2. Adri K.	Ing.Agr.	Agronomist	50
	3. Daou Ekou-Edi	Ing.Agr.	Entomologist	50
	4. Yawo A. Akpaloo	Ing.Agr.	Entomologist	50
	5. Akossiwa Duyiboe	Ing. Agr.	Agronomist	50
	6. Mawuena Gumedzoe	Ph.D.	Virologist	50

Annex 3. Maize Network Steering Committee Meetings (March 1987 - March 1991)

No.	Date	Venue	Participants*	
			Members	Observers
1st	23-27 March, 1987	Ouagadougou, Burkina Faso	7	4
2nd	7-9 November, 1987	Ouagadougou, Burkina Faso	6	8
3rd	7-9 April, 1988	Lome, Togo	6	7
4th	8-10 November, 1988	Zaria, Nigeria	6	8
5th	23-24 March, 1989	Lome, Togo	7	8
6th	6-10 November, 1989	Ouagadougou, Burkina Faso	6	5
7th	26-30 March, 1990	Ouagadougou, Burkina Faso	6	4
8th	5-8 November, 1990	Cotonou, Benin	7	5
9th	13-14 March, 1991	Niamey, Niger	7	3

*The Committee consists of the 6 elected national maize scientists and the Network Coordinator; the observers are representatives of IITA, SCO, USAID.

Annex 4. Cowpea Network Steering Committee Meetings (March 1987 - March 1991).

No.	Date	Venue	Participants*	
			Members	observers
1st	23-27 March, 1987	Ouagadougou, Burkina Faso	7	4
2nd	7-9 November, 1987	Ouagadougou, Burkina Faso	6	8
3rd	28-31 March, 1988	Ouagadougou, Burkina Faso	5	10
4th	8-10 November, 1988	Zaria, Nigeria	7	6
5th	23-24 March, 1989	Lome, Togo	7	5
6th	6-10 November, 1989	Ouagadougou, Burkina Faso	7	6
7th	26-30 March, 1990	Ouagadougou, Burkina Faso	5	4
8th	5-8 November, 1990	Cotonou, Benin	7	7
9th	13-14 March, 1991	Niamey, Niger	6	3

*The Committee consists of the 6 elected national cowpea scientists and the Network Coordinator; the observers are representatives of IITA, SCO, USAID.

Annex 5. Number of sets of regional maize trials received by Network member countries 1987-1991*.

Country	RUVT-1					RUVT-2**			RUVT-3					Total per country
	87	88	89	90	91	87	88	89	87	88	89	90	91	
Benin	2	4	4	4	3	2	2	2	2	4	3	2	2	36
Burkina Faso	2	3	2	3	3	1	2	2	1	3	3	3	3	31
Cameroon	1	3	3	3	3	1	2	2	0	2	3	3	3	29
Cape Verde	-	-	0	0	1	0	0	0	2	2	1	1	0	7
Cent.Afr. Rep.	2	2	2	2	2	2	1	1	0	1	1	1	2	19
Chad	1	1	1	2	2	0	1	0	2	1	1	2	2	16
Côte d'Ivoire	1	2	2	2	3	0	1	2	0	3	2	1	2	21
Gambia	2	2	2	2	2	0	0	0	2	2	2	2	2	20
Ghana	1	1	3	2	3	1	1	2	0	0	1	1	3	19
Guinea	3	0	2	2	2	2	4	4	0	0	2	2	1	24
Guinea Bissau	0	2	2	2	2	0	2	1	1	3	2	0	2	19
Mali	0	0	1	2	2	1	0	0	1	0	2	3	3	15
Mauritania	0	0	1	1	1	0	0	0	0	0	1	1	1	6
Niger	1	1	1	1	2	0	1	1	0	1	1	1	1	12
Nigeria	2	1	1	3	3	1	2	1	0	1	1	2	3	21
Senegal	2	3	3	0	2	2	3	3	1	3	2	0	2	26
Togo	3	3	2	2	2	2	3	2	3	3	2	2	2	31
TOTAL/YEAR	23	28	32	33	38	15	25	23	15	29	30	27	34	352

* RUVT-1 = Early maturing drought tolerant variety trial ;
RUVT-2 = Full-season/Intermediate maturing variety trial ;
RUVT-3 = Extra-early maturing variety trial.

** In 1990, there was an arrangement between IITA and SAFGRAD to harmonize trials (germplasm) delivery to NARS. SAFGRAD handed over late variety trials (RUVT 2) to IITA and IITA has stopped delivering early variety trials (RUVT 1).

Annex 6. Number of regional maize trials whose data were returned to the Coordinator by the collaborating countries (1987-1990).

