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SCIENTIFIC, TECHNICAL AND RESEARCH COMMISSION
(O A U / S T R C)

SEMI-ARID FOOD GRAIN RESEARCH AND DEVELOPMENT:
PHASE II.

WEST AND CENTRAL AFRICA COWPEA NETWORK
"Réseau Niébé de l'Afrique Centrale et Occidentale"
(R E N A C O)

STATE OF ART OF COWPEA
COLLABORATIVE RESEARCH NETWORK

(March 1987 - August 1991)

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EXECUTIVE SUMMARY

Following the successful completion of SAFGRAD I, (1978-86), two workshops were held in February and March, 1987 in which the West and Central Africa Cowpea Collaborative Research Network, well known by its French acronym "Réseau Niébé de l'Afrique Centrale et Occidentale (RENACO)" was established. During the second workshop, a Steering Committee of six membership was elected and cowpea production constraints, research infrastructures and personnel, strengths and weakness of national programmes were inventorized and classified in the subregion. Common constraints and researchable topics and priorities were identified.

The principal objective of the network being to stimulate the initiative and capacity of national scientists to solve cowpea production constraints themselves in the subregion, network programmes and implementations were accomplished by assignment of technology development responsibilities on the basis of the capability and ecological situation of the national agricultural research systems (NARS). Technology adoption being the responsibility of each participating NARS.

To enable Lead Centers (relatively strong NARS) to properly accomplish their responsibilities, RENACO organized, in 1988, a monitoring tour and a seminar for scientists from Lead Centers. This enabled national and IITA international scientists to interact for 12 days. They held discussions mainly on appropriate research methodologies. A group training session, in 1989, and a cowpea monitoring tour in 1990, were organized mainly for scientists from technology adopting centers. Research methodologies, agricultural research and technology transfer were discussed. A group seminar for research agronomists accross networks: maize, cowpea and sorghum, was also organized in 1991. Low input technologies and shaping agronomic research in West and Central Africa were discussed. These activities coupled with the biennial workshops and regional trials which enabled scientific information exchange and dissemination of new and appropriate technologies developed through the network efforts have resulted in increased on-farm-testing and release of new technologies in certain countries.

Networking has also step up interaction between SAFGRAD Coordination Office and national directors of research, many of whom have contributed not only to hosting the network activities such as monitoring tours or Steering Committee meetings, but have also taken the responsibility of assigning specialized scientists to cowpea research activities in their countries to enhance research outputs.

The biggest impact of networking can be viewed by the renewed interest of national scientists in cowpea research activities. A strong link and frequent interaction among scientists from different countries in the subregion have resulted in the breakdown of the linguistic barrier, that has for a long time prevented Anglophones, Francophones and Lusophones from learning from one another.

An even greater impact on networking can be achieved if only transferrable technologies are regularly produced and the use of chemical poisons to control cowpea insect pests in order to achieve yield >400 kg/ha is reduced to a minimum. To achieve this, not only does it require national scientists to be well aware of farmers' needs and requirements, but also to be well trained and to work in a multidisciplinary team in mass breeding for multiple disease, insect pests, *Striga* resistance and better adaptation to changing environmental conditions. Such a team, perhaps with the exception of Nigeria and Ghana, is still to be built in most participating NARS. Therefore, further training, both in-service and degree oriented is necessary, if the network was to accomplish its objective in the not-too-distant future.

I. - BACKGROUND

The SAFGRAD Phase I Cowpea Resident Research mandate in Burkina Faso was successfully completed in 1978-1988.

From the laudable scientific breakthrough of the Phase I research activities, it was unanimously agreed at two Workshops held at Ouagadougou, Burkina Faso from 23-27 February 1987 and from 23-27 March 1987 by national directors of agricultural research and their cowpea scientists of the 18 SAFGRAD member countries as well as Regional and International Research Centers that the SAFGRAD Research Project should be extended into a second phase. The United States Agency for International Development (USAID) accepted again to fund the project under the auspices of the Organisation of African Unity, Scientific, Technical and Research Commission (OAU-SRTC).

The second phase of the SAFGRAD cowpea research project has a primary objective of boosting the initiative and capacity of national scientists to direct cowpea research activities themselves in the subregion in the not long-distant future.

In order to prepare the foundation for the eventual take over of cowpea research activities by national scientists, a collective venture on cowpea research was established by SAFGRAD-IITA involving 17 SAFGRAD member countries known as the West and Central Africa Cowpea Collaborative Research Network (RENACO). Cowpea production constraints, research personnel, infrastructure as well as the research strengths and weaknesses of each national programme were presented. The needs, researchable topics and the state of art on cowpea research in Central and West Africa were also enumerated and discussed.

The national directors of research and cowpea scientists were sincere in appraising their individual country's research capacities and they fully endorsed the laudable idea of networking.

They believed that the network exercise was the most feasible solution to tackling cowpea production constraints by sharing scientific information and technologies so developed from the network exercise or by other regional and international agricultural centers.

A Steering Committee comprising of six national cowpea scientists was elected during the March 1987 workshop. The committee immediately met with responsible authorities of the SAFGRAD Coordination Office (SCO), IITA-GLIP, USAID and the IITA-GLIP seconded Coordinator of the network.

