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SCIENTIFIC, TECHNICAL AND RESEARCH COMMISSION
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SEMI-ARID FOOD GRAIN RESEARCH AND DEVELOPMENT
*( S A F G R A D )*

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

# COWPEA WORKSHOP:

## COUNTRY REPORTS AND OTHER ACTIVITIES

NIAMEY, NIGER, 8-14 MARCH, 1991

*Edited by*:

*Nyanguila MULEBA and Olusoji O. OLUFAJO*

International Insitute of Tropical Agriculture
PMB 5320, Ibadan, Nigeria

*February, 1992*

# Country Reports and Other Activities of the Cowpea Network

*Proceedings of the Cowpea Network held in conjunction with the Maize and Sorghum Networks on 8-14 March, 1991 at Niamey, Niger*

*Edited by:*

**Dr. N. Muleba**
Coordinator, RENACO
IITA/SAFGRAD-RENACO

**and**

**Olusoji O. Olufajo**
Agronomist,
IAR, Ahmadu Bello University
PMB 1044, Zaria, Nigeria

International Institute of Tropical Agriculture
Ibadan, Nigeria

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# CONTENTS

# SIGNIFICATION OF ACRONYMS USED

**Bean/Cowpea CRSP:** Collaborative Research Support Program

**IAR** : Institute for Agricultural Research (Ahmadu Bello University, Zaria, Nigeria)

**ICRISAT** : International Crops Research Institute for the Semi-Arid Tropics

**IDRC** : International Development Research Center (Canada)

**IITA** : International Institute of Tropical Agriculture

**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

**USAID** : United States Agency for International Development

# DECLARATION

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# PREFACE

The biennial Workshop of the SAFGRAD Cowpea Network is geared principally at gathering national and international scientists together to discuss cowpea production constraints and research in the sub-region. So far, since 1987, two SAFGRAD West and Central Africa Cowpea Network Workshops have been held; the third one was held jointly with the West African Maize and Sorghum Networks' at Niamey, Niger, from 8-14 March, 1991.

However, unlike the two previous ones, concerted efforts from the SAFGRAD Coordination Office and the above-cited networks' were merged together in organizing the third Workshop. The Workshop, which included the "Inter-Networks' Conference", had a Pan-African dimension involving the five SAFGRAD Networks and guests from the Pan-African *Striga* Network and other Inter-African and International Organizations including local government authorities.

The major interest of the Cowpea Network (RENACO) section of the Joint Workshop included interaction and exchange of experiences gained during the 4 years of networking with national and international scientists working in various crop commodity, research disciplines as well as other interested parties of the agricultural sector.

The overall interest was to discuss on ways and means of ensuring better and effective flow of relevant technologies towards the enhancement of sustainable cowpea crop research and production in the sub-region.

The output of the Inter-Networks' Conference "Scientific-up-to-date", from the Workshop have been reported elsewhere by the SAFGRAD Coordination Office. Whereas other cowpea network activities are contained here in these proceedings. They consisted mostly of technology development research of RENACO

Lead and Associate Centers conducted primarily for the interest of the concerned countries, but with spill over to neighbouring countries, especially those with relatively weak national research programs. They supplemented also research carried out by IITA core programs as backstopping to RENACO.

The RENACO activities are reported in this order:

- Lead Centers;
- Associate Centers;
- Technology Adapting Centers;
- IITA Core Research Progress Report;
- RENACO Regional Trials;
- Election of 50% of the membership of the RENACO Steering Committee.

In addition to these, working groups for breeders, agronomists, entomologists and pathologists were also set up at the workshop. However, the groups did not come out with formal reports of their discussions. It is hoped that the group discussions will be reactivated in our future activities in order to find rapid solutions to pressing problems, such as *Striga* resistant varieties and disease resistant photosensitive cowpea cultivars for the Guinea savanna zones.

The presence of all member countries at the Workshop, with the exception of Cameroon and Senegal who were absent with appologies, clearly demonstrates that RENACO has not only accomplished its assignment of stimulating the initiative and capacity of national cowpea scientists to solving cowpea production constraints themselves, but are also rapidly taking care of farmers' needs and requirements as can be seen by the numerous new varieties released as reported through the network efforts.

Ouagadougou, January 1992

N. Muleba
Cowpea Network Coordinator

# SUMMARY

The inter-network conference on food grain research and production in semi-arid Africa and the Cowpea Network Workshop were held at Niamey, Niger from 8-14 March, 1991. During the conference, a total of 15 scientific papers were presented on various aspects of cowpea research. Four of the papers were presented during the joint sorghum-maize-cowpea session while the remaining 11 were presented during a separate cowpea workshop.

All the 17 member countries of RENACO, with the exception of Cameroon and Senegal, presented reports of their research activities for 1989-90. The Grain Legume Improvement Program of IITA also presented an overview of its research activities between 1989 and 1990. In addition, the Network Coordinator presented the results of the 1989-90 regional trials.

A significant achievement was the formation of working groups in areas of breeding, agronomy, entomology and pathology including *Striga*. The four working groups met to plan collaborative research. However, no formal report was given to the Steering Committee by the different working groups.

An election was conducted to reconstitute the Steering Committee. The following people were elected to serve as members of the Steering Committee for the next two years:

| | | |
|---|---|---|
| 1) Dr. O.O. Olufajo | Agronomist | (Nigeria) |
| 2) Dr. (Mrs) C. Dabire | Entomologist | (Burkina Faso) |
| 3) Mr. M. Gumedzoe | Virologist | (Togo) |
| 4) Mr. H. Hamma | Weed Scientist | (Niger) |
| 5) Dr. F.L. Guilavogui | Entomologist | (Guinea) |
| 6) Dr. K.O. Marfo | Breeder | (Ghana) |

Seven recommendations were made, at the end of the workshop, by the participating cowpea network scientists.

# PART I

## LEAD CENTERS

RENACO Lead Centers are six, namely:

- Burkina Faso
- Cameroon
- Ghana
- Niger
- Nigeria
- Senegal

Lead Centers have as a major thrust in Network activities to conduct technology development research that are of primary interest to them, results of which can be shared with other SAFGRAD-RENACO member countries.

Cameroon and Senegal did not attend the Niamey workshop, hence their research activities for the 1989-90 season were not presented.

# BURKINA FASO

Burkina Faso was assigned responsibilities in the areas of breeding (drought, *Striga,* insect and disease resistance); entomology and pathology. The following trials were conducted during the 1990 cropping season:

a) **Breeding:**

**Breeding nurseries:** Sixteen crosses were made viz: one for Bruchid resistance; two for Aphids resistance; eight for *Striga* resistance; one combining Aphids and Bruchids resistance; three combining Aphids, Bruchids and *Striga* reistance; and one for scab (*Elsinoe phaseoli)* resistance.

- F1 plants from the 16 crosses made up of 100 plants each were advanced to F1 in wooden boxes.

- F1 plants (1,500 plants/cross) were advanced to F3 at Kamboinse during the 1990 cropping season. Each population was subjected to selection against naturally occurring fungal, bacterial and viral diseases.

- Three F4 populations (KVx403, KVx404 and KVx414) were advanced to F5 by subjecting them to selection for adaptation and resistance to naturally occurring fungal, bacterial and viral diseases as well as insect pests. In order to attain this goal, they were sown on two dates under protection against insect pests, and one date (optimal sowing date) without protection against insect pests at four locations; Pobe in the Sahel; Kamboinse in the Sudan savanna: and Farako-Ba and Nyangoloko in the northern Guinea savanna. Disease-free, high yielding plants with good growth habits were mass-selected from each treatment. Each populaltion F5 was reconstituted by mixing 1/3 of seed selected from the first and second sowing dates (50% each) under insect pests protection and 2/3 of seed selected under no-insect pests protection.

**Preliminary yield trials**

- Fifteen entries, ten of which were lines selected from crosses involving the *Striga* resistant varieties B301 and SUVITA-2 (including its best derivative lines) were yield tested at three locations; Pobe, Kamboinse and Farako-Ba, using two sowing dates under protection against insect pests and one sowing date (optimum sowing date) without insect pest protection. They were scored for resistance to naturally occurring diseases under each growing condition. A combined analysis, taking into account locations, sowing dates and insect pest protection showed that lines KVx402-5-2, KVx 402-19-1 and KVx402-19-5 were the best adapted and highest yielding under the different testing conditions. Other lines/cultivars that were of interest were KVx397-6-6 and KVx 397-9-11 in the Sahel; KVx397-6-6, KVx 398-29-2 and TN121-80-7 in the Sudan savanna; and KVx397-9-11 and KVx398-29-2 in the northern Guinea savanna.

- Fifteen entries out of which 13 combining Aphids, Bruchids and *Striga* resistance were yield tested at Pobe, Kamboinse and Farako-Ba. The experimental design was the same as described in the above-cited experiment. The promising lines across locations, sowing dates and insect pest protection treatment were: KVx164-41-64, KVx291-47-222 and KVx295-2-124-51. Other lines of interest were: KVX305-2-118-23-2, KVx293-114-13 and KVx305-2-118-23-1 in the Sahel; KVx305-2-118-23-2 and KVx305-118-23 in the Sudan savanna; and KVx305-118-31 in the northern Guinea savanna.

**Advanced yield trials**: Seven promising lines and one commercial check were tested in pure stands and intercrop with cereals with and without insect pest protection at four locations: Pobe, Kamboinse, Farako-Ba and Nyangoloko. Line KVX396-4-5-2D performed best at each location under each growing condition. Its yield was, however, reduced significantly under no-insect pest protection in pure-stands. Line KVx165-14-1 was resistant/

tolerant to insect pests in that its yield was not statistically affected by insect pest protection treatments. Other lines of interest were IT85D-3516-2 and KVx396-18-10 in both Sudan and northern Guinea savanna zones.

**Evaluation of dual purpose cowpea:** Twelve entries, seven of which were obtained from GLIP-IITA, Ibadan and four from IAR in northern Nigeria and one commercial check were tested at two locations: Pobe and Kamboinse. They were sown at the optimum sowing date, in pure stands under insect pest protection (two sprays). The most promising lines for both grain and fodder yields across locations were: IT86D-714, IT86D-3428-4, IAR7/180-4-5 and IAR7/180-4-5-1.

b) **Entomology:**

*Insect population dynamics*

- **Aphids (*Aphis craccivora*):** This is an on-going study. Aphids attack cowpea at the early stage of the cropping season. In 1990, Aphids emerged throughout the month of August and declined in early to mid-September and became less important thereafter until early November when they virtually disappeared.

- **Thrips (*Magalurothrips sjostedti*):** In contrast with aphids, thrips emerged towards the end of the season. Their population was low in early August, just before cowpea flowering. About 20 insects per container per week were captured. Towards mid-August an alarming increase (60 insects per container per week in mid-September) was observed, building up to 200 insects a week per container at the end of October. At cowpea maturity in early November, thrips population was oberved to have declined considerably. It appears, therefore, that since local varieties flower in September and October, they are either resistant or tolerant to thrips. In order to avoid thrips

damage, cowpea should be planted so as to flower in early August, although they will be subjected to pod and seed rot because of the normal heavy rainfall at this period.

*Field host plant resistance studies*: Lines tested in preliminary yield tests (earlier described in the cowpea breeding section) were studied for their resistance to naturally occurring insect pest infestations at Pobe, Kamboinse and Farako-Ba.

- **Cowpea field resistance to Aphids:**

  .. Pobe: There was no Aphids infestation at this Sahelian location in 1990, just as in 1989.