Country	RUVT 1				RUVT 2*			RUVT 3				Total per country
	87	88	89	90	87	88	89	87	88	89	90	
Benin	0	2	2	4	0	1	2	0	3	2	2	18
Burkina Faso	2	3	2	3	1	2	2	1	3	3	3	25
Cameroon	0	2	3	3	0	2	2	0	2	3	3	20
Cape Verde	-	-	0	-	-	-	-	0	0	0	0	0
Cent. Afr. Rep.	0	1	1	1	0	0	0	-	0	1	1	5
Chad	0	0	1	2	-	0	-	0	0	1	2	6
Côte d'Ivoire	0	0	1	1	-	0	0	-	0	1	1	4
Gambia	1	0	0	1	-	-	-	1	0	0	1	4
Ghana	1	1	3	2	1	1	2	-	0	1	1	13
Guinea	3	-	1	2	2	0	1	-	-	0	1	10
Guinea Bissau	-	0	0	0	-	0	0	0	0	0	-	0
Mali	-	-	1	2	1	-	0	0	-	2	2	8
Mauritania	-	-	1	1	-	-	-	-	-	1	1	4
Niger	1	0	0	1	-	1	1	-	0	1	1	6
Nigeria	1	1	1	2	1	1	1	-	1	1	2	12
Senegal	2	0	2	-	2	0	2	1	0	1	-	10
Togo	1	2	2	2	1	2	2	1	2	2	2	19
TOTAL	12	12	21	27	9	10	15	4	11	20	23	164

* In 1990, there was an arrangement between IITA and SAFGRAD to harmonize trials (germplasm) delivery to NARS. SAFGRAD handed over late variety trials (RUVT 2) to IITA and IITA has stopped delivering early variety trials (RUVT 1).

** "-" represents no set of that particular trial was requested/received by the collaborating country; 0 means data were not returned for any trial(s) received.

Annex 7. Cowpea regional trials sent to members countries in 1987

Country	Number of trials requested							
	Drought resistance trial	*Striga* resistance trial	Intercropping		Maize/ Cowpea relay cropping	Observation nursery	Minimum insecticide trial	Total
			sorghum/ cowpea	millet/ cowpea				
Benin	1	-	-	-	-	1	2	4
Burkina Faso	2	2	2	-	2	2	-	10
Cameroon	-	-	1	-	1	-	1	3
Cape Verde	-	-	-	-	-	1	-	1
Central Afr. Republic	-	-	-	-	-	1	-	1
Chad	2	-	-	2	1	2	-	7
Gambia	1	-	2	2	-	1	-	6
Ghana	1	1	1	-	-	-	1	4
Guinea Bissau	1	-	1	-	-	1	-	3
Guinea Conakry	-	-	1	-	2	2	1	6
Côte d'Ivoire	-	-	-	-	-	1	-	1
Mali	2	2	-	3	-	1	-	8
Mauritania	1	-	-	-	-	-	-	1
Niger	3	3	-	-	-	1	2	9
Nigeria	2	3	1	3	1	1	2	13
Senegal	2	-	1	1	-	2	2	8
Togo	-	-	2	-	1	4	-	7
TOTAL	18	11	12	11	8	21	11	92

Annex 8. Cowpea regional trials sent to member countries in 1989.

Country	Name of Trials							
	Resistance to				Adaptation to			
	Aphids	Virus	Bruchids	*Striga*	Transition zone	Sudano-Sahelian zone	Northern Guinea zone	Total
Benin	-	-	-	1	-	-	1	2
Burkina Faso	1	1	1	1	-	1	1	6
Cameroon	-	1	1	-	-	1	1	4
Cape Verde	1	1	-	-	-	-	-	2
Central Afr. Republic	-	-	-	-	-	-	-	0
Chad	1	1	1	1	-	1	-	5
Côte d'Ivoire	-	-	-	-	-	-	1	1
Gambia	-	-	-	-	-	-	1	1
Ghana	-	-	-	-	-	-	1	1
Guinea Bissau	1	1	-	-	-	1	-	3
Guinea Conakry	2	4	1	-	6	-	-	13
Niger	1	-	1	1	-	1	-	4
Nigeria	1	1	1	1	-	1	1	6
Mali	-	1	-	2	-	-	-	3
Mauritania	-	1	-	-	-	1	-	2
Senegal	-	-	-	1	-	-	-	1
Togo	2	2	1	1	2	-	1	9
TOTAL	10	14	7	9	8	7	8	63

Annex 9. Feedback received from member countries for the 1987-88 cowpea regional trials.

Country	Name of Trials									
	Drought resistance trial	*Striga* resistance trial	Virus resistance trial	Intercropping		Maize/ Cowpea relay cropping	Bruchids resistance trial	Aphids resistance trial	Minimum insecticide trial	Total
				sorghum/ cowpea	millet/ cowpea					
Benin	1	-	1	-	-	-	1	1	-	4
Burkina Faso	2	2	1	1	-	2	1	1	-	10
Cameroon	-	-	-	1	-	-	-	-	1	2
Central Afr. Republic	-	-	-	-	-	-	-	-	-	0
Cape Verde	-	-	-	-	-	-	-	1	-	1
Tchad	2	-	-	-	-	0	-	-	-	2
Gambia	1	-	-	-	-	-	-	-	1	2
Ghana	1	1	-	1	-	-	-	-	1	4
Guinea Bissau	1	-	-	-	-	-	-	-	-	1
Guinea Conakry	-	-	-	1	-	2	-	-	1	4
Côte d'Ivoire	-	-	-	-	-	-	-	-	-	0
Mali	2	2	-	-	-	-	-	-	-	4
Mauritania	1	-	-	-	-	-	-	-	-	1
Niger	3	2	-	-	-	-	-	-	1	6
Nigeria	2	3	-	-	-	0	-	-	1	6
Senegal	2	-	-	-	-	-	-	-	-	2
Sierra Leone	-	-	-	-	-	-	-	-	-	0
Togo	-	-	2	2	-	1	1	1	-	7
TOTAL	18	10	4	6	0	5	3	4	6	56

Annex 10. Feedback received from member countries for the 1989-90 regional cowpea trials.