A review of cowpea research and production programmes as well as research infrastructure and personnel of each country was carried out. Common constraints were identified and relatively strong national programmes were given the role of Lead Centers. Researchable topics were assigned to Lead Centers according to their strengths and ecological zones.

The resolutions and decisions taken by the Steering Committee during the March 1987 workshop are summarized as follows:

1) Agro-ecologies

Three agro-ecological zones from north to south were recognized:

- 1) The Sahel: 200-600 mm rainfall from mid-June to mid-September;
- 2) Sudan savanna: 600-900 mm rainfall from June to September;
- 3) Northern Guinea savanna: 900-1200 mm rainfall from June to mid-October.

2) Climatic Constraints

Drought (inadequate, poor distribution and erratic rainfall) and heat (high air and soil temperatures) stresses, and sandblasts due to high wind velocity are major climatic constraints. They are gradually increasing from south to northwards.

3) Biological Constraints

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

4) Soil Constraints

Low water retention capacity, low fertility and high soil temperatures.

5) Socio-economic constraints

Poor on farm-testing, inadequate seed production and distribution system and continued cultivation without use of appropriate inputs.

6) Financial Constraints

All national programmes have limited resources to conduct appropriate research, upgrade research infrastructures, train and keep their scientists informed with the latest scientific achievements.

7) Insufficient number of skilled scientists, technicians and extension personnel

In conclusion, after prioritizing cowpea production constraints and evaluating the capacity of national programmes, the Steering Committee allocated research responsibilities to strong national programmes according to their geographical locations. The Steering Committee also realized that peasant farmers adopt new technologies not necessarily because of better adaptation to the physical environment and high yield, but also consumers preference and requirements (grain type, colour, texture, etc). Therefore, national scientists were urged to pay more attention to these specificities more than ever before.

II. - NETWORK OBJECTIVES

The primary objective of RENACO is to develop the capacity and initiative of the national cowpea scientists to direct the network themselves by (i) properly identifying cowpea production constraints and (ii) generating through networking in collaboration with IITA-GLIP, the appropriate technologies overcoming the constraints. The purpose of networking is to enable national cowpea programmes of West and Central Africa to pool together their resources to tackle common cowpea production problems in the subregion and to find appropriate solutions for the benefit of their inhabitants. The rationale of networking is based on this very simple but effective adage "United, we stand, Divided, we fall". This becomes more relevant when needs are numerous, and resources are limited.

III.- NETWORK PROGRAMME AND IMPLEMENTATION

Based on the commonality of the constraints and the existence of strong and weak national programmes within the subregion, in order to ensure the cost effectiveness and sustainability of networking, the cowpea network Steering Committee adopted the strategy of assigning technology-development research responsibilities to strong national programmes (Lead Centers) depending on the ecological zone; the technology adaptive research responsibilities being handled by all national programmes, especially the weak ones, of the participating countries, while IITA-GLIP at Ibadan, Nigeria, and its outreach sub-stations in Nigeria and Niger, continue to backstop the activities (research, training, etc) of the network. Varieties developed by IITA are channelled, through Lead Centers, directly or indirectly within the network; directly if varieties were recommended for regional testing after being identified as promising by Lead Centers; and indirectly if they were used in cowpea genetic improvement by Lead Centers.

The cowpea Steering Committee assigned research responsibilities to 6 national programmes, which accepted the role as Lead Centers as follows:

1) Burkina Faso

- Breeding for drought, *Striga*, insect pests and disease resistance;
- Entomology and pathology (including viral diseases) for the three ecological zones of semi-arid West Africa.

2) Cameroon

- Entomology with emphasis on cowpea storage pest problems.

3) Niger

- Breeding for drought, *Striga* and *Macrophomina* disease resistance;
- Agronomic studies (millet-cowpea intercropping) and cowpea pathology (*Macrophomina* spp) for the Sahelian zones.

4) Nigeria

- Breeding for drought, *Striga*, *Alectra*, insect pests and disease resistance;
- Cowpea agronomy, pathology (including scab, brown blotch, *Septoria* leaf spot, *Striga* and *Alectra*) and entomology for the three ecological zones of West Africa with emphasis on mode of inheritance of diseases, *Striga* and *Alectra* resistance in cowpea.

5) Senegal

- Breeding for drought, insect pests and disease resistance;
- Cowpea entomology for the Sahelian and Sudanian zones.

6) Ghana

- Breeding for adaptation to transition zones;
- Cowpea entomology for transition zones.

Owing to variations in *Striga* strains, two countries (Benin and Mali) were assigned the responsibilities of validating research for *Striga* resistance in 1990.