  .. Kamboinse: At this Sudanian location, the group of KVx 397 through KVx402 lines, were all infested with Aphids, although at a moderate level. The most promising line and cultivar were KVx402-19-2 and TN93-80-6, respectively. For the set of KVX164 through KVX305, the most resistant lines were: KVx295-2-124-51, KVx293-114-13 and KVx295-2-124-52. The common check TVX3236 was highly susceptible to Aphids in both trials.

  .. Farako-Ba: At this northern Guinea savanna location, the level of Aphids infestation was higher than Kamboinse and there was no statistical difference between entries in both sets of experiments. However, for the set of KVx397 through KVx402, lines KVx402-19-2 and TN93-80-6 had the lowest score of Aphids infestation suggesting that their resistance observed at Kamboinse is also applicable to Farako-Ba.

- **Cowpea field resistance to thrips:** In both preliminary yield trials, thrips population was higher at Kamboinse (23 thrips/flower) than at Pobe (10-17 thrips/flower) and Farako-Ba (4 thrips/flower). The least thrips infested

cultivars and line across locations were TVx3236, KVx293-114-13 and KVx164-65-6. In spite of high thrips pressure at Kamboinse, in the Sudan savanna zone, lines KVx396-18-10, KVx 397-9-11, KVx398-7-1 and KVx401-31-1 had the lowest thrips infestation at that location.

*Other entomological studies*

- **Effect of cowpea plant population density on natural insect pest infestation:** The experiment which started in 1989 was conducted at two sites in 1990: on-station (bottomland field) and on-farm (upland field). Entries used in 1990 were a farmer's variety, KVx165-14-1 and KVx396-18-10.

  From the 1989 and 1990 results, it appears that low plant populations or wide spacings enabled cowpea plants to grow more vigorously and to resist insect pest damage better than high plant populations. As much as 200 kg of grain can be obtained per hectare with currently available improved cowpea cultivars without insect protection.

- **Insecticide evaluation**: A local product: neem (*Azadirachta indica*) cake infusion (two levels: (50 and 100 mg/litre of water), Karate Ed, Cyfluthion, Serimol, Phenthoate, Reldan 50 EC, and Decis + Dimethoate were tested against an unsprayed check to study their effect in suppressing aphids, thrips, *Maruca* and pod sucking bugs. Karate ED (Lambda Cyhalothrine) and Deltamethrine (Decis) effectively controlled the population of thrips, *Maruca* and pod sucking bugs. The addition of the systemic insecticide Dimethoate to Decis, did not improve the efficacy of the mixture in controlling insect pests as in previous years. Since, the neem cake infusion gave good results, it will be tested again next year.

c) **Pathology**

**Survey of cowpea fungal diseases:** Twenty samples consisting of seven cultivars and four local varieties were taken from six experiment stations and sub-stations (viz: Farako-Ba, Kamboinse, Kouare, Di, Saria and Pobe) to study naturally occurring seed transmitted fungal diseases. Of the 12 fungi studied, only *Fusarium equiseti, F. semitectum* and *F. graminearum* did not induce diseases on cowpea. *Colletotrichum capsici* and *Macrophomina phaseolina* induced severe diseases on cowpea and could result into an epidemy under certain conditions. Cultivar differences in seed borne diseases were observed. Seed treatment with fungicide Benlate T20 was effective in controlling seed borne diseases (except *C. capsici* and *M. phaseolina*) in some cultivars, particularly IT81D-994 and KVu69. It is, therefore, recommended that a seed lot containing, more than 20% contamination should not be used. Moreover, seeds should be treated with an effective fungicide such as Benlate T20 before planting.

**Importance of brown blotch (*C. capsici*) disease:** The pathogen of the disease was found in five of the six stations studied. The infection was higher at Farako-Ba than Kamboinse and Pobe. Local varieties were less infected than improved cultivars. Among the latter, cultivars TVx3236 at Farako-Ba, Kamboinse and Pobe and KN-1 at Di were less infected than the others.

**Evaluation of yield losses induced by brown blotch disease**: The study was conducted at two localtions: Farako-Ba and Kamboinse with three cultivars and five levels of disease control, using fungicide Benlate T20. To ensure disease infection, spreader rows were sown ten days earlier than the test plots. The disease incidence was higher at Farako-Ba in the northern Guinea savanna compared with Kamboinse in the Sudan savanna. Cultivars KVx61-1 was highly susceptible to the disease at both locations: KVu69 was intermediate while KVx396-4-4 was least susceptible. Cultivar KVx61-1 was able to give good yield only when protected with Benlate T20.

d) *Striga* control studies:

**Evaluation of local and introduced germplasm for *Striga* resistance:** Six landrace varieties and cultivars from Niger, and two landrace varieties from Burkina Faso were evaluated for *Striga* resistance in a *Striga* sick plot at Kamboinse. *Striga* shoots emerged in tested varieties and cultivars. However, cultivars TN27-80 from Niger, and KVx396-16-10-1 from Burkina Faso, killed all *Striga* shoots before they flowered or set capsules. In variety Sadore local, from Niger, 90% of *Striga* shoots were parasitized by the insect *Smicromis sp.*

**Preliminary yield test in a *Striga* sick plot:**

- Fifteen entries including 10 lines derived from B301 crosses were evaluated in a *Striga* sick plot at Kamboinse in the Sudan savanna zone. Based on *Striga* emergence date, *Striga* density and *Striga* dry weight, the following lines and cultivars were found to be *Striga* resistant: KVx397-6-6, KVx397-9-11, KVx398-7-1, KVx402-5-2, KVx402-19-1, KVx402-19-5, TN121-80-7 and B301. With the exception of KVx402-19-1 and B301, all resistant lines and cultivars gave good yields, KVx4o2-5-2 giving the highest yield.

- Fifteen entries out of which 13 combined *Striga*, Aphids and/or Bruchids resistance were yield-tested in a *Striga* sick plot at Kamboinse. The following lines were found to be *Striga* resistant: KVx164-65-5, KVx164-41-64, KVx295-2-124-52, KVx295-2-124-121 and KVx305-118-31, but their yields were not significantly different from that of the check, SUVITA-2.

**Advanced yield trial in a *Striga* sick plot:** Nine entries originating from IITA-Ibadan (4), Senegal (1), Niger (2) and Burkina Faso (2) were yield-tested in a *Striga* sick plot at Kamboinse and Fada N'Gourma in the Sudan savanna zone.

.. IT81D-994 and TN121-80-7 were *Striga* resistant at both locations, confirming the 1989 observations. TN93-80-6 was also resistant at both locations in 1990.

.. IS86-275N, IT87F-1738-4, IT86D-257 and KVx396-18-10 were *Striga* tolerant (i.e., they gave high yield in spite of heavy *Striga* infestation).

**Effect of Solarisation and Nitrogen Rates on *Striga* Control:** Two solarisation treatments (viz: transparent polyethylene sheet laid on a field plot versus a bare soil field plot) and three nitrogen rates (viz: 0, 15, and 30 kg N/ha as urea) were tested in a *Striga* sick plot using a *Striga* suceptible cultivar IT82E-32. A transparent polyethylene sheet allows short wave lengths (<760 nm) solar radiation to pass through and retains long wave lengths (>780 nm) back-radiation. As a result, temperature increases in the soil covered by the plastic sheet. Lethal temperatures (>45-50°C) are expected to sterilize the soil (including the killing of *Striga* seeds). A soil temperature wave is expected to be transmitted from top soil to subsoil within 24 hours. The plastic sheets were used in May 1990, a sunny and hot period.

Solarisation significantly delayed *Striga* emergence. It also decreased *Striga* density and dry weight significantly. (*Striga* dry weight was more than 10 times greater in untreated than in solarized plots). However, there was no significant effect on cowpea seed yields. Nitrogen rates had no significant effect on Striga emergence, density and dry weight. However, in contrast to solarisation treatment, cowpea grain yields increased significantly with increasing nitrogen rates. Solarisation was, thus, effective in sterilizing *Striga* infested plots.

e) **Agronomy**

**Soil and water management:** Four cowpea cultivars (KVx396-4-4, KN-1, TVx3236 and a farmer's variety (Koakin local) were tested at three levels of soil water management (viz: sowing on flat,

sowing on flat converted to tied ridges three weeks after sowing and sowing on tied-ridges) in an Alfisol at Kamboinse. Cowpea yield increased significantly with the early ridging and tied ridges. Grain yield of the commercially released cultivar, TVx3236 did not differ significantly from that of the farmer's variety (Koakin local) while KVx396-4-4 yielded significantly higher than the latter.

**Effects of wind-break and mulching on cowpea in the Sahel:** A promising line, KVx396-4-4, was tested against a drought resistant cultivar TN88-63, a drought susceptible cultivar IT82E-32, and a farmer's variety, Pobe Local, using two wind-break treatments (with and without wind-break) and two mulching treatments (with and without mulching). The experiment was established at Pobe/Djibo in the Sahel. On the average, protection of cowpea crops against dominant wind increased grain yield by 7% whereas mulching increased cowpea yield by 5%. The new line KVx396-4-4 was the highest or among the high yielding cultivars in all treatments. Its yield was higher in the combination: no-wind-break, with mulching than in the combination: wind-break with mulching. It outyielded TN88-63 only under the no-wind-break treatment. Both TN88-63 and KVx 396-4-4 outyielded the drought susceptible cultivar, IT82E-32 in all treatments. The farmer's variety, Pobe Local, performed poorly in all treatments probably because of its long growth duration which exposed it to severe end of season drought conditions.

**Effect of cowpea cultivars and spacings on the performance of cereal in intercropping systems:** The new line KVx 396-4-4 was tested against TVx 3236 and a farmer's variety at three spacings (viz: 20 x 160 cm, 60 x 160 cm and 100 x 160 cm). The spatial arrangement consisted of 2 cereal rows to one cowpea row. The spacing between rows was 80 cm. The experiment was established at Pobe in the Sahel; Kamboinse and Fada N'Gourma in the Sudan savanna; and Farako-Ba in the northern Guinea savanna. Cereals and cowpea were sown at the same time at all locations, except at Farako-Ba, where cowpea was sown three weeks after cereals.

Sowing cowpea at an intra-row spacing of 20 cm resuslted in the highest yield at all locations, but this did not differ significantly from the 60 cm spacing. The best intercrop performance (combined yield of cereals and cowpea) was obtained from the 60 cm intra-row spacing. With the exception of the Kamboinse location, where the local variety (Sakoula local) gave the highest yield, KVx396-4-4 significantly outyielded other cultivars and varieties at all locations.

# GHANA

Ghana was made one of the six RENACO Lead Centers since 1989. It was assigned research responsibilities in the areas of breeding for adaptation and cowpea entomology including storage for transition zones.

a) **Breeding**

**Germplasm collection and evaluation:** Cowpea germplasm collection was carried out in eight regions of Ghana in collaboration with the Plant Genetic Resouces Unit of IITA. Ninety local landraces and 169 wild cowpea varieties were collected and screened for resistance to the major insect pests of cowpea.

**Hybridisation and line selection**: A hybridisation program using pedigree-backcrossing method to incorporate heat tolerant genes into cowpea varieties/lines, Vallenga, Sumbrizie, Sumbrozogla and IT81D-1137 reached an advance stage during 1990 season. F5-6 and F5-BC generations were evaluated for heat tolerance. Aphid and bruchid resistance were incorporated into a promising local variety, Dagarti by crossing it with IT81D-716 and IT83S-728-13.