Country	Name of Trial							
	Resistance to				Adaptation to			
	Aphids	Bruchids	Virus	*Striga*	Tran-sition zone	Sudano-Sahelian zone	Northern Guinea zone	Total
Benin	-	-	-	-	-	-	1	1
Burkina Faso	1	1	-	-	-	1	1	4
Cameroon	-	-	-	-	-	1	1	2
Cape Verde	1	1	-	-	-	-	-	1
Central African Republic	-	-	-	-	-	-	-	0
Côte d'Ivoire	-	-	-	-	-	-	1	1
Gambia	-	-	-	-	-	-	1	1
Ghana	-	-	-	-	-	-	1	1
Guinea Bissau	-	-	-	-	-	-	-	0
Guinea Conakry	1	2	-	-	3	-	-	6
Mali	-	1	-	2	-	-	-	3
Mauritania	-	1	-	1	-	-	-	2
Niger	-	-	-	-	-	1	-	1
Nigeria	1	1	-	1	-	1	1	5
Senegal	-	-	-	1	-	-	-	1
Tchad	1	1	1	1	-	1	-	5
Togo	2	2	1	1	2	-	1	9
TOTAL	6	10	2	7	5	5	8	43

Annex 11. Cowpea regional trials sent to member countries in 1991

Country	Adaptation to transition zone	Adaptation to northern Guinea savanna	*Striga* resistant trial	Adaptation to Sudano-Sahelian savanna	Observation nursery	Total
Benin	-	-	3	3	-	2
Burkina Faso	-	2	2	2	1	7
Cameroon	-	2	2	2	-	O
Cape Verde	-	-	-	-	2	2
Central African Rep.	1	2	-	-	-	3
Chad	-	-	1	3	3	7
Côte d'Ivoire	1	1	-	-	-	2
Gambia	-	2	-	-	-	2
Ghana	1	1	1	-	1	4
Guinea Bissau	2	2	-	-	1	5
Guinea Conakry	2	1	-	-	1	4
Mali	-	1	2	2	2	7
Mauritania	1	-	-	1	1	3
Niger	-	-	3	1	2	6
Nigeria	-	1	3	1	2	7
Senegal	-	-	-	-	-	0
Togo	1	2	3	-	-	6
Sierra Leone	3	-	-	-	-	3
TOTAL	12	17	20	15	16	80

Annex 12. List of Participants to the Joint Networks' Seminar for Research Agronomists, IITA/Ibadan, Nigeria, 7-19 January, 1991

Name of Participant	Country	Address
1. M. Amidou	Benin	Station de recherches sur les cultures vivrières d'INA, BP 03, N'Dali
2. M. Adomou	"	Station de Recherches sur les cultures vivrières d'INA, BP 03, N'Dali
3. Hien Victor	Burkina Faso	INERA, 03 BP 7192, Ouagadougou 03
4. Lompo François	"	INERA, 03 BP 7192, Ouagadougou 03
5. Ebete Anatole	Cameroon	IRA, Box 2123, Yaounde
6. Ngoumou Nga Titus	"	IRA/MESIRES, Box 415, Garoua
7. Yandia Abel	Cent. Afr. Rep.	Direction de la Recherche SOCADA, BP 997, Bangui
8. Gayesena Yassine	Chad	Station Expérimentale de Gassi, BP 101, N'Djamena
9. L.O.Tetebo	Ghana	Crops Research Institute, N.A.E.S., Box 52, Tamale
10. Patterson Osei Bonsu	"	Crops Research Institute Box 3785, Kumasi
11. Ibrahima Bah	Guinea Conakry	C.R.A. Kilissi, BP 163, Kindia
12. N'Tji Coulibaly	Mali	IER, BP 438, Bamako
13. Diakalia Sogodogo	"	IER, BP 438, Bamako
14. Sidi R'Chid	Mauritania	CNRADA, BP 22, Kaedi
15. Cherif Ari Oumarou	Niger	INRAN, BP 429, Niamey
16. O.O. Olufajo	Nigeria	IAR/ABU, PMB 1044, Zaria
17. K.A. Elemo	"	IAR/ABU, PMB 1044, Zaria
18. A.Y. Akintunde	"	National Rice/maize Centre PMB 5042, Moor Plantation Ibadan
19. Sene Manievel	Senegal	SRA-CNRA, BP 53, Bambey
20. Saliou Diangar	"	ISRA-CNRA, BP 53, Bambey

Annex 13. List of Participants at Training Course for Maize Research Technicians (1988, 1989 and 1990)

1988 Participants	Country
1. Soumanou Mohammed	Benin
2. Zouré Grégoire	Burkina Faso
3. Badahoro-Zaromo, A.	Central Afr. Republic
4. Romtitingar Djidinray	Chad
5. Sow Abdoulaye	Guinea
6. Sidibe Issa	Mali

1989 Participants	Country
1 Ali Imam Abacar	Chad
2. Dawuni Ahmed	Ghana
3. Fernandez Augusto	Guinea-Bissau

1990 Participants	Country
1. Denangnon Gangbo	Benin
2. Noba Raymond	Burkina Faso
3. Faikreo Jean	Cameroon
4. Bojang Abdoulaye	Gambia
5. Maïga D. Mohamadou	Mali
6. Attiley Kossi	Togo

Annex 14. List of the participants to the RENACO's seminar held in November 1988 at IITA, Ibadan, Nigeria.