IV.- SUMMARY OF ACHIEVEMENTS OF THE COWPEA NETWORK

1) Strengthening national research system

As at August 31, 1991, RENACO Lead Centers were conducting activities in all aspects of cowpea research. While capitalizing on multiple insect pests and disease resistance developed by IITA-GLIP, national scientists of Burkina Faso are also attempting to incorporate them into agronomic backgrounds, acceptable to peasant farmers. Their ultimate goal is to have drought, multiple disease, *Striga*, aphids and other insect pest resistant cowpea varieties. Nigerian scientists are attempting to identify new sources of *Striga* and *Alectra* resistance and mode of inheritance which is a commendable step towards an initiation of a breeding programme for resistance to these parasitic weeds. Scientists from Niger are looking for new and stable sources of *Striga* resistance. Whereas, scientists in Benin and Mali are studying the virulence of *Striga gesnerioides* strains including the ones parasitizing weeds such as *Ipomeas sp.* Scientists in Cameroon are working on cowpea storage methods acceptable to peasant farmers. Collaborative research projects conducted by Lead and Associate Centers is presented in Table 1.

2) Regional trials

In 1987-88, the biennial regional testing consisted of a total of 7 trials:

- 1) Drought resistance
- 2) *Striga* resistance
- 3) Sorghum-cowpea intercropping
- 4) Millet-cowpea intercropping
- 5) Maize-cowpea relay cropping
- 6) Observation nursery
- 7) Minimum insecticide treatments

in 92 sets. The inputs of the trials were obtained from IITA-SAFGRAD resident research in Ouagadougou and from IITA headquarters, Ibadan, Nigeria. They were dispatched to member countries as shown in Table 2; a total of 56 feedback was received from participating countries by the end of 1988.

Table 1. Research projects or activities carried out by RENACO Lead and Associate Centers.

Country	1988*			1989			1990			1991		
	P	C	Report	P	C	Report	P	C	Report	P	C	Report
Benin (Assoc.C)												
Validation studies for <i>Striga</i> resistance in coastal zones				x	x	Yes	x	x	Yes	x		
Burkina Faso												
1) Breeding for adaptation to Sahel, Sudan & Northern G. savannas	x	x	Yes	x	x	Yes	x	x	Yes	x		
2) Breeding for <i>Striga</i> resistance	x	x	Yes	x	x	Yes	x	x	Yes	x		
3) Breeding for Bruchids resistance	x	x	Yes	x	x	Yes	x	x	Yes	x		
4) Breeding for Aphids, bruchids, <i>Striga</i> resistance and adaptation to Sahel, Sudan & N.Guinea savannas	x	x	Yes	x	x	Yes	x	x	Yes	x		
5) Entomological studies including insecticide screening	x	x	Yes	x	x	Yes	x	x	Yes	x		
6) Virological studies including screening cowpea for resistance	x	x	No	x	x	No	x	x	No	x		
Cameroon												
1) Use of botanical products in cowpea storage	x	x	Yes	x	x	Yes	x	x	Yes	x		
2) Use of solarisation in sterilization of cowpea weevils	x	x	Yes	x	x	Yes	x	x	Yes	x		
3) Study of low input storage containers and facilities	x	x	Yes	x	x	Yes	x	x	Yes	x		
4) Screening cowpea for pod and seed resistance to cowpea weevils	x	x	Yes	x	x	Yes	x	x	Yes	x		

* P = planned; C = completed; X = effected; - not effected

Table 1 (cont'd-1)

Country	1988*			1989			1990			1991		
	P	C	Report	P	C	Report	P	C	Report	P	C	Report
<u>Ghana</u>												
1) Breeding for adaptation to transition zones							x	x	Yes	x		
2) Cowpea entomology for transition zones including storage studies							x	x	Yes	x		
<u>Mali</u> (Assoc. Center)												
1) Validation test for <i>Striga</i> resistance in the Sahel and Sudan Savanna							x	x	Yes	x		
<u>Niger</u>												
1) Breeding for adaptation to Sahel and Sudan savanna	x	x	Yes	x	x	No	x	x	Yes	x		
2) Screening cowpea for <i>Striga</i> resistance	x	x	Yes	x	x	No	x	x	Yes	x		
3) Screening cowpea for ashy stem resistance	x	x	Yes	x	x	No	x	x	Yes	x		
4) Pathology of <i>Macrophomina</i> sp.	x	x	Yes	x	x	No	x	x	No	x		
5) Cowpea Agronomy	x	x	No	x	x	No	x	x	Yes	x		
<u>Nigeria</u>												
1) Breeding for adaptation to Sahel, Sudan savanna and N. Guinea savannas	x	x	Yes	x	x	Yes	x	x	Yes	x		
2) Breeding for <i>Striga</i> , <i>Alectra</i> , insect pests and disease resistance	x	-	-	x	-	-	-	x	-	x		
3) Screening cowpea for scab, brown blotch and <i>Septoria</i> resistance	x	x	Yes	x	x	Yes	x	x	Yes	x		
4) Study of inheritance of <i>Striga</i> resistance in cowpea	x	x	Yes	x	x	Yes	x	x	Yes	x		

Table 1 (cont'd-2)