**Varietal trial**: Two IITA Cowpea International Trials were conducted - CIT-3 (bruchid resistant lines) and CIT-4 (aphid resistant lines). Promising lines from CIT-3 were: IT86D-544, IT86D-64 and IT81D-1137 while those from CIT-4 were IT86D-444, IT85D-3577 and IT86D-888.

b) **Entomology**

**Minimum insecticide application trial (RENACO):** Two cowpea varieties and three insecticide regimes were tested at three locations - Kwadaso, Nyankpala and Damongo. Cowpea varieties used at Kwadaso were: Legion Prolific and Sorosko while IT84S-2246 and Vallenga were used at Nyankpala and Damongo. The insecticide regimes were: no insecticide applied; 2 sprays at flower bud initiation and 50% flowering; 3 sprays at flower bud initiation,

50% flowering and mid pod fill. At Kwadaso, insecticide application reduced insect damage to the crop and increased grain yield. At Damongo, grain yields of IT84S-2246-4 were not significantly different under 2 or 3 sprays while for Vallenga application of the third spray resulted in more than 0.5 t/ha increase in yield. In contrast, at Nyankpala, there was a significant difference in the yield of IT84S-2246-4 under 2 and 3 sprays; the third spray increased yield by over 0.5t/ha. For Vallenga grain yields were not significantly different under 2 and 3 sprays.

**Evaluation of plant products for control of cowpea storage beetle:** Out of the eleven plant products tested, four were as effective as the insecticide check (Actellic 2% dust) for the preservation of cowpea seed for six months. These were neem seed oil, jatropha seed oil, groundnut oil and black pepper powder. Test on the persistence of these products is in progress.

**Screening of germplasm:** Out of a total of forty-two cowpea cultivars screened for resistance to field insect pests at Kwadaso only a few showed promising resistance to aphids, flower thrips and pod borers. About 81% and 58% of the 31 early maturing cowpea genotypes screened in the field at Nyankpala were ranked as manifesting levels of resistance to thrips and *Maruca*, respectively.

c) **Agronomy:**

**Variety combination and relative sowing time in maize/cowpea intercropping system:** The experiment was conducted at three locations - Fumesua (forest zone), Pokoase (coastal savanna zone) and Kpeve (transition zone). Two maize varieties, Dobidi (full season and tall) and Aburotia (medium and short) were sown either simultaneously with or five days before cowpea. Maize grain was not significantly affected by component cowpea at all locations while cowpea yields were slightly reduced when planted simultaneously with maize cultivar, Dobidi.

# NIGER

Niger was assigned research responsibilities in the areas of breeding for drought, *Striga* and *Macrophomina* disease resistances; cowpea agronomy and cowpea pathology for the Sahel.

a) **Breeding**

**Preliminary yield trials:** Two preliminary yield tests were conducted in 1990 (one at Kolo and Tarna and the other at Kolo only). The entries included 30 lines derived from a cross of KNS x TN88-63 and two checks. In the first trial, the best lines at both locations were: KN89-7, KN89-8, KB89-2, KB89-13 and KB89-11 which significantly outyielded the best check, TN88-63. In the second trial, none of the lines significantly outyielded the best check.

**Advanced collaborative (INRAN/ICRISAT) yield trial:** Thirty-six entries developed by INRAN and IITA/ICRISAT were tested at several locations in Niger in 1989 and 1990. The best lines and cultivars across locations in terms of grain yield were: ITN89E-4, TN5-78, IT85S-265-72, ITN89E-3 and KC85-7. With regards to fodder yield, lines/cultivars KVx100-2, KA85-23, KB85-18 and KB85-14 performed best across locations.

**RENACO regional adaptation trial for Sudan savanna and the Sahel:** The trial was conducted at Kolo in 1989 and at Kolo, Gabougoura and Ouallam in 1990. At Gabougoura, entries were exposed to high pressure of *Striga* infestation and *Macrophomina* disease; whereas at Ouallam they were exposed to heat and drought stress. Based on grain and fodder yields, lines TN5-78, KVx396-4-4 and KVx30-309-6G gave the best performance across years and locations. The KVx lines were less susceptible to bacterial blight.

**Adaptation trial for local varieties:** Twenty entries (out of which 14 were local landraces collected in 1987 and six were commercial cultivars used as checks) were tested in 1990 at

Ouallam, in the Sahel, and Kolo and Tarna in Sahelian-Sudanian zones. At each location, yields of some local varieties were similar to and even better than those of the commercial varieties. Averaged across locations, the local varieties: TN87-28, TN87-127 and TN87-41B gave the best grain yields while TN87-256A, TN87-182, TN87-28 and TN87-127 were found to be good dual purpose varieties.

**Study on varietal mixture:** Two varietal mixtures (i) KVx100-2 and TN5-78 (two cultivars of different growth cycles and fodder yields) and (ii) KVx 30-309-6G and Gabougoura local (a late maturing landrace), were studied. A total of 10 treatments (viz four pure-stands and three mixtures: 50% + 50%: 75% + 25% and for each of the two varietal associations 25% + 75%) were used. The experiment was established at two locations: Gabougoura and Ouallam in 1990. The purpose of the experiment was to study the population buffering effect introduced by varietal mixture against pure varietal effect under high disease pressure or drought stress. Data obtained at Gabougoura were not reliable due to a high *Striga* pressure. At Ouallam, 2 mixture treatments KVx100-2 (75%) + TN5-78 (25%) and KVx100-2 (25%) + TN5-78 (75%) outyielded the pure-stand treatments.

b) ***Striga* resistance studies:**

**Striga resistance observation nursery:** Ten out of the 70 entries screened for *Striga* resistance during the 1988 off-season, were observed along with one resistant check (B301) and one susceptible check (TN88-63) for *Striga* resistance as well as for yield potential in two *Striga* sick plots in 1990. Varieties TC85-252, 100-8, TN49-80 and TN99-80 had the lowest number of *Striga* shoots per plot; suggesting that they are probably *Striga* resistant. The resistant check, B301 had no *Striga* shoot. Among the resistant varieties only TC85-252 and TN49-80 gave high grain yields. These yields were, however, comparable to that of the susceptible check TN88-63 which had the highest number of *Striga* shoots per plot. TN88-63 is known to be *Striga* tolerant. The *Striga* resistant check (B301) gave the lowest yield.

**Advanced *Striga* resistant trial:** Nine cultivars out of which two (B301 and IT82D-849) *Striga* resistant were tested at four locations: Tarna, Magaria, Koni and Kalapate in *Striga* sick plots. Cultivar B301 was infested by *Striga* at Magaria and Koni while *Striga* emerged on IT82D-849 at Magaria only. However, the number of *Striga* shoots on the plots of these two *Striga* resistant varieties were the lowest. Cultivars which bore the lowest number of *Striga* at the first *Striga* count had also the least number of *Striga* at maturity. To this effect, *Striga* population dynamics are distinguisable by three curve shapes: S shape - for *Striga* suceptible cultivars (TN88-63, Mougne and TN80-80); and linear or quadratic shapes - for *Striga* resistant cultivars (B301, IT82D-849, SUVITA-2, TN5-78 and TN121-80). At Koni, TN121-80, TN5-78 and SUVITA-2 produced more *Striga* shoots than the susceptible checks, TN88-63 and Mougne.

**RENACO regional *Striga* resistant trial:** Twelve entries from RENACO were tested at Tarna in a *Striga* sick plot. Cultivars which were infested with the least number of *Striga* shoots were: KVx396-4-4-4, IT82E-32 (the susceptible check), TN121-80, KVx396-4-4-2, B301, SUVITA-2, and IT82D-849. The highest yields were obtained from TN121-80, TN93-80 and KVx 396-4-4-4 and the lowest from KVx 396-11-6, B301, IT82E-32 and IT82D-849.

**Effect of cowpea plant population on *Striga* infestation:** The *Striga* tolerant cultivar TN88-63 was sown in a *Striga* sick plot at six plant population densities varying from 6,944 to 111,111 plants/ha. *Striga* density measured at cowpea maturity increased with decreasing cowpea plant population whereas cowpea grain yield increased with increasing cowpea plant population.

c) **Agronomy**

**Effect of continuous cultivation of millet and cowpea on soil fertility in the Sahel:** Continuous cultivation of millet or cowpea in pure stands and millet-cowpea intercrop with cowpea sown two and eight weeks after millet were studied over a three-

year period (1986-1988). In each year, crop residues were removed. Soil analysis carried out at the beginning of the 1989 cropping season showed that soil organic matter and exchangeable Mg were higher in plots that received continuous pure stands of cowpea compared with other treatments. Millet as the test crop, absorbed more N on plots that received high levels of N fertilization in 1989, pure-stand cowpea and millet-cowpea intercrop with cowpea sown 2 weeks after millet than other treatments. Therefore, cowpea, especially when sown in pure stands, appears to be a good preceding crop to millet.

# NIGERIA

Nigeria was assigned research responsibilities in the areas of breeding for drought, *Striga, Alectra*, insect pests and disease resistances; cowpea agronomy, pathology and entomology for all three ecologies of semi-arid zones of West Africa.

a) **Breeding:**

**Preliminary cowpea yield trial:** Sixty newly introduced/selected lines were tested in a non-replicated trial at Samaru (in the northern Guinea savanna) and Minjibir (in the Sudan savanna). The local check (SAMPEA-7) was outyielded by 14 and 31 of the new lines at Minjibir and Samaru, respectively.

**Advanced yield trial:** Thirty lines were compared in a fully replicated trial sited at Samaru and Minjibir. Most of the lines outyielded the check varieties (SAMPEA 1, 4 and 7).

**Dual purpose cowpea trial:** Ten lines were tested at Gausau (in the Sudan savanna), Minjibir and Samaru. In general, lines 4/48-15-1, 7/180-4-5-1, 7/180-4-5B and 2/180-4-9 appeared promising.

**Hybridisation and selection:** A large number of single plant selections were made from F2 populations of crosses involving B301 and IT82D-849 (two sources of resistance to *Striga*) with SAMPEA 3 and 7.

**Multilocation cultivar trial:** Eight short duration, fourteen medium duration, eight dual purpose and nine vegetable cowpea cultivars were tested at Samaru as part of All-Nigeria coordinated cowpea research program. The promising lines were as follows: short duration: IT86D-719; medium duration: IT86D-957; dual purpose: IAR 7/180-4-5-1 and IAR 4/48-15-1; vegetable cowpea trial: IT83S-899 and IT83S-911.

b) **Agronomy:**

**Effect of seed size and phosphorus on the growth and yield of cowpea cultivars:** Two cowpea cultivars (SAMPEA-6 and SAMPEA-7) were tested at three levels of phosphorus (0, 37.5 and 75.0 kg P/ha). The seeds of the two cultivars were graded into three sizes (large, medium and small). Regardless of cowpea cultivars, seed size had no significant effect on grain yield while the application of P had significant positive effect on grain yield.

**Effect of rate and time of nitrogen application on cowpea grain yield:** Four levels of N (0, 20, 40 and 60 kg N/ha) were applied to cultivar SAMPEA-7 at three growth stages. Neither the rate nor the time of N application had a significant effect on grain yield.

**Response of cowpea to nitrogen and phosphorus fertilization:** Cultivar SAMPEA-7 was tested at four levels of nitrogen (0, 10, 20 and 40 kg N/ha) and three levels of phosphorus (0, 13.2 and 26.4 kg P/ha). Neither N nor P influenced grain yield significantly.