Name of Scientist	Country	Address
Dr. C. Dabire (Mrs)	Burkina Faso	Cowpea Entomologist CRAF, 01 B.P. 476 Ouagadougou 01
Mr. J. Ouedraogo	"	Cowpea Breeder INERA, 01 B.P. 7192 Ouagadougou 01
Mr. G. Ntoukam	Cameroon	Cowpea Entomologist B.P. 33, Maroua,
Dr. M. Owusu-Akyaw	Ghana	Cowpea Entomologist Crops Research Institute P.O.Box 3785, Kumasi,
Dr. Adam Toudou	Niger	Cowpea Pathologist INRAN, B.P 429, Niamey
Mr. Hamma Hassane	"	Cowpea Pathologist INRAN, B.P. 429, Niamey
Prof. O.I. Leleji	Nigeria	Cowpea Breeder IAR/ABU, PMB 1044, Zaria
Dr. C.I. Amatobi	"	Cowpea Breeder IAR/ABU, Kano
Prof. A.M. Emechebe	"	Cowpea Pathologist IAR/ABU, PMB 1044, Zaria
Mr. C.E. Odion	"	Cowpea Agronomist IAR/ABU, Kano
Dr. A.B.BAL	Senegal	Cowpea Entomologist CNRA, B.P. 53, Bambey
Mr. C. Ndiaga	"	Cowpea Breeder ISRA/CNRA, B.P. 55, Bambey

Annex 15. List of the participants to the RENACO's group training course at the INERA Research Station, Kamboinse/Ouagadougou in 1989.

Name of Scientist	Country	Address
1. Dr. J. Detongnon	Benin	Cowpea Breeder Station RCV-Niaouli, B.P. 3 ATTOGON
2. Mr. Ouéitar Gam	Chad	Cowpea Agronomist Projet CHD82/003/PNUD/FAO B.P. 101, Gassi
3. Mr. Adou Amalaman	Côte d'Ivoire	Cowpea Agronomist IDESSA-DCV, BP 635, Bouake 01
4. Mr. Abu Biai	Guinea Bissau	Cowpea Agronomist M.D.R.E Agriculture C.P. 71, Bissau DEPA/CENEMAC, Contuboel
5. Dr. F.L. Guilavogui	Guinea Conakry	Cowpea Entomologist IRAG-MARA B.P. 576, Conakry
6. Mr. Kodio Ondié	Mali	Cowpea Breeder IER/DRA/SRCVO, B.P. 438, Sotuba
7. Mme D. N. Yaro	"	Cowpea Entomologist IER/DRA/SRCVO, B.P. 438, Sotuba
8. Mr. D. Sogodogo	"	Cowpea Agronomist IER/DRA/SRCVO B.P. 438, Sotuba
9. Mr. S.O. Katilé	"	Cowpea Pathologist IER/DRA/SRCVO B.P. 438, Sotuba
10. Mr. A. Moutari	Niger	Cowpea Breeder INRAN, B.P. 429, Niamey,

Annex 16: **Maize Monitoring Tour to Burkina Faso and Ghana, 12-20 September, 1988.**

Participants	Country	Address
1. Mr. Ch. Gouro Yallou	Benin	Maize Breeder DRA, BP 884 Cotonou
2. Mr. Jacob Sanou	Burkina Faso	Maize Breeder INERA, Farako-Bâ BP 910 Bobo-Dioulasso
3. Mr. Alloudoumyngue Nadingar	Chad	Research Administrator Bureau de Recherche Agronomique BP 441, N'Djamena
4. Mr. Lansana Touré	Guinea	Maize Agronomist IRAG, Bordo-Kankan BP 576, Conakry
5. Dr. N.U.A. Idem	Nigeria	Maize Agronomist IAR/ABU BP 1044, Zaria
6. Mr. Abdou Ndiaye	Senegal	Maize Breeder CRA/Fleuve BP 240, Saint Louis
7. Mr. Payaro Toky	Togo	Maize Agronomist RPAA BP 218, Kara
8. Dr. J.M. Fajemisin	Network Coordinator	Pathologist/Breeder IITA/SAFGRAD **01 B.P. 1495** **Ouagadougou 01**

Annex 17. Maize Monitoring Tour to Cameroon and Nigeria 8-22 September, 1990.

Participants	Country/position	Address
1. Dr. Charles Thé	Cameroon	Maize Breeder IRA/NCRE BP 2067, Yaoundé
2. Mr. Clément Ganglaou	Central Afr. Republic	Maize Agronomist Direction de la Coordination Agricole BP 786, Bangui
3. Mr. Koffi Attiey	Côte d'Ivoire	Maize Breeder IDESSA, 01 BP 635, Bouake
4. Mr. M.S. Mbenga	Gambia	Maize Agronomist/Breeder Dept of Agricultural Research Station Ministry of Agric. Yundum Agric. Station, Yundum
5. Mr. G.K.S. Aflakpui	Ghana	Maize Agronomist CRI, P.O. Box 3785 Kumasi
6. Mr. NTji Coulibaly	Mali	Maize Agronomist IER-SRCVO, BP 438 Bamako
7. Mr. Naino Jika	Niger	Cereal Breeder INRAN, BP 429, Niamey
8. Dr. J.M. Fajemisin	Network Coordinator	Pathologist/Breeder IITA/SAFGRAD, 01 BP 1495 Ouagadougou 01
9. Dr. Taye Bezuneh	SAFGRAD Director of Research	Research Administrator OAU/STRC/SAFGRAD 01 BP 1783, Ouagadougou 01
10. Dr. S.K. Kim	IITA Maize Breeder	Maize Breeder IITA, PMB 5320 Ibadan, Nigeria
11. Dr. J. Kling	IITA Maize Breeder	Maize Breeder IITA, PMB 5320 Ibadan, Nigeria

Annex 18. Cowpea Monitoring Tour to Burkina Faso, Niger and Nigeria, 5-21 September, 1988.