Country	1988*			1989			1990			1991		
	P	C	Report	P	C	Report	P	C	Report	P	C	Report
<u>NIGERIA (Cont'd)</u>												
5) Study of inheritance of <i>Alectra</i> resistance in cowpea				x	x	Yes	x	-	-		x	
6) Cowpea cereals inter-cropping studies	x	x	Yes	x	x	Yes	x	x	Yes		x	
7) Soil fertility studies	x	x	Yes	x	x	Yes	x	x	Yes		x	
8) Weed science studies	x	x	Yes	x	x	Yes	x	x	Yes		x	
<u>Senegal</u>												
1) Breeding for adaptation to Sahel and Sudan savannas	x	x	Yes	x	x	Yes	x	x	Yes		x	
2) Cowpea entomology including insecticide screening	x	x	Yes	x	x	Yes	x	-	-			

In 1989-90, the biennial regional testing consisted again of a total of 7 trials:

- 1) Resistance to aphids
- 2) Resistance to bruchids
- 3) Resistance to virus
- 4) Resistance to *Striga*
- 5) Adaptation to transition zones
- 6) Adaptation to Sudano-Sahelian zones
- 7) Adaptation to Northern-Guinea zones

in 63 sets. Lines included in the trials were developed by Burkina Faso, Niger, Nigeria, Ghana and IITA-GLIP. Trials were dispatched to member countries as shown on Table 2; and a total of 44 feedback was received from participating countries.

The biennial regional testing (1991-92) consisted of four trials and one observation nursery.

- 1) Adaptation to transition zone;
- 2) Adaptation to northern Guinea savanna zone;
- 3) Adaptation to Sudan savanna and the Sahel;
- 4) Resistance to *Striga*
- 5) Observation nursery.

making a total of 80 sets. Entries included in the trials were developed by Burkina Faso, Niger, Nigeria, Ghana, Senegal and GLIP-IITA. Trials were sent to member countries as shown on Table 1. The first feedback is expected by the end of the year 1991.

3) On-farm testing

Although the network is not directly involved in national multilocal trials and on-farm testings; it is significant that through the network efforts (regional trials included), there have been renewed interests in cowpea research activities in all participating countries. The following cultivars obtained through RENACO activities have been released (Table 3) or are about to be released in the underlisted member countries (Table 4).

4) Training of National Scientists

With the ultimate goal of boosting the capacity and initiative of national cowpea scientists to identify cowpea production constraints and develop or identify appropriate technologies to overcome such constraints, Workshops and monitoring tours (Table 5) and group training seminars (Table 6) were carried out as follows:

Table 2. Regional Trials dispatched to RENACO member countries and feedback received since 1987-91*

Country	1987-88			1989-90			1991
	Number		Report (Yes/No)	Number		Report (Yes/No)	Number planned
	Planned	Compl.		Planned	Compl.		
Benin	4	4	Yes	2	1	Yes	6
Burkina Faso	10	10	Yes	6	4	Yes	7
Cameroon	3	2	Yes	4	2	Yes	6
Cape Verde	1	1	Yes	2	1	Yes	2
Central Afr.Rep.	1	0	-	0	0	-	3
Côte d'Ivoire	1	0	-	1	1	Yes	2
The Gambia	6	2	Yes	1	1	Yes	2
Ghana	4	4	Yes	1	1	Yes	4
Guinea Bissau	3	1	Yes	3	0	-	5
Guinea Conakry	6	4	Yes	13	6	Yes	4
Mali	8	4	Yes	3	3	Yes	7
Mauritania	1	1	Yes	2	2	Yes	3
Niger	9	6	Yes	4	1	Yes	6
Nigeria	13	6	Yes	6	5	Yes	7
Senegal	8	2	Yes	1	1	Yes	0
Sierra Leone	0	0	-	0	0	-	3
Tchad	7	2	Yes	5	5	Yes	7
Togo	7	7	Yes	9	9	Yes	6
Total	92	56		63	44		80

* Upon recommendation of the Steering Committee in November 1987, RENACO dispatches regional trials every two years, i.e., the year during which a workshop is held.

Table 3. Cowpea varieties released since 1987 to date

Country	Variety
- Benin	IT82E-32; IT81D-1137; TVx 1850-01F.
- Burkina Faso	TVx 3236, Suvita-2.
- Cape Verde	KN-1; Local Santiago
- Ghana	Vallenga (IT82E-16); Asontem (IT82E-32).
- Guinea Bissau	IT82E-9; IT83S-889.
- Guinea Conakry	IT85F-867-5; IT83D-338-1; IT84S-2246-4.
- Mali	Suvita-2, KVx61-1.
- Mauritania	IT83S-343-5-5; Suvita-2; KVx 256-K17-11
- Nigeria	Sampea-7 (IAR-48)
- Senegal	IS86-275
- Togo	58-146