**Millet/cowpea genotype interaction**: Three millet cultivars (ex-Borno, SE 2124 and 'Maiwa') and five cowpea cultivars (SAMPEA-7, Ife Brown, TVx 3236, IT81D-1137 and IT84S-2246-4) were grown in all possible mixtures in a 1:1 row arrangement. Ex-Borno and SE 2124 outyielded 'Maiwa' millet in both pure and mixed stands. The cowpea cultivar IT81D-1137 performed best in both pure and mixed stands while IT84S-2246-4 gave the lowest yields. On the average, cowpea yield was reduced by about 41% in the mixture compared with sole plots.

**Productivity of maize/cowpea intercrop as affected by genotype and fertilizer application:** Two cultivars of maize (TZBSR-W and Ag-Kaduna) and four of cowpea (SAMPEA-1, SAMPEA-6, SAMPEA-7 and a farmer's variety) were intercropped in all possible combinations. Maize grain yield was not affected by component

cowpea but maize reduced cowpea yield by 81%. The improved cowpea cultivars did not outyield the farmer's variety significantly in both pure and mixed stands. In another trial, four levels of nitrogen (0, 75, 150 and 225 kg N/ha) three levels of phosphorus (0, 17.5 and 35 kg P/ha and two levels of potassium (0 and 50 kg K/ha) were tested in all possible combinations. Maize responded positively and cowpea negatively to N up to 75 kg N/ha. Maize response to P reached 17.5 kg/ha while grain yield of cowpea increased up to 35 kg P/ha. The two component crops showed no response to K.

c) **Studies on parasitic flowering plants:**

**Evaluation of cowpea cultivars for resistance/tolerance to *Striga gesnerioides*:** Out of the 23 cowpea cultivars tested on a *Striga* infested field at Bakura, only IT81D-994 and IT81D-985 had no emerged *Striga*. Other cultivars that were moderately resistant to *Striga* were SUVITA-2, IT82D-849, IT86D-843, TN93-80 and TN121-80.

**Effect of nitrogen sources and rates on parasitic weed infection on cowpea:** Pot culture and field experiments were conducted at Samaru and Darazo respectively to study the reactions of three cowpea cultivars: SAMPEA-7 (*Striga* susceptible), SUVITA-2 (moderately *Striga* resistant) and a local check to nitrogen sources (ammonium nitrate, ammonium sulphate, calcium nitrate and urea) and rates (0, 30, 60, 120 and 240ppm) in pot culture and (30 and 60 kg N/ha)in field studies. In pot culture, *Striga* shoots emerged almost exclusively from the check pots (no N applied) of SAMPEA-7 and SUVITA-2. However, there were some *Striga* shoots in pots of SAMPEA-7 treated with 60ppm of calcium nitrate and those treated with 30 ppm of urea. No *Striga* emergence or attachment was observed on plants from pots treated with either ammonium nitrate or ammonium sulphate. All N sources increased cowpea dry matter up to 30 ppm after which a decline was observed. In the field, all N-treated and untreated plots were heavily infested with *Striga*. However, N application

resulted in improved grain yield and crop vigour. Thus, N was effective in serving as palliative for cowpea to physiololgically withstand *Striga*.

**Inheritance of resistance to *Alectra vogelii* in cultivar B301:** The following eight populations of cowpea were inoculated with *Alectra* in pot culture in the greenhouse: four cultivars, namely B301, IT82D-849, SUVITA-2 and IT84S-2246-4; one F1 population (B301 x IT84S-2246-4); three F2 populations, namely B301 x IT82D-849, B301 x SUVITA-2 and B301 x IT84S-2246-4. B301 and the F1 population (B301 x IT84S-2246-4)2 were free of *Alectra* infestation while all plants of the other three cultivars were susceptible.

Plants of F2 populations segregated in ratio of 1:13:16, susceptible resistant. It, therefore, appears that the resistance of *A. vogelii* in B301 is controlled by two complementary dominant genes.

**Screening of germplasm for resistance to *Alectra*:** Fourteen lines introduced from IITA-Ibadan were grown in pot culture and artificially infested with *Alectra* seeds. The lines were categorised into the following groups:

- susceptible lines: supported high number of both emerged and attached *Alectra* plants: SUVITA-2, IT84S-2246-4, VITA-3, SAMPEA-7 and IT87S-1252.

- Lines which supported low number of emerged *Alectra* plants but relatively high number of attached *Alectra* plants (they also exhibited symptoms characteristic of *Alectra* infestation: dark green foliage and bunchiness of the upper internodes): IT81D-994 and IT86D-843.

- Resistant lines: supported few emerged and attached *Alectra* plants: B301, IT86D-472 and IT86D-534.

d) **Pathology:**

**Effect of seed treatment chemicals on seed-borne cowpea disease scab:** Out of the six (Delsene M, Rovral T5, Benlate, Fernasan D, Dithane M-45 and Apron Plus) fungicides tested, Benlate, Rovral T5 and Delsene M gave effective control of seed-borne infection of cowpea seedlings by the scab pathogen *Sphaceloma sp.* However, Delsene M (carbendazim x maneb) was the most efficacious of all the fungicides while Apron Plus was the least effective.

**Effect of fungicidal spray regime on the severities of scab and *Septoria* leaf spot of cowpea:** The best control of scab and septoria leaf spot was obtained at Samaru by spraying a tank mixture of Benomyl and Mancozeb at 7-day intervals beginning 4 weeks after sowing (WAS). Similar fungicidal efficacy and grain yields were obtained when cowpea was sprayed at 14-day intervals beginning 5 WAS and 7-day intervals beginning 6 WAS. The least efficacy was obtained when spraying was done at 14-day intervals beginning 6 or 7 WAS.

**Screening cowpea lines for multiple disease resistance:** Entries in nine cowpea international trials from IITA, four All-Nigeria Coordinated Cowpea trials and one IAR trial were screened in the field at Samaru for their reaction to scab (*Elsinoe phaseoli* with *Sphaceloma anamorph* state). *Septoria* leaf spot and bacterial blight (*Xanthomonas campestris pv. vignicola*). Results are as follows:

- Extra-early lines: only IT86D-1056 combined resistance to both scab and *Septoria* leaf spot but it was susceptible to bacterial blight. Line IT86D-792 was resistant to *Septoria* leaf spot.

- Medium maturing lines: none of the lines combined resistance to both scab and *Septoria* leaf spot. However, IT85D-3850-1 and IT85D-3850-2 were resistant to *Septoria* leaf spot.

- Bruchids resistant lines: none of the lines tested had high levels of resistance to both scab and *Septoria* leaf spot. Most of the lines were also susceptible to bacterial blight.

- Aphid resistance: only two lines IT82E-25 and IT85D-3577 were resistant to *Septoria* leaf spot.

- Vegetable cowpea: none of the lines was resistant to the pod phase of scab.

- Virus nursery: only one line, IT82E-16 was resistant to both bacterial blight and *Septoria* leaf spot.

- *Striga* resistance: only IT86D-400 combined resistance to both scab and *Septoria* leaf spot. Many of the lines were, however, resistant or moderately resistant to scab.

- All-Nigeria Coordinated Cowpea Trial: lines that were of interest include K59, H-113-4 and FARV 13 which combined resistance to both scab and *Septoria* leaf spot; IT84S-2246-4 which was resistant to scab; and IT85D-3577, L80, IAR 2/180-4-12 and IAR 7/180-4-5-1, which were resistant to *septoria* leaf spot.

e) **Entomology**

**Biology and bionomics of *Clavigralla sp.*:** Field observations of the pod-sucking bugs (*Clavigralla spp.*) showed that they arrived later and their number was smaller in 1990 compared with 1989. The adults occurred on cowpea before pods were produced. They later fed on both green and dry pods but dry pods were preferred. The nymphs fed on green pods and were rarely found on dry pods. Populations peaked in October and November. Pigeon pea (*Cajanus cajan*) was found to be an alternative host of *Clavigralla*.

**Field screening of cowpea lines for resistance to insect pests:** Out of the thirteen local varieties screened at Minjibir, only four, Achishuru (red), Achishuru (purple), Dan-Alokawa and Dan-Karadua possessed some levels of resistance/tolerance to *Maruca* and thrips.

**Chemical control of insect pests:** Of the six insecticide formulations tested, Cymbush supper ED at 0.5 l/ha, Sherpa plus at EC at 1 l/ha, Festac EC at 0.3 l/ha and Polythrin EC at 1.0 l/ha were effective against thrips and *Maruca testulalis*. An insect growth inhibitor, CGA, was also effective in controlling *Maruca*.

**Cultural control of cowpea insect pests:** The effect of chilli pepper on insect pests of cowpea was investigated in a cowpea/pepper mixture. Pepper did not offer protection against thrips and *Maruca*. Pod sucking bugs were not counted due to low number of pods.

f) **SAFGRAD-RENACO regional cowpea trial**

Three trials were conducted and results obtained are as follows:

- Adaptation trial for the northern Guinea savanna:The trial was conducted at Samaru. Lines KVx396-4-4, KVx396-4-2, KVx396-4-5 and KVx396-18 were very promising for yield, seed colour and seed texture.

- Adaptation trial for the Sudan savanna zone: This trial was conducted at Minjibir. The trial plot was infested with *Striga*. Though heavily infested with *Striga*, lines KVx396-18-10 and TN88-63 gave the highest grain yields; suggesting that they are tolerant to *Striga*.

- *Striga* resistance trial: This trial was conducted at Minjibir in *Striga* sick plot. Cultivar B301 was free of *Striga* attack. Lines TN121-80 and TN93-80 combined good resistance to *Striga* with high grain yields. Although SUVITA-2 and IT82D-849 exhibited high resistance to *Striga*, their grain yields were low. Lines KVx396-4-4-4 and KVx 4-4-2 appeared to be tolerant to *Striga*.

# PART II.

# ASSOCIATE CENTERS

Associate Centers are those national cowpea programs estimated to possess reasonably sufficient research infrastructure and technology development capabilities. They are, therefore, entrusted with research validation activities with a major objective of assertaining the performance of newly developed technologies by Lead Centers of the Cowpea Network and IITA.

# BENIN

As a RENACO associate Center, Benin was assigned research validation activities in 1989 for *Striga* resistance for coastal regions.

a) **Breeding:**

**Germplasm conservation:** The entire germplasm collection of Benin was planted in 1990 for regeneration as well as for field observation purposes.

**Breeding nurseries:** Crosses were made in 1990 with the objective of improving cowpea for bruchid resistance, grain quality (white and large seeds) and plant type. Lines from F2 to F8 were evaluated during the season.

**Cowpea cultivar trials:** Several cowpea cultivar trials were conducted in 1990 throughout the country.

- **Early maturing cultivars:** The trial was established at two locations, Niaouli and Adjohoun, in southern Benin. Only cultivar IT86D-1010 from IITA performed either equally or better than the local variety, Kpodjiguegue at both locations.

- **Medium maturing cultivars:** The trial which consisted of ten cultivars from IITA was established only at Niaouli. Only IT86D-535 gave a yield greater than 1.0 t/ha.

- **Variety trial for adaptation to savanna zones:** The trial which consisted of nine cultivars from IITA and a local check was established at Save and Iboulofin in south of Benin and at INA, Ndali in northern Benin. Only cultivar IT85D-3517-2 performed well across locations.

- **Nationally coordinated cultivar trial**: The trial consisted of 12 best lines identified from previous research work in the country.

  . In the south, the trial was established at six locations. Only cultivars IT84S-2246-4 gave the best performance (92 to 141% of the yield of the check) across locations. Other cultivars of interest were: IT84D-513 and TVx 1850-01F.