Participants	Country/position	Address
1. Dr. Paco Sereme	Burkina Faso	Cowpea Pathologist CRAF, 01 BP 476 Ouagadougou 01
2. Mr. Carlos Silva	Cape Verde	Cowpea Agronomist INIA, BO 50, Praia
3. Mr. Malam Sadjo	Guinea Bissau	Cowpea Agronomist MDR/DEPA, CP 71 Bissau
4. Dr. F.L. Guilavogui	Guinea	Cowpea Entomologist IRAG-MEN, BP 1003 Conakry
5. Mr. Adamou Moutari	Niger	Cowpea Breeder INRAN, BP 429 Niamey
6. Mr. Cisse Ndiaga	Senegal	Cowpea Breeder ISRA/CNRA, BP 53 Bambey

Annex 19. Cowpea Monitoring Tour to Burkina Faso, Niger and Nigeria, 27 August-14 September, 1990.

Participants	Country/Position	Address
1. Dr. J. Detongnon	Benin	Cowpea Breeder SRCV-Niaouli B.P. 3, Attogon
2. Dr. C. Dabire (Mrs)	Burkina Faso	Cowpea Entomologist CRAF, 01 B.P. 476 Ouagadougou 01
3. Mr. J. Ouedraogo	Burkina Faso	Cowpea Breeder INERA, 01 B.P. 7192 Ouagadougou 01
4. Mr. G. N'Toukam	Cameroon	Cowpea Entomologist IRA, B.P. 33, Maroua
5. Mr. M. Bojang	Gambia	Cowpea Agronomist Yundum Agric. Research Station P.O. Box 739, Yundum
6. Dr. M.O. Akyaw	Ghana	Cowpea Entomologist Crops Research Institute P.O. Box 3785, Kumasi
7. Dr. S.D. Maiga	Niger	Cowpea Entomologist INRAN, B.P. 429, Niamey
8. Mr. A.A. Zaria	Nigeria	Cowpea Breeder IAR/ABU, PMB 1044, Zaria
9. Dr. O.O. Olufajo	Nigeria	Cowpea Agronomist IAR/ABU, PMB 1044, Zaria

Annex 20. Utilization of maize technologies obtained through the Network by NARS in West and Central Africa.

Country	Germplasm Development	Adoption/On-Farm Trials
1. Benin	Farako-Bâ 85 TZSR-W-1, TZB-SR DMR-ESRW, Pool 16 DR, TZPB-SR, EV 8328-SR, SEKOU 85 TZSR-W-1	Pirsaback 7930-SR, TZESR-W, DMR-ESRW, SEKOU 81 TZSR-W-1
2. Burkina Faso	EV 8322-SR, Pool 16 DR, EV 8330-SR, EV 8331-SR, Maka	22-SR (= EV 8322-SR), SAFITA-2, KPB (= 30 SR), KPJ (= 31 SR), Maka
3. Cameroon	(a) Pool 16 DR, Maka, CSP, DMR-ESRY, TZEF-Y (b) Uses Tied and Simple ridges for selecting for drought resistance.	CMS 8806 (= DMR-ESRY), Pool 16 DR.
4. Cape Verde	-	Maka
5. Chad	-	TZESR-W, TZB-SR, CMS 8602 (= 31SR)
6. Côte d'Ivoire	TZSR-Y-1, Maka, Pool 16 DR	Pool 16 DR, Maka
7. Ghana	(a) Pool 16-SR, 31-SR, 43-SR 49-SR (b) Screening techniques for streak resistant varieties	SAFITA-2, Dorke-SR (= 31 SR) Abeleehi (= 49-SR), Okomasa (=43-SR)
8. Guinea	DMR-ESRY, Pool 16 DR CSP Early, DR Comp Early	Ikenne 83 TZSR-Y-1
9. Guinea Bissau	-	TZESR-W,TZESR-Y
10.Mali	-	SAFITA-2, DMR-ESRY, TZEF-Y
11.Mauritania	Maka, Capinopolis 8245	CSP Early, CSP Early x L. Raytiri
12.Niger	Pop 31-SR, J.F. Saria, Maka, Pool 16 SR	Maka, Pop 31-SR, TZESR-W
13.Nigeria	TZB-SR, TZSR-Y-1, DMR-ESRW, DMR-ESRY	TZB-SR, TZSR-Y-1, DMR-ESRY DMR-ESRW, TZPB-SR
14.Senegal	Pool 16 DR, Maka	Ikenne(1) 8149-SR Maka, Pool 16 DR
15. Togo	(a) Ikenne 8149-SR, EV8443-SR TZESR-W x Gua 314, Pool 16 DR, Maka (b) Screening techniques for streak resistant varieties.	EV 8443-SR, Ikenne 8149-SR

Annex 21. **Maize varieties cultivated in various countries in West and Central Africa.**