Table 4. Varieties accepted by NARS

Country	Name of Variety
Benin	IT84S-2246; IT84D-513, TVx 1999-01F, IT81D-1137
Burkina Faso	KVx 30-309-6G, KVx 61-1, KVx 396-4-4; KVx 396-4-5; KVx 396-18-10;
Cameroon	IT81D-994
Cape Verde	IT83D-444;
The Gambia	IT84S-2049; IT83S-728-13; TVx3236.
Ghana	IT81D-1137; IT83S-818; KVx396-4-2; KVx396-4-4; KVx396-4-5; KVx396-18; KVx30-305-3G.
Guinea B.	IT85D-3516-2; IT86D-498; IT87S-1390; IT85D-3577; IS86-275N; IS87-416N; IT86D-373; KVx30-309-6G.
Guinea C.	IT84S-2246-4; IT82E-32; IT86D-1048; IT86D-1056; IT85F-867-5.
Mali	TN93-80; TN121-80
Mauritania	IT86D-472; IT82D-544-4; IT81D-897; IT82ED-716; IT82D-927; TVx 1948-01F.
Niger	A18-1-1; A73-1-2; KVx30-309-6G; KVx100-2; KVx30-305-3G; KVx396-4-5.
Nigeria	TVx 3236; IT81D-994.
Togo	TVx 1850-01E; IT81D-985; 58-146; IT83S-818; IT82E-66; KVx 396-4-4.

Monitoring tour (Table 5):

The objective of the monitoring tour is to enable scientists from Technology Adopting Centers, Lead Centers and IITA-GLIP to interact on the field with regard to production constraints, research methodologies and appropriate new technologies. A monitoring tour was organised in 1988 to IITA-Ibadan, northern Nigeria, Niger and Burkina Faso. Six national scientists from Niger, Burkina Faso, Senegal, Cape Verde and Guinea Bissau participated. In 1990, the same afore-mentioned countries were toured by eight scientists from Benin, Burkina Faso, Cameroon, The Gambia, Ghana, Niger and Nigeria.

Workshops: Scientific Information and Technology Exchange: (Table 5)

The 1987 Workshop held in March at Ouagadougou, Burkina Faso consisted of the re-orientation of the SAFGRAD cowpea research activities. This ended the IITA resident cowpea research in Burkina Faso and gave birth to the Cowpea Collaborative Research Network for West and Central Africa, known by its French acronym as "Réseau Niébé de l'Afrique Centrale et Occidentale" (RENACO). RENACO became fully operational in April 1988. At the workshop, cowpea production constraints, research personnel, infrastructure as well as research strengths and weakness of each national program were presented. The needs, researchable topics and state of art on cowpea research in Central and West Africa were also enumerated and discussed. A Steering Committee made up of 6 professional national cowpea scientists was elected to direct the activities of RENACO.

In March 1989, another Workshop was held at Lome, Togo, involving the maize and cowpea networks. Participants were offered the opportunity for the first time, since the inception of the SAFGRAD Project, to have their scientific information up-to-date presented and discussed. An alarming response was received with 30 original scientific papers from maize and cowpea national and international scientists. It was gratifying to note that all aspects of maize and cowpea research activities were covered. Scientists also siezed the opportunity to interact among themselves during the five days duration of the workshop. Other activities carried out during the workshop consisted of: presentation of country reports, regional trial reports, GLIP-IITA core scientists progress reports, formulation of regional trials and their requisition by member countries and election of the new RENACO Steering Committee. Two Workshop proceedings were published as follows:

Table 5. Workshop and Cowpea Monitoring Tours

	1987	1988	1989	1990	1991
<u>Activity</u>	Workshop	Tour	Workshop	Tour	Workshop
- Number	1	1	1	1	1
- Theme	Establishment of cowpea network for Central & West Africa	Scientific information & research methodologies exchange	Joint maize-cowpea workshop with two sub-components: <ul style="list-style-type: none"> . Scientific up-to-date . country reports 	Scientific information & research methodologies exchange	Inter-network conference with the sub-components: <ul style="list-style-type: none"> . New frontiers of food grain research in the 1980's . Scientific up-to-date . Country Reports
No. of participants	30	6	43	9	44
No. of countries	18	6	16	7	16

- Fajemisin, J.M.; Muleba, N.; Emechebe, A.M. & Dabire, C. (1989). "Towards Production Technologies for Maize and Cowpea in Semi-Arid West and Central Africa"; *Scientific Papers presented at a Joint Workshop of SAFGRAD Maize and Cowpea Networks*; Lome, Togo, March 20-24, 1989; published by SAFGRAD-IITA in Burkina Faso. pp.277.
- Muleba, N. & Detongnon, J. (1989). "Proceedings of the Cowpea Workshop": *Country reports and other activities*: 20-24 March, 1989, Lome, Togo; pp.27.

The 1991 Workshop was held in March at Niamey, Niger, with a Pan-African dimension, involving inter-networks conferences. It was organized by the SAFGRAD Coordination Office with the collaboration of the maize, sorghum and cowpea collaborative research networks for West and Central Africa. Scientists from the Millet and Sorghum collaborative research networks for East Africa, Pan-African *Striga* network, the Institute of the Sahel (INSA), etc, participated.

The Workshop was organized in three components in the following order:

- **Plenary session 1:** New frontiers of food grain research in the 1990's.
- **Plenary session 2:** Scientific up-to-date;
- **Separate session:** for each participating network.

The separate session of the cowpea network included the following activities: presentation of an up-to-date cowpea scientific information; country reports by Lead, Associate and Technology Adopting Centers; GLIP-IITA core scientists progress reports; the 1989-90 cowpea regional testing reports; election of the new Steering Committee; and formulation of the 1991-92 regional trials and their requisition by member countries.