  . In the north, the trial was established at four locations. Only TVx1999-01F gave the best performance across locations; it was consistently among the six top high yielders. Other cultivars of interest were: TVx1850-01F and IT81D-1137.

- **Yield testing of bruchid resistant cultivars:** This consisted of nine bruchid resistant lines from IITA and a local check Kpodjiguegue. The trial was established at Niaouli. Cultivar IT86D-364, IT84S-2246-4 and Kpodjiguegue gave yields greater than 1.0 t/ha.

- **Yield testing of aphid resistant cultivars:** The trial consisted of nine aphid resistant cultivars from IITA and a local check, Kpodjiguegue. It was established at Niaouli. None of the introduced cultivars out-yielded Kpodjiguegue.

b) *Striga* **resistance Studies:**

- **RENACO regional *Striga* resistance trial:** The trial which consisted of 12 cultivars from RENACO was established at two locations: Tindji and Bohicon, in farmers fields in southern Benin. At both locations, no *Striga* shoot emerged in plots of cultivars KVx396-6-1, B301, IT82D-849, TB93-80, TN121-80 and SUVITA-2. Yieldwise, the *Striga* susceptible cultivars, IT82E-32 and IT82E-16 outyielded or gave yields similar to the best *Striga* resistant cultivars, IT82D-849

and B301 at both locations. All the other above mentioned resistant cultivars gave low yields because of their susceptibility to viral and fungal diseases.

- **IITA international *Striga* resistance trial:** Ten entries from IITA-Ibadan were grown at two locations, Agbangnizoun and Zakpota in farmers' fields in southern Benin. At Agbangnizoun, no *Striga* shoot emerged from plots of IT82D-845, IT81D-994, B301 and SUVITA-2. At Zakpota, *Striga* shoots emerged in plots of all tested cultivars. However, it should be noted that:

  (i) Cultivar IT81D-994, IT82D-849 and SUVITA-2 had the least *Striga* shoots per plot (0.0, 0.5 and 0.75 *Striga* shoots per plot, respectively). *Striga* emerged from their plots 55, 43 and 50 days after sowing. Thus, they appeared to be *Striga* resistant.

  (ii) B301 had 2.75 *Striga* shoots per plot and *Striga* emerged 43 days after sowing; suggesting that it had high level of resistance to the Zakpota *Striga* strain.

  (iii) For all the remaining cultivars, *Striga* shoots per plot ranged from 7.75 to 32.50 and *Striga* emerged 36-43 days after sowing; indicating that they were susceptible to the Zakpota *Striga* strain.

The Zakpota *Striga* strain, therefore, appeared to be the most virulent in the RENACO member countries. Lines B301, IT81D-994 and IT82D-849 gave the highest yield at both locations.

# MALI

Mali was assigned research validation activities mainly on *Striga* resistance for Sahelian and Sudanian zones in 1989 as an Associate Center.

a) **Breeding**

**Breeding nurseries:** Several crosses were made from 1985 up to date. The objectives are as follows:

- Disease resistance: (IAR 1696 x Niban) and (Bambey 21 x 15-316).
- Bruchid resistance: (TVu2027 x TVu123).
- Grain quality: (IPAO-201 x TVu79).
- *Striga* and drought resistance (SUVITA-2 x TVu123) (SUVITA-2 x TVu79) (B301 x IAR 1696), (B301 x Niban), (B301 x TVu7607), (B301 x Amary Shô), (B301 x TVu2027) (IAR1696 x IT82D-849), (Niban x IT82D-849), (TVu7607 x IT882D-849), (Amary Shô x IT82D-849) and TVu2027 x IT82D-849.

The crosses have been advanced to different stages of generations.

**Advanced yield test:** Only advanced lines from the cross Niban x IAR 1696 were subjected to yield test in 1990. The best disease resistant lines were as follows:

- Seed yield (1.5 - 1.7 t/ha) for 600-900 mm rainfall zone: lines 106, 149 and 112.

- Fodder yield (3.0 - 4.5 t/ha) for 600-900 mm rainfall zone: lines 100 and 343.

**Evaluation of local germplasm:** Local germplasms were evaluated throughout the country in 1990. The results are follows:

- Early maturing varieties (55-65 days to maturity for the 400-600 mm rainfall zone): TVu 9352, TVu7607 and CIPEA-8273 were promising; yield ranged from 700 to 900 kg/ha.

- Intermediate maturing varieties (75-90 days to maturity, for the 600-900 mm rainfall zone): TVu7607, TVu7682 and Amary Shô appeared promising; yield ranged from 1.0 to 1.5 t/ha.

- Dual purpose cowpea varieties: TVu7968 and TVu7651 were promising; seed yields ranged from 0.6 to 0.9 t/ha and fodder yields from 2.0 to 2.5 t/ha.

- Cowpea varieties for forage or silage (for the 600-900 mm rainfall zone): TVu 7645, TVu7702 and TVu7632 with fodder yield of about 3.0 t/ha were the best.

**RENACO regional observation nurseries:** Two observation nurseries were received from RENACO and were established at Cinzana in 1990. The results were as follows:

F9 lines combining *Striga*, Aphids and Bruchids resistance: With respect to seed yield and field disease and insect pests resistance, lines KVx 291-47-224, KVx 305-118-31, KVx305-118-32 were the best; their yields ranged from 1.4 to 1.8 t/ha. Other lines of interest included: KVx 295-124-51, KVx 295-2-124-52 and KVx 295-2-124-99. The lines were not screened for either *Striga* or insect pest resistance.

**F8 lines combining good adaptation and *Striga* resistance:** With respect to yield and field disease and insect pests resistance, lines: KVx397-9-11, KVx399-29-2 and KVx401-3-2 were the best; their yield ranged from 1.3 to 1.9 t/ha. Other lines of interest included KVx397-6-6, KVx397-41-1, KVx402-5-2, KVx402-5-3, KVx402-19-5 and KVx402-24-6.

The lines were not screened for *Striga* resistance.

b) **Entomology**

**Field evaluation of 9 lines introduced from RENACO for their reaction to insect pests:** The trial was established at Cinzana, in Sudan savanna zone, in 1990. Lines IT86D-560 and IT87D-1827 were not infested by aphids. They also had the least number of *Maruca* pod borers as compared to other lines. Lines IT86D-560 and KN-1 (Aphids susceptible check) were among the highest yielding entries.

Bruchid resistance biological test conducted in the laboratory revealed that IT86D-713 was resistant; IT84S-2246 and IT87S-1393 were tolerant while KN-1 was most susceptible to bruchid.

c) *Striga* **control studies**

Studies conducted to date have revealed that:

- B301 and SUVITA-2 were free from *Striga* infestation, though occasionally at some locations few *Striga* shoots emerged from their plots. This could be attributed to the presence of either outcross among varietal seed or new and more virulent strains of *Striga*.

- KVx61-1, KVx65-114, IT82D-849 and KVx61-74 have good level of resistance to *Striga*. They, however, exhibited low level of susceptibility to *Striga* in some locations.

- TN88-63 is very tolerant to *Striga*; while
- Bambey-21 is very susceptible to *Striga*.

**RENACO regional *Striga* resistance trial:** The trial consisted of 12 cultivars from RENACO. It was conducted at Koporo (in the Sahel) in 1989 and Koporo and Cinzana (in the Sudan savanna) in 1990. The results were as follows:

- SUVITA-2 and TN121-80 were free from *Striga* across years and locations.

- TN93-80, IT82D-849 and B301 had few *Striga* infestation.

- The best cultivars with respect to yield and *Striga* resistance were: SUVITA-2, TN121-80 and TN93-80.

- Other cultivars of interest having good yields under *Striga* infestation were: KVx 396-8-5 and KVx 396-6-1.

***Striga* control measures:**

- Zero-tillage reduced *Striga* infestation by 60% as compared to ploughing but it gave the lowest yield.

- Cereal/cowpea intercropping: In intercrop, copwea effectively reduced *Striga hermontica* infestation by 70% (*S. hermontica* attacks cereals only).However in case of mixed infestation of the same field plot by *S.hermontica* and *S. gesnerioides,* it was better to use cowpea cultivars resistant to *Striga* than susceptible ones.

- Soil fertilization improved cowpea vigour, grain and fodder yields as well as *S. gesnerioides* vigour. Thus, fertilization had no effect on *Striga* control.

# PART III.

# TECHNOLOGY ADAPTING CENTERS

Technology adapting is a major component of the Cowpea Network activities. It constitutes the fundamental of regional trials. To this effect, it enables national cowpea programs appreciate the value and the relevance of new technologies developed within the Network. Such technologies may have direct or indirect benefits on cowpea production within the sub region.

Direct benefit is obtained when a new technology proves to be of good performance and is accepted and adopted by farmers of any country. Whereas, indirect benefit, is obtained when the technology is used for the fine tunning of a locally developed technology in order to improve and to attract farmers' interest. Note that although only activities of weak national programs are reported in this section it does not mean that Lead and Associate Centers are exempted from this activity.

## CAPE VERDE

The 1989 and 1990 activities of the national cowpea program of Cape Verde were concentrated on adaptation trials under farmers' conditions and regional trials.

In on-farm testing, varieties Mississippi Silver, KN-1 and IT83D-442 performed best. With regards to regional trials, observation nurseries were established in 1989 for *Aphids* and virus resistant lines. The local varieties performed better than the introducted lines and therefore none of the new or improved lines was retained. The trials will be repeated in 1991 to draw up a final conclusion

## CENTRAL AFRICAN REPUBLIC

The weakness of the Central African Republic (CAR) Cowpea Research Program appears to be a lack of properly structured Research Institute, not to talk of a cowpea research program. Nevertheless, varieties obtained from SAFGRAD and IITA before 1986 were tested and TN88-63 and KN-1 were found to be well adapted. Future research efforts will be concentrated on IITA and RENACO regional trials as well as sowing date trials. Technical assistance was solicited from RENACO in order to put the cowpea research component in CAR on a firm footing.

## COTE D'IVOIRE

In the absence of a breeder, research activites in Côte d'Ivoire were mainly concentrated on RENACO trials. The agronomist of the cowpea program also initiated chemical fertilizer trials on cowpea. Promising varieties from the RENACO regional adaptation trial for the transitional zone were KN-1, KVx165-14-1 and IT84S-2246-4.

In 1991, attention would be focused on the evaluation of local germplasm already collected, fertilizer, variety, sowing dates as well as minimum insecticide trials.

## THE GAMBIA

The regional trials (adaptation to Sudano-Sahelian savanna) conducted in 1989 and 1990 showed that KVx396-4-2, KVx396-4-4, KVx396-4-5 were the best varieties.

The quality of their grains was also found to be acceptable to consumers.

Other activities included on-farm testing sponsored by USAID, with the aim of extending improved cowpea cultivars to farmers.

## GUINEA BISSAU

In search of earliness and resistance to pod sucking bugs and diseases, the national program conducted regional adaptation trials, and Aphids and bruchids resistance trials. Artificial infestation facilities do not exist in Guinea Bissau. Although results are yet to be confirmed, the best cultivars were IT87S-1390 and IT85D-3517-2. *Striga* is not a constraint in Guinea Bissau.

The 1991 cowpea research activities will consist of verification of the 1989-90 results, collection of local germplasms, intercropping studies and identification of viral diseases. Since there is no virologist in the national program, technical assistance was requested from RENACO.