Country/Name of variety	Origin	Where grown	% of Total maize area
BENIN			
TZB and TZB-SR	IITA	North	22
Poza Rica 7843-SR	CIMMYT-IITA	South	7
TZSR-W	IITA	North	5
TZESR-W	IITA	North	5
Pirsaback 7930-SR	CIMMYT-IITA	South	2
Massahoue	Benin	South	10
Gbade Souaton	Benin	South	10
Gbade Sou Enin	Benin	South	10
BURKINA FASO			
SR22 (=EV8322-SR)	CIMMYT-IITA	NGS	25
IRAT 171	INERA/IRAT	NGS	10
Maka	Mauritania	SS	1
IRAT 80	INERA/IRAT	NGS	1
IRAT 200	INERA/IRAT	NGS	1
FBH 1	INERA/IRAT	NGS	0.5
FBH 1	INERA/IRAT	NGS	0.5
IRAT 81	INERA/CI	NGS	0.5
KPB (=EV8330-SR)	CIMMYT-IITA	NGS	0.5
8321-18	IITA	NGS	0.5
CAPE VERDE			
Local Santiago	Cape Verde	Semi-Arid	75
Local Fogo	Cape Verde	Arid	20
Local	Cape Verde	Arid	5
CENTRAL AFRICAN REPUBLIC			
Dentado Compuesto Blanco	CIMMYT	-	-
Los Diamantes 7921	CIMMYT	-	-
Local Varieties	Cent. Afr. Rep	-	
CHAD			
Mathan Kouri	Tchad (local)	Sahel zone	
Gusau 82 TZESR-W	IITA	Lake Chad area	
CMS 8501	Cameroon		
CMS 8507	Cameroon		
Locals	Tchad		
COTE D'IVOIRE			
CD	Benin	Center	-
MTS	Côte d'Ivoire	Center	-
CJB	Côte d'Ivoire	Country wide	-
Ferke 7929	CIMMYT	Country wide	-
Ferke 7529	CIMMYT	North	-
TZSR-Y	IITA	Center-North	-
Ferke 7622	CIMMYT	North	-
IRAT 83	IRAT/CI	South	-
IRAT 81	IRAT/CI	North	-

Annex 21. (Cont'd-2)

Country/Name of variety	Origin	Where grown	% of Total maize area
NIGERIA			
TZB/TZB-SR	IITA	Across Nigeria	
TZPB/TZPB-SR	IITA	" "	
TZSR-W	IITA	" "	
TZSR-Y	IITA	" "	
8321-18	IITA	" "	
8322-13	IITA	SGS, NGS	
8329-15	IITA	Across Nigeria	
8425-8	IITA	" "	
8505-2	IITA	" "	
8505-5	IITA	" "	
TZESR-W	IITA	" "	
DMR-ESRW	IITA	Downy mildew zone	
DMR-ESRY	IITA	" " "	
DMR-LSRW	IITA	" " "	
DMR-LSRY	IITA	" " "	
EV 8443-SR	CIMMYT-IITA		
EV 8428-SR	CIMMYT-IITA		
Western Yellow	IAR & T	South West	
SENEGAL			
JDB (Tocumen 7835)	CIMMYT	Kaolack-Casamance	40
Synthetic C	CIMMYT	" "	20
Early Thai	CIMMYT	Fleuve	10
Maka	Mauritania	Fleuve	5
Pool 16 DR	SAFGRAD	Center	5
BDS III	Senegal	Center	2
EVC-B	CIMMYT	Fleuve	3
EVC-J	CIMMYT	Center-South	3
NR 52	Senegal	Nioro	1
SD 23	-	-	-
KD 32	-	-	-
VG 41	-	-	-
TB 56	-	-	-
VG 30	-	-	-
Across 7728	CIMMYT	-	-
ZM 10	Senegal	Casamance	5
TOGO			
Ikenne 8149-SR	CIMMYT-IITA		6
EV 8443-SR	CIMMYT-IITA		6
NH1	IRAT		3
Locals	Togo		85

*SGS = Southern Guinea Savanna; NGS = Northern Guinea Savanna; SS = Sudan Savanna.

Annex 22. Promising maize varieties in the pipeline for release in West and Central Africa countries.

Country/Name of variety	Origin	Adaptation Area
BENIN		
DMR-ESRW	IITA	North
Pool 16 DR	SAFGRAD	North
EV 8328-SR	CIMMYT-IITA	North
BURKINA FASO		
FBC 6	INERA (Burkina)	
KPB		
KPJ		
KEB		
KEJ		
Pool 16 DR		
CAPE VERDE		
Maka	Mauritania/SAFGRAD	
CENT.AFR. REPUBLIC		
CMS 8501	Cameroon	
CMS 8710	Cameroon	
CHAD		
Pool 16 DR	SAFGRAD	Soudan Savanna
CMS 8602	Cameroon	Sudan Savanna
CSP X L. Raytiri F3	SAFGRAD	Sahel
COTE D'IVOIRE		
Maka	Mauritania/SAFGRAD	Center
Pool 16 DR	SAFGRAD	Center
TZEF-Y	SAFGRAD	Center
Ferke 8336	CIMMYT	North
GHANA		
Dorke SR (Pool 16-SR)	CIMMYT-IITA	Country-wide
GH 8363-SR (QPM)	CIMMYT-IITA	Country-wide
GUINEA		
Ikenne 83 TZSR-Y-1	IITA	
EV 8428-SR	CIMMYT-IITA	
IRAT 200	IRAT/CI	
IRAT 292	IRAT/CI	
Poza Rica 8526	CIMMYT	
MALI		
DMR-ESRY	IITA/SAFGRAD	
TZEF-Y	SAFGRAD	
Los Banos 8531	CIMMYT	
Across 8464	CIMMYT	