A total of 150 national and international scientists and administrators attended the workshop. In general, the papers and country reports presented demonstrated that new technologies were being generated for the sub-region. These enabled the formulation of the 1991-92 regional trials. From the number and quality of papers presented by maize, sorghum and cowpea scientists and the great interaction among the networks, participants were unanimous in advocating that the biennial inter-network workshop be encouraged.

Short term in-service training for scientists (Table 6):

The objective was the same as the monitoring tour, but discussions were held in classrooms and laboratories with lectures given by national as well international scientists.

Table 6. Training and Seminars organized by RENACO

	1988	1989	1990	1991
- Number	1	1	0	1
Theme	- State of research in West and Central Africa	- Experimentation agricole et transfert de technologie avec le niébé comme exemple	-	Shaping agronomic research in West and Central Africa (A joint maize, cowpea & sorghum networks Seminar).
No. of participants	12	10	-	20
No. of Countries	6	7	-	12

A seminar was organised in November 1988 at IITA, Ibadan for 12 scientists from Lead Centers. The scientists included breeders, agronomists, pathologists and entomologists; the subject discussed centered mainly on appropriate research methodologies.

A group training course was organized in 1989 at Kamboinse/Ouagadougou in cooperation with the national cowpea programme of Burkina Faso. Ten scientists and technicians from Côte d'Ivoire, Niger, Guinea Conakry, Mali, Benin, Guinea Bissau and Tchad participated. The subject matters centered mainly on technology development and transfer with cowpea as an example.

A joint sorghum-maize-cwpea networks seminar for research agronomists was organised in January 1991 at IITA, Ibadan. Twenty (20) agronomists from member countries except Cape Verde, Côte d'Ivoire, Gambia, Guinea Bissau and Togo participated. The objective of the seminar was to improve the understanding of the participants on the low input technology strategy through close contacts and discussions. The subject matter centered on low input technology strategy and appropriate technologies.

Visits to national programmes:

Seasonal visits to national programmes by either the Steering Committee members, Lead Centers Staff, IITA-GLIP scientists or the Cowpea Network Coordinator offered an informal on-the-spot training opportunity to national scientists and support staff by enabling them to discuss cowpea production technologies.

The following countries were visited by either the Network Coordinator or RENACO national scientists or IITA-GLIP scientists:

- In 1987: Burkina Faso, Guinea Conakry, Mali, Mauritania, Niger, Nigeria, Senegal and Togo;
- In 1988: Burkina Faso, Cameroon, Cape Verde, Niger, Nigeria, Senegal, Tchad and Togo;
- In 1989: Benin, Burkina Faso, Côte d'Ivoire, Ghana, Guinea Bissau, Mali, Niger, Nigeria and Togo;
- In 1990: Burkina Faso, Cape Verde, Central African Republic, The Gambia, Mali, Niger, Nigeria, Senegal, Tchad.

V. - NETWORK IMPACT

The impact of the network can be viewed on several grounds as follows:

1) Management of research activities:

A strong link has been established between SAFGRAD Coordination Office (SCO) and the Directors of Research of participating countries. The Directors have been very active and responsive to all network activities (Steering Committee meetings, monitoring tours, workshops, training and regional trials) by either encouraging the contribution and the participation of their scientists and/or hosting meetings. In many countries, steps are underway towards specializing some scientists in cowpea research work (as opposed to a scientist or group of scientists working on several crops). It should be noted that without the full cooperation of the Directors of research, the success of the network in any form would not have been possible.

2) Cowpea research:

The greatest impact of the cowpea network is the renewed interests and total commitment of national programs to cowpea research activities. Sixty-two national scientists throughout West and Central Africa are not only enthusiastic in carrying out their respective responsibilities, but are also very keen in collaborating with one another within the network area and IITA in developing appropriate technologies meeting farmers' needs and requirements. Thus, the linguistic barrier that has always separated anglophone, luzophone and francophone countries from learning from one another has been broken!

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 (Table 3) with several others in the pipeline for release (Table 4).

New varieties have been developed with the following attributes:

- . Striga resistant varieties: The varieties shown on Table 7 were identified to be resistant to *Striga gesnerioides* and are being incorporated in good agronomic background.

Table 7. *Striga* Resistant Cowpea Varieties in West and Central Africa

Name of variety	Origin	Pedigree	Country in which it is resistant to <i>Striga</i>	National programs incorporating it in 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
- KVx61-74	Burkina Faso	-	Burkina Faso, Mali	Burkina Faso
- IT81D-994	IITA-Ibadan	-	Burkina Faso, Nigeria	-

. Drought resistant varieties:

- Gorom Local (SUVITA-2) (Burkina Faso)
KVx30-305-3G; KVx396-4-2
- 58-57, IS86-275 (Senegal)
- TN88-63 (Niger)

. Varieties adapted to drought and excess moisture

- KVx 396-18-10; KVx 396-4-4; KVx396-4-5 (Burkina Faso)

. Aphids 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)

. Dual purpose varieties: fodder and seed yield:

- IAR7/180-5-1, IAR7/180-4-5 (Nigeria).