# GUINEA CONAKRY

The 1989-90 research activities included:

- Collection and classification of 144 local germplasms.
- Preliminary evaluation of introduced varieties - Cultivars IT85F-867-5, IT84D-449, IT86D-534 and IT84S-2246 were found to give good performance.
- Sowing date trial: 15 September appeared to be the optimum date for cowpea planting.
- Regional trial: trials conducted included adaptation to the transition zone and *Aphids* and bruchids resistance using artificial infestation. Lines IT87S-1459 and IT84S-2246 were found promising with regards to *Aphids* resistance.
- Minimum insecticide trials: two insecticide sprays were found to be effective.

The 1990 research program will be repeated in 1991 in addition to new RENACO regional trials.

The national program does not have a pathologist and would like to receive training/assistance in this area from RENACO.

# MAURITANIA

Cowpea production under irrigation appears to be the best option from the research results obtained. The results reported were the regional trials sent by IITA-SAFGRAD in 1987-88. Varieties KVx256-K17-12 and TN88-63 were retained because they were adapted while KVx30-G183 was retained for its resistance to bruchids.

RENACO regional trials were conducted and results were sent but not received by the RENACO Coordinator.

## TCHAD

Based on RENACO regional trials, varieties were tested for adaptation to the Sudanian and Sahelian savannas and *Striga* and bruchids as well as virus resistance. For several reasons, results of trials conducted in Tchad are not reliable; e.g. high coefficient of variation (C.V.) in case of adaptation trial, lack of *Striga* emergence, lack of virus attacks. It is however, worth noting that varieties KVx30-305-3G, TVx3236, IT81D-985, IT81D-994 and KN-1 obtained through RENACO regional trials are in the pre-extension stage. Tchad also requested for training of national scientists but it was noted that the arbitrary transfer of staff from one crop commodity to another was not compatible with the objective of RENACO, i.e. strengthening of the national cowpea program.

## TOGO

Cowpea resarch activities in Togo was carried out by different research organizations. Their objectives consisted of adaptation in the different ecologies throughout the country and *Aphids*, bruchids and *Striga* resistances.

With regards to adaptation, KVx396-4-2, KVx396-4-4, KVx 396-4-5, IT86D-535 and IT86D-719 appeared to be promising. In addition, IT87S-1393 and IT86D-1038 were found to be good for bruchid resistance. *Striga* was discovered in the southern part of the country quite recently and a *Striga* resistance trial was conducted. Gorom local (SUVITA-2) and IT82D-849 were found to resist *Striga* attack. Work was also carried out on artificial infestation with bruchids, bruchids control using natural products and intercropping techniques. Studies on these aspects will be repeated in the 1991 cropping season.

# PART IV.

# IITA CORE RESEARCH PROGRESS REPORT

Technical backstopping to RENACO is provided by IITA, especially in the area of technology development research strategies and technology transfer within the West and Central African region. Among many other things, IITA develop and supply multiple disease, insect pests, *Striga* and *Alectra* resistant/tolerant cultivars to RENACO. In addition training programs for national agricultural research systems is offered and also facilitates the organization of short term training sessions and seminars, monitoring tours and cowpea biennial workshops by RENACO.

This part of the report, treated in four parts according to subject matter, highlights progress of IITA cowpea research activities.

# IITA COWPEA ENTOMOLOGY

Dr. L.E. Jackai presented a report on IITA cowpea entomology. The main thrust is breeding for resistance against various insect pests which attack the cowpea crop at various stages of growth.

These include: pre-flowering pests (*Aphids craccivora* [(Kock)]), post-flowering (*Clavigralla tomentosicollis stal*) and pos-harvest pests (*Callosobruchus maculatus Fab.*).

The screening of cowpea for host-plant resistance (HPR) to the afore-mentioned insect pests follows the same scheme.

Scientists at IITA have observed that, in most cases TVu lines resistant to insect pests are pigmented and have small seeds. Hence, attention is being focused on Wild *Vigna* species which have provided the best resistance. So far, the main problem is their small seed size but breeders can use them as breeding materials to develop varieties that will possess acceptable seed size.

# IITA COWPEA BREEDING

Dr. B.B. Singh gave a progress report on cowpea breeding at IITA. He indicated that the plant breeding activities at IITA have been organised in such a way that a breeder (Dr. Myers) based at Ibadan takes care of breeding for host-plant resistance for humid areas whilst he (Dr. Singh) takes care of the dry savannas in Minjibir Kano, Nigeria.

The main objective of the breeding activities at Minjibir/Kano is to develop cowpea varieties for cereal-based cropping systems in West and Central African savanna.

Attemps have, therefore, been made to develop cultivars that can be grown in either pure stands or mixed cropping with minimal spray (maximum of 2) or no insecticide spray regime. Attention has also been focused on breeding against diseases (bacterial blight, *Septoria*, scab, etc), insect pests as well as parasitic weeds (*Striga* and *Alectra*). With this in view, there is all year round activities at Minjibir/Kano.

He mentioned that national programs (particularly Lead Centers) can get materials from IITA breeding program at any time.

Results obtained last year identified cultivar IT86D-719 as the best entry from short duration trials while IT86D-101, a white-seeded cultivar with small leaves and multiple disease resistance was also found promising.

In the medium duration cultivar trial, the outstanding entries were IT81D-1629 and IT87D-1134 which were not only resistant to bruchids but gave good yield with minimum spray.

Promising cultivars from the dual-purpose trial were IT88D-249-3 (which gave 2242 kg and 1120 kg/ha of fodder and grains respectively) and IT89D-433. Most of the cultivars were resistant to bruchids and aphids.

Some cultivars that could yield between 150-300 kg grains under farmers' conditions in mixed culture, with minimum or no spray were also identified.

With regards to breeding against diseases, IT88S-501-8 has been identified to be resistant to some of the major diseases and is presently being used for crossing.

- For *Striga*, the following crosses have been made with B301 and IT81D-994 (the two sources of *Striga* resistance): B301 x IT81D-994: B301 x SUVITA-2 and IT82D-849 x IT81D-994

- For *Alectra:* B301 x IT84S-2246-4,
  B301 x IT82D-849,
  IT81D-994 x IT82D-849,
  IT81D-994 x IT84S-2246

By transferring the *Striga* and *Alectra* resistant genes to IT84S-2246, it has been possible to get a line which is resistant to bruchids, thrips, aphids, *Striga* and *Alectra*.

# IITA COWPEA PHYSIOLOGY

Dr. Peter Craufurd presented IITA activities in the area of cowpea physiology in 1990.

The major studies involved prediction of flowering date and evaluation of techniques for quantifying temperature and photoperiod and for separating water response from temperature and photoperiod responses.

Another study consisted of screening of germplasm/lines for water use efficiency (drought) at two dates of sowing as well as influence of plant density. It was observed that there was more energy conversion at early sowing than late sowing as well as 50% reduction in yield due to late sowing.

There were also studies on morphological adaptation of cowpea to cereal intercrop (Millet/cowpea). The observations made indicated that grain and fodder yields were reduced by 40 and 23% respectively when erect cowpea variety was used compared with 23 and 5% reduction for spreading type.

Studies will continue on the screening for drought resistance, photoperiod and temperature resistance and yield and physiological responses of prostrate and erect cowpea to intercropping. Research will also be intensified on water as well as morphological adaptation and photosynthesis.

# IITA COWPEA PATHOLOGY

Dr. D.A. Florini, the newly-recruited IITA cowpea pathologist, indicated that she had just joined IITA and, therefore, did not have much to say than to appeal to national scientists for cooperation.

# PART V.

## RENACO REGIONAL TRIALS

Regional trial experimentation is considered the most appropriate vehicle for transferring new technologies developed by RENACO Lead Centers, IITA GLIP or any other sources to all member countries. Such technologies can either be used to step-up agricultural production if they are accepted and adopted by farmers of a given country or for the fine tunning of locally developed technologies to up-grade their performance so as to attract farmers attention and adoption.

# RENACO REGIONAL TRIALS

Dr. Muleba presented a report of the 1989/90 regional trials of RENACO. He indicated that there were seven regional trials:

- resistance to Aphids
- resistance to Bruchids
- resistance to virus
- resistance to *Striga*
- adaptation to transition zones
- adaptation to northern Guinea savanna zones
- adaptation to Sahelian and Sudanian zones

Out of the 53 sets of trials sent out, the total feeback received as at the time of presentation of the report was 35. However, eight logbooks which were received late were yet to be analysed.

The nine varieties included in the regional adaptation trial for northern Guinea savanna were grouped into five according to their yield and stability index.

With regards to the regional adaptation trial for Sudano-Sahelian zone, 11 varieties and a local check were compared. There was feeback from only Burkina Faso, Niger, Nigeria and Tchad.

For *Striga* resistance, 9 varieties were involved and feedback was received from Mali, Nigeria, Senegal and Benin.

The Aphids resistance trial involved ten varieties and there was feedback from Burkina Faso, Guinea Conakry, Guinea Bissau, Mali, Nigeria, Tchad and Togo. There was a high C.V. from the trial conducted in Tchad due to flooding but a higher C.V. obtained in Guinea Conakry could not be explained.

For Bruchids resistant, 10 varieties were involved and feedback was received from Burkina Faso, Cape Verde, Guinea Conakry, Guinea Bissau, Mali, Nigeria, Tchad and Togo. Again there were high C.V. values (> 30%) in many locations due probably to variations in block units, poor rainfall distribution or poor management.

Dr. Muleba observed that in order to improve the quality of regional trials, scientists should make as many observations as possible. These include: plant population, days to flower bud formation, flowering and maturity, disease, insect pest damages including bruchids and aphids and also yield.

Finally he emphasized that the idea of reporting the performance of regional trials is to enable national scientists understand the performance of new technologies across locations in the sub-region. Therefore, delaying feedback will result in delayed dissemination of information to farmers (on-farm trials).

# PART VI.

## ELECTION OF 50% OF THE MEMBERSHIP OF THE RENACO STEERING COMMITTEE

It is the practice of the Cowpea Network to renew 50% of its membership every two years. This, to ensure continuity of the committee and to permit as many national program scientists as possible, to serve on the Committee.

The renewal process takes place at the biennial workshop when several cowpea scientists from all over West and Central Africa and other Regional and International research Centers are present.

# ELECTION OF 50% OF THE MEMBERSHIP OF THE RENACO STEERING COMMITTEE

The session was chaired by Prof. A.M. Emechebe, assisted by Mr. A.Y. Yehouenou, French rapporteur, and Mrs. O. Alabi, English rapporteur. The objective of the session was to organise an election for the renewal of 50% of the membership of the above-mentioned Committee as stipulated in RENACO guidelines. Three out of the 17 member countries of RENACO were not present at the time of voting. They were Cameroon, Senegal and Tchad.

The old Steering Committee members were six at the beginning, but one of them had left for further studies. Out of the 5 old members, 3 were present at the workshop, viz.

- Dr. (Mrs.) C. Dabire
- Dr. O.O. Olufajo
- Mr. G. Amankwa

Those absent were Dr. J. Detongnon of Benin, sent as a Consultant to Cameroon by IITA and Mr. Ndiaga Cisse of Senegal whose wife was reported sick. Voting for the people who were absent was rejected by six against one vote.

Mr. G. Amankwa asked to be relieved from the membership of the Steering Committee as he planned to go for further studies. Therefore, only Dr. O.O Olufajo and Dr. (Mrs.) C. Dabire were retained in the committee, leaving four positions to be filled.

Commenting briefly before the voting process, the Chairman of the session reiterated the roles the Steering Committee members were expected to play. He said that Committee members were to be chosen taking into account the various disciplines of research and member countries of cowpea network. A participant also added that Steering Commitee members were expected to be energetic and dynamic and they should be capable of defending the interest of the cowpea network.