Annex 22. (Cont'd)

Country/Name of variety	Origin	Adaptation Area
MAURITANIA		
Gwebi 8422	CIMMYT	
Pool 16 DR	SAFGRAD	
CSP Early	CIMMYT/SAFGRAD	
NIGER		
Composite Kollo 1	Niger	South (Rain-fed)
NIGERIA		
White Composite	IAR & T	
SENEGAL		
Sids 8445	CIMMYT	
Ikenne(1) 8149-SR	CIMMYT-IITA	
TOGO		
AB 11	Togo	
AB 12	Togo	
AB 13	Togo	

Annex 23. Cowpea cultivars released or about to be released from the Network efforts.

Country	Cultivars		Area of adaptation
	Released	To be released	
1. Benin	Vita-5	IT82E-32	Coastal zone
		IT81D-1137	Coastal zone
		TVx 1850-01F	Transition zone
2. Burkina Faso	Gorom L. (Suvita-2)	KVx61-1	Sahel
	KN-1	KVx396-4-4	Sahel Sud. zone
		KVx396-4-2	Sudano-Guinean zone
3. Cameroon	Br1 (IT81D-985)	IT81D-994	Sudano-Guinean zone
4. Chad	IT81D-994	TN88-63	Sudano-Sahelian zone
	KN-1		
	TVx3236		
5. Ghana	Asonteme (IT82E-32)		Transition zone
	Valenga (IT82E-16)		Guinea savanna zone
6. Guinea Bissau	IT82E-9		Guinea savanna zone
7. Mali	Gorom L. (Suvita-2)	KVx61-1	Sahel
	TN88-63	KVx61-74	Sahelo-Sudanian
	KN-1		Sudano-Guinea
8. Gambia	IT81D-994	-	Sudano-Guinean
9. Niger		KVx100-2	
		KVx30-309-6G	Sudano-Sahelian zone
		KVx61-74	
		TN27-80	
10. Nigeria	Sampea-7 (IAR-48)		Sudano-Guinean
	Sampea-1 (IAR-339-1)		savanna zone
		TVx3236	Sudano-Guinea
		IT81D-994	savanna zone
11. Senegal		IS86-275	Sahelo-Sudanian zone
		B 89	
12. Togo	Vitoco (IT81D-985) (Vita-5)	IT81D-1137	Coastal, transition and Guinea savanna zones
13. Central African Republic	KN-1		Transition and
	TVx 1948-01F		Guinea savanna zones

Annex 24. Varieties released by different RENACO national cowpea programs since 1987.

Country/Name of variety	Origin	Areas of Adaptation	Year released	Quantity of seeds released (kg/ha)	Areas cultivated in 1990	Yield potential (kg/ha)	Yield under farmers' conditions (kg/ha)	Remarks
BENIN:								
IT82E-32	IITA/Ibadan	Coastal zone	-	-	-	-	-	-
IT81S-1137	-do-	-do-	-	-	-	-	-	-
KVx1850-01F	-do-	Northern Benin	-	-	-	-	-	-
BURKINA FASO:								
TVx3236	IITA	300-1000 mm	1987	2.500 (156 ha)	250	1.500	800-1000 400-600	Pure crop Mixed cropping. Amount of seed requested more than what is produced by extension services.
CAPE VERDE:								
KN-1	-	-	-	-	-	-	-	-
Local Santiago	-	-	-	-	-	-	-	-
GHANA								
Vallenga (IT82E-16)	IITA/Ibadan	Northern Ghana	1987	1100 (68 ha)	23,000 ✓	1,700	800-1200	Good yield potential but low price paid in market
Asontem (IT82E-32)	IITA/Ibadan	Southern Ghana	1987	100 (6 ha)	29,000	"	1000	Good yield potential but low price paid in market
GUINEA BISSAU								
IT82E-9	IITA/Ibadan	North Eastern regions	1988	-	-	-	-	-
Bambey-21	ISRA/Senegal	-do-	-	-	-	-	-	-

Annex 24. (Cont'd). Varieties released by different RENACO national cowpea programs since 1987.

Country/Name of variety	Origin	Areas of Adaptation	Year released	Quantity of seeds released (kg/ha)	Areas cultivated in 1990 (ha)	Yield potential (kg/ha)	Yield under farmers' conditions (kg/ha)	Remarks
GUINEA CONAKRY:								
IT85F-867-5	IITA/SAFGRAD	Lower Guinea	1990	600	40	1.000	500	High rainfall zone
IT85F-867-5	"	Medium Guinea	1990	700	46	900	500	High Altitude Low temperature
IT83D-338-1	"	Upper Guinea	1989	500	33	650	350	Guinea savanna zones
IT84S-2246-4	"	Upper Guinea	1990	800	53	800	500	"
MAURITANIA:								
IT83S-343-5-5	SAFGRAD	Guidimaka	1987/88	25000	1000-2000	1.500	500-700	
Suvita-2	SAFGRAD	Attabi	"	"	500	1.000	300-400	Drought resistant.
KVx256-K17-11	SAFGRAD	Tagaut	"	"	500	1.000	-	Acceptability difficult because seed color.
NIGERIA:								
Sampea-7 (IAR-48)	IAR Nigeria	Savanna & forest zones	1987	10000	75000	1500-2500	600	Area cultivated is an estimate. It may actually be more than 75.000 ha.
SENEGAL:								
IS86-275	ISRA Senegal	Sahelian	"	-	20000-30000	2200-2500	600-1100	-
TOGO:								
58-146	ISRA	The whole country	1987-88	-	ND	1100-1600	400-1000	Still in pre-released stage in certain zones

Annex 25. Varieties in pre-extension stage in various RENACO national programs since 1987.