In conclusion, the impact of the Network on agricultural production and development will largely depend on the extent to which technologies developed by RENACO Lead and International Agricultural Research Centers are transferred to local farmers.

3) Technology transfer and its related problems

Technology transfer does not simply mean moving technologies, say, from Point A (Experiment Station) to Point B (Farmers' fields). It also includes the adoption of the technologies by farmers. Therefore, such technologies must be proven to be more profitable and meeting the needs and requirements of the targeted farmers. To achieve this, scientists must, therefore, familiarize themselves with the problems and constraints confronting farmers, so that they can design the appropriate research methodologies for the development of the most efficient and beneficial technologies for farmers immediate use.

Due to the longtime neglect by policy makers, agricultural research in West and Central Africa has not been geared specifically to meeting the needs and requirements of peasant farmers. In order to remedy this situation, the SAFGRAD West and Central Africa Cowpea Network underlined this point as one of its top priority research effort since its inception in March, 1987. Consequently, Workshops, monitoring tours, Seminars and other training activities have been regularly carried out with the view of identifying the basic constraints limiting cowpea production and the best ways to go about solving them.

To this effect, five RENACO Lead Centres were identified in 1987 and became fully and actively operational in 1988. A sixth Lead Center was added in 1989. IITA core activities, which have been redeployed at two sub-stations located at strategic points: Niamey, Niger in the Sahel (in collaboration with ICRISAT) and Kano, Nigeria in the Sudan savanna (in collaboration with the Institute for Agricultural Research (IAR) of Nigeria), offer technical backstopping for the conduct of relevant research and technology development, etc., for the interest of the semi-arid West and Central African region. It is gratifying to note that such technologies were put out for regional testing in 1989 and have been reported in the 1989-90 regional trial preliminary results to be of outstanding performance.

With further efforts and investment on training activities, greater and relevant research achievements shall be obtained and transferrable technologies shall be developed for the enhancement of increased cowpea productivity and production in the not-too-distant future.

VI. - FUTURE THRUST OF NETWORK PROGRAM AND AREAS OF WHICH FINANCIAL SUPPORT IS REQUIRED

SAFGRAD-I was principally a resident research effort conducted by IITA Scientists in Burkina Faso. This activity enabled the identification of cowpea production constraints and research methodologies overcoming them. Some promising technologies were developed by the end of SAFGRAD-I. The transfer of such technologies encountered a number of difficulties of which one of the major one was fitting in the different ecological niches and at the same time suiting the needs and requirements of the complex peasant farmers throughout the semi-arid zones of West and Central Africa.

SAFGRAD-II had as its major preoccupation to establish a collaborative cowpea research network and to stimulate initiative and capacity of national scientists to solve cowpea production constraints in West and Central Africa themselves. Since this required working in more than one research site in the sub-region in a concerted manner, cowpea production constraints were properly addressed. Consequently, new technologies fitting the different ecological niches and meeting farmers exigences in the sub-region are being developed. This is accomplished through the transfer of research methodologies (Table 8), developed by IITA-SAFGRAD, to national agricultural research (NARS), being the fruits of RENACO training activities.

It should be pointed out however, that only a small portion of NARS have been able to convert fully, the transferred methodologies and their exploitation satisfactorily. In this regard, special mention must be made to Burkina Faso (cited as an example), which benefited from intensive interaction with the cowpea network coordination office and contributed a lot to the remarkable achievements obtained by the network.

Table 8. Research findings accepted by NARS.

Description of findings	Country applying it
- Use of sowing dates in screening cowpea for adaptation to semi-arid zones.	Burkina Faso, Niger and Nigeria
- Use of a single seed descendant method for advancement of lines from F1 to F6 in less than 3 years and for the development of new varieties in less than 7 years.	Burkina Faso
- Minimum insecticide to protect cowpea against insect pests	Burkina Faso, Cameroon, The Gambia, Ghana, Guinea Conakry, Niger, Nigeria, Senegal.
- Maize-cowpea relay cropping and cereals-cowpea intercropping systems	Benin, Burkina Faso, Cameroon, The Gambia, Ghana, Guinea Bissau, Guinea Conakry, Nigeria, Tchad, Togo
- Bio-test for screening cowpea for bruchids resistance	Burkina Faso, Cameroon, Ghana, Guinea Conakry, Mali, Togo.
- Bio-test for screening cowpea for aphids resistance	Burkina Faso, Ghana.
- Tied ridges technique	Burkina Faso, Cameroon, Mali.
- <i>Striga</i> resistance methodology	Benin, Burkina Faso, Ghana, Mali, Niger, Nigeria, Senegal, Togo.

A further 13-18 months extension period of SAFGRAD-II as advocated by NARS, coupled with the newly adopted approach of working groups in cowpea agronomy, entomology, breeding and pathology including *Striga* will not only create the most appropriate forum for such useful interactions, but will also facilitate the rapid transfer, adoption and proper exploitation of new research methodologies by NARS, while expecting the arrival of 4-5 scientists currently being trained abroad to improve the critical mass of scientists in the sub-region.