The following people volunteered for the four vacant positions on the Steering Committee.

| Name | Country | Areas of Specialization | Years of Research Experience |
|---|---|---|---|
| Mr. A. Traore | Mali | Breeder | 7 |
| Mr. M. Gumedzoe | Togo | Virologist | 16 |
| Mr. H. Hamma | Niger | Weed Scientist | 10 |
| Dr. F. Guilavogui | Guinea | Entomologist | 6 |
| Dr. K.O. Marfo | Ghana | Breeder | 11 |

The results of the election were as follows:

| | |
|---|---|
| Mr. M. Gumedzoe | 13 votes |
| Dr. K.O. Marfo | 13 votes |
| Mr. H. Hamma | 12 votes |
| Dr. F.L. Guilavogui | 11 votes |
| Mr. Aliou Traore | 6 votes |

The first four people with higher votes were elected as the new members of the Steering Committee. Mr. Aliou Traore, was however, placed on the waiting list and shall automatically replace any member of the Committee members who opt out for one reason or the other.

The new Steering Committee members is presented below:

| | | |
|---|---|---|
| 1) Dr. O.O. Olufajo | Agronomist | (Nigeria) |
| 2) Dr. (Mrs.) C. Dabire | Entomologist | (Burkina Faso) |
| 3) Mr. M. Gumedzoe | Virologist | (Togo) |
| 4) Mr. H. Hamma | Weed Scientist | (Niger) |
| 5) Dr. F.L. Guilavogui | Entomologist | (Guinea) |
| 6) Dr. K.O. Marfo | Breeder | (Ghana) |

The session ended with acclamation of the newly elected members.

# PART VII.

## REPORT, RECOMMENDATIONS AND VOTE OF THANKS FROM THE COWPEA NETWORK WORKSHOP

# REPORT OF THE COWPEA WORKSHOP

The report of the Cowpea Workshop session was read by the Chairman, Dr. O.O. Olufajo, at the closing ceremony of the Inter-Networks' Workshop/Conference.

The inter-network conference on food grain research and production in semi-arid Africa was held at Niamey, Niger from 8-14 March, 1991. During the conference, a total of 15 scientific papers were presented on various aspects of cowpea research. Four of the papers were presented during the joint sorghum-maize-cowpea session while the remaining 11 were presented during a separate cowpea session.

All the 17 member countries of RENACO, with the exception of Cameroon and Senegal, presented reports of their research activities for 1989-90. The Grain Legume Improvement Program of IITA also presented an overview of its research activities between 1989 and 1990. In addition, the Network Coordinator presented the results of the 1989-90 regional trials.

A significant achievement was the formation of working groups in areas of breeding, agronomy, entomology and pathology including *Striga*. The four working groups met to plan collaborative research.

An election was conducted to reconstitute the Steering Committee. The following people were elected to serve as members of the Steering Committee for the next two years:

| | | |
|---|---|---|
| 1) Dr. O.O. Olufajo | Agronomist | (Nigeria) |
| 2) Dr. (Mrs) C. Dabire | Entomologist | (Burkina Faso) |
| 3) Mr. M. Gumedzoe | Virologist | (Togo) |
| 4) Mr. H. Hamma | Weed Scientist | (Niger) |
| 5) Dr. F.L. Guilavogui | Entomologist | (Guinea) |
| 6) Dr. K.O. Marfo | Breeder | (Ghana) |

The Steering Committee held a meeting to deliberate on issues affecting the network. At the meeting, Dr.O.O Olufajo was unanimously elected as the Chairman of the Committee for the next one year. Furthermore, Dr. K.O. Marfo was elected as the English rapporteur while Mr. H. Hamma was made the French rapporteur. Highlights of the meeting include:

(i) **Assessment of Lead and Associate Centers**

The Committee was satisfied with the performance of the Lead Centers. It was unanimously decided that the Lead and Associate Centers should continue to carry out the responsibilities earlier assigned to them. However, the cowpea program of Senegal was asked to limit its activities to breeding for drought and disease resistance.

(ii) **Formulation of regional trials**

The following regional trials were formulated for 1991-92:

a) Adaptation to transition zone
b) Adaptation to Sudanian and Sahelian zones
c) Adaptation to northern Guinea savanna
d) *Striga* resistance
e) Breeding nursery

# RECOMMENDATIONS

1) Judging from the number and quality of scientific papers presented at the workshop, and the great interaction between the networks, it is recommended that the biennial inter-networks workshop should be encouraged.

2) The network noted with satisfaction the research output on cowpea by the various national programs as evidenced by the representations at this workshop. It is recommended that SAFGRAD should continue to support and encourage national programs through networking.

3) The network considers the formation of working groups as a set in the right direction. It is recommended that necessary support should be provided to the groups in order to facilitate the provision of solutions to common problems of cowpea production in the subregion.

4) Considering the devastating effects of parasitic flowering plants on cowpea in the subregion, the network recommends that research should be intensified on *Striga* and *Alectra*.

5) The network noted the strong need for higher degree and in-service training. It is recommended that higher degree training should be included in the next phase of SAFGRAD.

6) In view of the fact that cowpea is a very important crop in the Sahelian zone, the network wishes to re-emphasize the need for IITA to continue its research activities on cowpea in this zone in collaboration with ICRISAT through the Sadore station.

7) The network expresses its satisfaction with the efforts and diligence with which the Network Coordinator is handling the affairs of the Network.

# VOTE OF THANKS

The participants of the Cowpea Workshop held on 8-14 March, 1991 at Niamey, Niger, wish to express their most sincere gratitude to the Director General of the National Agricultural Research Institute (INRAN), Niger and his entire staff for making it possible to hold the Workshop under their auspices and to visit the nearby Kolo Research Station at Niamey.

The kind gesture of the Director of the ICRISAT's Sahelian Center and his staff for allowing the participants to visit their research structures at Sadore located at about 40 km from Niamey, was greatly appreciated.

The participants wish to express their gratitude to Dr. J.M. Menyonga, SAFGRAD International Coordinator and his colleagues, Drs. T. Bezuneh, G. Kingma and Messrs. E. Adanlete and D. Ouedraogo for the logistic support without which the tenure of the Workshop could not have been possible.

The participants wish to record their sincere gratitude to the International Institute of Tropical Agriculture (IITA) for their continued interest and support as was witnessed by the full participation of their cowpea research scientitists at the Workshop and to USAID for their financial support. The presence of Dr. Dennis McCarthy, Agriculture Development Officer (ADO), USAID/BF was a renewed motivation to the participants of the interest and firm commitment of USAID to the Cowpea Network.

The participants are grateful to Dr. N. Muleba, Cowpea Network Coordinator, for his indefatigable efforts and diligency in handling and executing the Network affairs.

The participants are pleased to thank the Government and people of Niger for their warm welcome and kind hospitality.

Finally but not the least, the diligent secretarial role played by Mrs. Ouedraogo Rachel of IITA/SAFGRAD, Konseiga Yvone and Victoria Adunvo of the SAFGRAD Coordination Office was highly acknowledged by the participants and hereby wish to express their sincere gratitude.

# APPENDIX I

## Report of the Cowpea Network Advisory Panel held on 12 March, 1991 at Niamey, Niger.

# REPORT OF THE COWPEA NETWORK ADVISORY PANEL

## I. ATTENDANCE:

### 1 Members of the Panel

| | |
|---|---|
| - Dr. A.B. Salifu | Chairman, Cowpea Entomologist, Ghana. |
| - Mr. Musa Bojang | Cowpea Agronomist, The Gambia. |
| - Dr. F.L. Guilavogui | Cowpea Entomologist, Guinea Conakry. |
| - Dr. J.B. Suh | Cowpea Entomologist, GLIP, Ibadan, Nigeria. |
| - Mr. S. Yassine | Agronomist, Tchad. |
| - Dr. (Mrs) C. Dabire | French Rapporteur, Entomologist, Burkina Faso. |
| - Prof. A.M. Emechebe | English Rapporteur, Plant Pathologist, Nigeria. |

### 2. Observer

| | |
|---|---|
| - Dr. N. Muleba | (Network Coordinator) for early part of the meeting only. |

### 3. Terms of Reference

The Advisory Panel, set up by the Network Coordinator, had the following terms of reference.

(a) The panel was expected to:

- Review responsibilities of Lead Centers according to areas of research assignment entrusted to them.
- Review research activities carried out as supported by results of country reports and scientific communications presented.

- Review regional trials and observation nurseries conducted since 1987 and feedback given to the Network Coordinator.
- Review technology output from the regional trials and their performance.
- Review research work plans for the 1991-92 crop season.
- Review other related activities as may be required.

(b) Having reviewed the above, the Panel should then provide the following:

i) Assessment of each Lead Center.

ii) Identification of promising Technology Adapting Centers that are capable of assuming responsibility in a given area of research interest to the network.

iii) Endorse or comment on technologies that are of interest to the network for inclusion in regional trials or observation nurseries.

iv) Comment on research work plans of Lead Centers and IITA.

v) Comment on any other pertinent matters of interest.

4. Documents consulted by the Panel

To discharge its responsibilities, the Panel consulted the following documents made available to it by the Coordinator:

1) Proceedings of the 1987 Workshop, Ouagadougou, March 23-27, 1987.

2) Proceedings of the 1989 Workshop and Country Reports.

3) Reports of the 2nd-8th Meetings of the Cowpea Steering Committee.

4) Report of Regional Trials, 1987-89.

5) Report of Regional Trials, 1989-90.

6) SAFGRAD-II: Proposal for Extension.

7) Country reports.

## II. PANEL'S REPORT

### 1. Assessment of Lead and Associate Centers

Having ascertained the specific responsibilities assigned to the Lead and Associate Centers, the Panel assessed each of the Lead Centers. The following represents the Panel's unanimous assessment of these centers:

### 2) Assessment of the Lead Centers

#### a) Burkina Faso

Burkina Faso National Program has made admirable progress in the discharge of its Network responsibilities in the areas of breeding for: resistance to *Striga*, drought tolerance, and resistance to insect pests. The Panel felt, however, that the achievements of Burkina Faso in cowpea virology research are not as outstanding as those in the above-mentioned three areas.

Whilst it is possible that progress in virology was probably not fully communicated at the Workshop (due to the absence of the virologist), and while noting that most materials are routinely screened for resistance to viruses (as indicated in 1989-90 Report on Regional Trials), the Panel recommends that Burkina Faso pays closer attention to cowpea virology work.

#### b) Cameroon

Initially, Cameroon had mandate for all aspects of entomology in all three ecologies. However, the Steering Committee (SC) later took cognisance of the staffing situation in Cameroon and asked it to concentrate its effort on storage entomology. After a hesitant start, Cameroon picked up rapidly and executed very good work on cowpea storage, using solar radiation, wood ash and plant products; it also made good progress in hermetic storage.

The Panel, however, noted that the scientist that did the above work left late in 1990 for a 3-year Ph.D. study in the USA.

Although the Cameroon Director of Research has assured the Network Coordinator that an Agronomist would be assisted by a Bean, CRSP scientist (probably a breeder), the Panel recommends that whilst Cameroon should be allowed to continue with as much work as possible (within its staffing constraints), Ghana should be requested to assume responsibility for cowpea storage work in the Sudan savanna. This will be additional to Ghana's present responsibility for cowpea storage research in transitional and coastal savannas.

**c) Ghana**

The Panel noted Ghana's present responsibility for breeding for adaptation to the transitional and coastal savanna zones, as well as cowpea storage entomology research in the same region.