Country/Name of variety	Origin	Area of adaptation	Potential areas of cultivation (ha)	Yield potential (kg/ha)	Yield under farmers' conditions (kg/ha)	Remarks
BENIN:						
IT84S-2246	IITA/Ibadan	Coastal zone	-	-	-	-
IT84D-513	-do-	-do-	-	-	-	-
TVx1999-01F	-do-	-do-	-	-	-	-
BURKINA FASO:						
KVx30-309-6G	Burkina Faso	300-900 mm	110	1000 en pure 450 en assoc.	800 400	These areas of cultivation are those covered by the
KVx61-1	-do-	-do-	350	1500	900	1990 on-farm trials and
KVx396-4-4	"	300-1200 mm	350	1500 450	900 400	farmers field which received seeds from our stocks.
KVx396-4-5	-do-	-do-	250	1500 400	900 400	
KVx396-18-10	-do-	-do-	-do-	1500 500	400 400	
CAMEROON						
IT81D-994	IITA/Ibadan	Sudan & Northern Guinea Savannas	-	1200	400	Extension stage
CAPE VERDE						
IT83D-442	IITA/Ibadan	-	-	-	-	-
Mississipi Silver	-	-	-	-	-	-
GHANA						
IT81D-1137	IITA/Ibadan	Savanna areas	The whole of Ghana	1700	900	Highly acceptable seed coat color
IT83S-818	IITA/Ibadan	-do-	-do-	1000	650	-

Annex 25. (Cont'd-1). Varieties in pre-extension stage in various RENACO national programs since 1987.

Country/Name of variety	Origin	Area of adaptation	Potential areas of cultivation (ha)	Yield potential (kg/ha)	Yield under farmers' conditions (kg/ha)	Remarks
GUINEA BISSAU						
IT83-219	IITA/SAFGRAD					
IT85D-3516-2	-do-					
IT86D-498	-do-					
IT87S-1390	-do-					
IT85-3577	-do-	-	-	-	-	-
IT83D-889	-do-					
TVx309-66	-do-					
IS86-275N	ISRA-Senegal					
IS87-416N	ISRA-Senegal					
GUINEA CONAKRY						
IT84S-2246-4	IITA/SAFGRAD	Lower Guinea	20	1000	500	Insecticide Protection
IT82E-32	-do-	-do-	5	590	400	-
IT86D-1048	-do-	-do-	5	675	400	-
IT86D-1056	-do-	-do-	5	600	350	-
IT85F-867-5	"	Upper Guinea	5	800	500	-
MAURITANIA						
IT86V-472	SAFGRAD	Valley/Senegal	-	1600-2000	400-600	All these varieties have
IT82D-544-4	-do-	-do-	-	-do-	-do-	been accepted for their
IT81D-897	-do-	-do-	-	-do-	-do-	bruchids tolerant
IT82D-716	-do-	-do-	-	-do-	-do-	characteristics.
T82D-92	-do-	River valley	-	10000-20000	10000	Interesting for forage
TVx1948-MF	-do-	and dams	-	1500	-do-	production and supply
ISRA	-	-	-	1000	5.800	of green leaves for human consumption.

Annex 25 (Cont'd-2). Varieties in pre-extension stage in various RENACO national programs since 1987.

Country/Name of variety	Origin	Area of adaptation	Potential areas of cultivation (ha)	Yield potential (kg/ha)	Yield under farmers' conditions (kg/ha)	Remarks
NIGER:						
A18-1-1	INRAN-Niger	Low to average rainfall	-	1500	Being evaluated	Earliness appreciated by farmers. Also appreciated for grain quality.
A73-1-2	-do-	"	-	1200	"	
KVx30-309-6G	Burkina Faso	"	-	1500	"	
KVx100-2	-do-	-	-	1500	"	
NIGERIA:						
TVx3236	IITA/Ibadan	Sudano-Guinea savanna	Sudano-Guinea & savanna & forest zone	2500	600	-
IT81D-994	-do-	-do-	-do-	-do-	-do-	-
TOGO:						
TVx1850-01E	IITA/Ibadan	The whole country	-	1000-1300	600-1000	Yield of all varieties are highly variable, depending on the region and crop season as well as cultural practices, especially for IT81D-985.
IT81D-985	-do-	The whole country except savanna zone	-	1000-2000	900 en milieu humide	
58-146	ISRA/Senegal	The whole country	-	1100-1600	400-1000	
IT83S-818	IITA/Ibadan	Région des plateaux	-	1000-1300	-	Potential cultivated areas come under the extension services unit.
IT82E-16	-do-	et Maritime	-	1400-1700	-	None available yet.

1991-06

SAFGRAD II FINAL REPORT (WECAMAN)

OAU/STRC - SAFGRAD

AU-SAFGRAD-IITA