It is equally important to note that besides drought, heat, *Striga*, *Alectra* and disease resistance or tolerance, cowpea research in West and Central Africa has a long way to go. The use of chemical poisons in controlling insect pests in order to increase cowpea yield from 200-300 kg/ha to 1000-1500 kg/ha is not a viable option for the generally poor African farmer.

The African economy is not sound enough to accept the massive use of chemical products in its agricultural production system. African scientists are therefore, confronted with the challenge of finding relatively cheap ways requiring minimum or no input. With this challenge, the most feasible approach is to embark on a mass breeding program, incorporating all genes and conferring resistance or tolerance to all major physical, chemical and biological cowpea production constraints in good agronomic backgrounds. The success of this minimum input strategy will no doubt boost cowpea yield from 200-300 to 400-600 kg/ha in the near future.

With the ever increasing African population and given the importance of cowpea diet (supplies about 50% of the needed proteins) in low income African families, every effort must be made to up-grade cowpea production in the next 5-10 years. This dream can only come true if each national program is able to put in place a multidisciplinary team of cowpea scientists comprising a breeder, an agronomist, a pathologist, an entomologist and a social scientist. Since most national programs, perhaps with the exception of Nigeria and Ghana, do not have this facility, training effort cannot be neglected in the network program of activities.

LIST OF PUBLICATIONS:**1) Proceedings of workshops:****- Country reports:**

1. Muleba, N. & Olufajo, O.O., 1991. Proceedings of the Cowpea Workshop: Country reports and other activities, Niamey, Niger, March 8-14, 1991. (in preparation).
2. Muleba, N. & Detongnon, J., 1989. Proceedings of the Cowpea Workshop: Country reports and other activities, Lome, Togo, March 20-24, 1989. 27 pp.
3. Proceedings of Workshop on the Reorientation of SAFGRAD Cowpea Research Network in Central and West Africa. March 23-27, 1987, Ouagadougou, Burkina Faso. 27 pp.

- Conference papers:

4. Fajemisin, J.M., Muleba, N., Emechebe, A.M. & Dabire, C., 1989. Towards Production Technologies for Maize and Cowpea in Semi-Arid West and Central Africa. Scientific papers presented at a Joint Workshop of SAFGRAD Maize and Cowpea Networks. Lome, Togo, March 20-24, 1989. 277 pp.

2) Reports of the meetings of the RENACO Steering Committee

5. Ninth Steering Committee Meeting, Niamey, Niger, March 13-14, 1991. (Draft) 25 pp.
6. Eighth Steering Committee Meeting, Cotonou, Benin, November 5-9, 1990. 23 pp.
7. Seventh Steering Committee Meeting, Ouagadougou, Burkina Faso, March 26-30, 1990. 41 pp.
8. Sixth Steering Committee Meeting, Ouagadougou, Burkina Faso, November 6-10, 1989. 22 pp.
9. Fifth Steering Committee Meeting, Lome, Togo, March 23-24, 1989. 12 pp.
10. Fourth Steering Committee Meeting, Zaria, Nigeria, November 8-10, 1988, 13 pp.
11. Third Steering Committee Meeting, Ouagadougou, Burkina Faso, March 28-31, 1988. 14 pp.
12. Second Steering Committee Meeting, Ouagadougou, Burkina Faso, November 9-12, 1987, 27 pp.

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3) Annual Reports:

14. IITA/SAFGRAD 1990 Maize and Cowpea Collaborative Research Networks for West and Central Africa. Annual report 1990/91. 107 pp.
15. IITA/SAFGRAD 1989 Maize and Cowpea Collaborative Research Networks for West and Central Africa. Annual report 1989/90. 59 pp.
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4) Compilation of Regional Trial Results

17. RENACO regional trials 1989-90: Preliminary results. 47 pp.
18. Results of the 1987-88 regional cowpea trials. 40 pp.

5) Proceedings of Seminar and Training Sessions

19. Muleba, N. & Olufajo, O.O., 1991. Shaping Agronomic Research in West and Central Africa. *Proceedings of a Joint Maize-Cowpea-Sorghum Seminar for Research Agronomists*, IITA, Ibadan, Nigeria. January 7-18, 1991. (in preparation).
20. Muleba, N. & Detongnon J., 1991. Experimentation Agricole et Transfert de Technologies avec le niébé comme exemple. *Compte rendu du stage de perfectionnement professionnel*, Ouagadougou, Burkina Faso, 10-24 Septembre 1989.
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6) Other reports

22. 1990 Cowpea Monitoring Tour. August 27-September 14, 1990. 25 pp.
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7) Conference papers

24. Muleba, N. & Mosarwe, E., 1991. Management of cowpea under *Striga* infestation in Burkina Faso. Responses of daylength sensitive cultivars. Presented at the SAFGRAD-OAU-STRC's Inter-Networks Conference, Niamey, Niger, March 8-14, 1991 (in preparation).
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8) Journal papers

26. Muleba, N. & Brockman, F., 1991. Effect of seedbed preparation methods on cowpea yield in Alfisols and Oxisols in semi-arid West and Central Africa. *Tropical Agriculture*, 68, 45-49.
27. 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.
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