The Panel noted with great satisfaction that Ghana had done a lot more work relevant to the Network than was assigned to it. Obviously, Ghana has the capacity to assume greater network responsibility.

In view of the above, the Panel recommends that Ghana assumes responsibility for breeding for drought tolerance, with special emphasis on heat tolerance. Ghana should also take additional responsibility for storage entomology research in the Sudan savanna, i.e., over and above its present responsibility for storage entomology work in transitional and coastal savanna zones.

The Panel also recommends that steps be taken by appropriate Ghanaian authorities to ensure that the present cowpea teams in that country are seen to be better coordinated.

**d) Niger**

The Panel noted that Niger has a lot of potential but, at least until recently, there has been little or no coordination of cowpea research effort during the past 2 or 3 years. This is evidenced by failure to submit reports in time.

In general, Niger has not adequately fulfilled its responsibility to the network. The Panel recommends, consequently, that the network should ease the present burden on Niger, at least in the immediate future.

In view of the above, Niger should retain responsibility for *Striga* research (i.e., breeding/selection for *Striga* resistance and pathological work on *Striga*). Pending the return of their breeder from Ph.D. study, the network's research effort on breeding for drought tolerance and on agronomic work for Sahelian zone should be executed by Burkina Faso, Ghana and Nigeria.

**e) Nigeria**

On the whole, Nigeria has creditably discharged its research responsibilities to the network. However, work in entomology appears to be lagging behind than in other disciplines; also, the breeder should be a lot more enterprising than he hitherto appears to be.

The Panel noted that Nigeria is expected to shoulder more squarely its responsibilities in these two areas. The Panel also noted that work in other areas has progressed at levels expected of Nigeria. Nigeria should be requested to assume additional relsponsibility for agronomic research in the Sahelian zone and for breeding for drought tolerance.

**f) Senegal**

The Panel noted that Senegal appears to have been assigned more responsibilities than it appears capable/willing to carry. It was also noted that Senegal does not appear to be willing to exchange scientific materials and information with scientists in other countries of the network. Senegal has not done much work in chemical control of insect pests, probably because the scientist had left.

The Panel recommends that the Network should lessen Senegal's network load so that it concentrates only on drought resistance, an area of research that should naturally attract the highest priority in that country. Senegal should also strive to improve communication links with other members of the network.

2) Assessment of Associate Centers

**a) Mali**

The Panel was sufficiently impressed by the performance of Mali as an Associate Center and recommends that Mali be assigned responsibility for relevant aspect of cowpea research in the Sahelian zone, as an Associate Lead Center.

3) Comments on work plans

**i) Cameroon**

The work plan submitted by Cameroon is not consistent with its mandate.

**ii) Nigeria**

The proposal to study the biology and bionomics of *Clavigralla* is not recommended for approval because a lot of work has been done on it in the past, especially by IITA. The IAR entomologist is advised to up-date himself on the subject bearing in mind that

*Clavigralla* was formerly called *Acanthomia*. Otherwise the rest of Nigeria's work plan is consistent with their responsibility to the network.

**iii) Mali**

What Mali has proposed as five trials should really be one trial. The crop bambara groundnut being outside the network's mandate; the remaining 4 trials should be combined into one trial captioned: "Evaluating local cowpea lines/landraces for resistance to biotic (*Striga* and viruses) and abiotic (drought) stresses and for their performance in mixed cropping".

**iv) Ghana**

Their work plan is consistent with their present responsibility to the network.

4) Comments on technologies

The Panel believes that this should be better handled by the Steering Committee, especially as the Panel did not have access to most of the technologies proposed by the various NARS and by the IITA.

5) Other matters

i) **Assessment of achievements of the Network**

The Panel recommends that rather than send a team to tour member countries to assess the achievement of the network, the Network Coordinator and the Steering Committee (SC) should prepare a questionnaire on achievement indicators and send it to national Cowpea Coordinators in various countries for completion and subsequent return to the Coordinator.

ii) **Technology adapting NARS**

The Panel noted the present arrangement for strengthening weaker NARS through visits by experienced scientists (although these need not necessarily be SC members) from more advanced NARS. It is recommended that this type of assistance be intensified, as should be the practice of providing minor research equipment/ materials to these weaker NARS. The network is reminded of the adage that "a chain is as strong as its weakest link".

# APPENDIX II.

## List of Cowpea Participants to the Niamey Workshop, Niamey, Niger, 8-14 March, 1991

**List of Cowpea Participants to the Niamey Workshop, Niamey, Niger, 8-14 March, 1991.**

| Country | Name of scientist | Address |
|---|---|---|
| **BENIN** | 1. Yehouenou Alphonse | Phytotechnicien, DRA, BP 884 Cotonou, Bénin |
| **BURKINA FASO** | 2. Clementine Dabire | Entomologiste, INERA 01 B.P. 476, Ouagadougou, 01 Burkina Faso |
| | 3. Ouedraogo T. Jeremy | Phytoamélioratéur, INERA, 01 B.P. 476 Ouagadougou, 01 Burkina Faso |
| **CAPE VERDE** | 4. Carlos E.P. Silva | Phytotechnicien, Institut National d'Investigation Agraire, B.P. 50 Praia, Cap Vert. |
| **CENTRAL AFRICAN REPUBLIC** | 5. Yandia Abel | Entomologiste, Chef de Station Agricole de Soumbe, BOSSANGA, Coordinateur National niébé, B.P. 997, Bangui |
| **COTE D'IVOIRE** | 6. Adou Amalaman | Phytotechnicien, Institut des Savanes (IDESSA) 01 B.P. 635, Bouake 01 |
| **GAMBIA** | 7. Bojang Musa | Agronomiste, Dept of Agric. Research Ministry of Agriculture Yundum Agric. Station Yundum |

| Country | Name of scientist | Address |
|---|---|---|
| **GHANA** | 8. J.K. Twumasi | Pathologist, Crops Research Inst. P.O. Box 3785, Kumasi, |
| | 9. Afun K. Jakpasu | Entomologist, Crops Research Inst. P.O. Box 3785, Kumasi, |
| | 10. Marfo K. Owusu | Breeder, Nyankpala Agric. Expt. Station, P.O. Box 52, Tamale |
| | 11. Owusu-Akyaw Michael | Entomologist, Crops Research Inst. P.O. Box 3785, Kumasi, |
| | 12. Salifu Abdullah Baba | Entomologist, Crops Research Inst. Nyankpala Agric. Expt. Station, P.O. Box 52, Tamale |
| | 13. Godfreid A. Amankwa | Breeder, Crops Research Inst. P.O. Box 3785, Kumasi |
| | 14. Asafu-Agyei J.N. | Agronomist, Crops Research Inst. P.O. Box 3785, Kumasi |
| **GUINEA** | 15. Guilavogui Fode Laye | Entomologiste, Coordinateur National Niébé, IRAG/MARA, BP. 576, Conakry |
| **G. BISSAU** | 16. Isabel Miranda | Phytotechnicienne MDRA/DEPA/CENEMAC BP 71, Bissau |
| **MALI** | 17. Aliou Traore | Phytotechnicien IER/SRCVO, B.P. 438, Sotuba, Bamako |
| **MAURITANIA** | 18. Sidi R'Chid | Phytotechnicien Centre National Recherche Agro. et du Dév. Agricole, BP 22, Kaedi |

| Country | Name of scientist | Address |
|---|---|---|
| **NIGER** | 19. Adamou Moutari | Phytoamélioratteur INRAN, BP 429, Niamey |
| | 20. Hame Abdou Kadi | Entomologiste, INRAN, BP 240, Maradi |
| | 21. Cherif Ari Oumarou | Phytotechnicien INRAN, BP 429, Niamey |
| | 22. Hamma Hassane | Spécialiste du *Striga* INRAN, BP 240, Maradi |
| | 23. Mohamaed Nouhoum | Phytoamélioratteur Cowpea Breeder, INRAN, BP 240, Maradi |
| | 24. Maiga D. Seyny | Entomologiste, INRAN/KOLLO, Niger |
| **NIGERIA** | 25. Yayock Joseph Y. | Professeur of Agronomy & Director, Institute for Agric. Research, Ahmadu Bello University PMB 1044, Zaria |
| | 26. Alphonse M. Emechebe | Professor of Phytopathology & Dean, Faculty of Agric. Ahmadu Bello University, PMB 1044, Zaria |
| | 27. Alabi Olufunmilola | Phytopathologist, IAR/Ahmadu Bello University, PMB 1044, Zaria |
| | 28. Adu J.K. | Microbiologist, IAR/Ahmadu Bello University, PMB 1044, Zaria |
| | 29. S.T.L. Lagoke | Weed scientist IAR/Ahmadu Bello University, PMB 1044, Zaria |

| Country | Name of scientist | Address |
|---|---|---|
| NIGERIA (Cont'd) | | |
| | 30. Olufajo, O.O. | Agronomist, IAR/Ahmadu Bello University, PMB 1044, Zaria |
| | 31. Sheybayan Joseph A.Y. | Agronomist, Department of Agronomy IAR/Samaru, Ahmadu Bello University, PMB 1044, Zaria |
| TCHAD | 32. Gaye Sewa Yassine | Phytotechnicien, Station Expérimentale de Gassi, BP. 101, Ndjamena |
| TOGO | 33. Reneaud Henri | Phytotechnicien, Responsable de la Production Agricole Accélérée (RPAA), B.P. 218, Kara |
| | 34. Toky Payaro | Phytotechnicien Ingénieur Agronome Programme RPAA/SAFGRAD/ DRA, B.P. 2318, Lomé |
| | 35. Gumedzoe Y. Mawuena | Phytotechnicien Université du Benin Ecole Supérieure d'Agronomie B.P. 1515, Lome |
| | 36. Akossiwa Duyiboe | Phytotechnicienne Responsable Programme National Niébé, Direction de la Recherche Agronomique B.P. 2318, Lomé |
| NETWORK COORDINATORS | | |
| | 37. Nyanguila Muleba | SAFGRAD Cowpea Network Coordinator for West and Central Africa OAU/STRC/SAFGRAD/IITA, 01 B.P. 1783, Ouagadougou 01, Burkina Faso |

| Country | Name of scientist | Address |
|---|---|---|
| **ORGANIZATIONS** | | |
| ICRISAT: | 38. Bonny R. Ntare | Principal Groundnut Breeder, ICRISAT Sahelian Center, BP 12404, Niamey, Niger |
| | 39. Sogodogo Diakalia | Phytotechnicien ICRISAT/Mali, Programme Bilatéral, BP. 34, S/C Ambassade Américaine, Bamako, Mali |
| IITA: | 40. Singh, Bir B. | Breeder, IITA Kano Sub-Station Sabo Bakin Zuwo Road PMB 3112, Kano |
| | 41. Craufurd Peter | Crop Physiologist, ICRISAT-WASIP, Kano Sub-Station, PMB 3112, Sabo Bain, Zuwo Road, Kano |
| | 42. Suh, Joseph B. | Entomologist, IITA, PMB 5320, Ibadan, Nigeria |
| | 43. Hossain M.A. | Grain Legume Breeder, IITA-Ghana Crops Research Institute, P.O. Box 3785 Kumasi, Ghana. |
| | 44. Jackaï, L.E.N. | Entomologist, IITA-GLIP, PMB 5320 Ibadan, Nigeria |
| | 45. Florini A.D. | Regional Outreach Specialist, IITA, PMB 5320 Ibadan, Nigeria |
| | 46. Deganus, E.F. | Coordinator, Special Projects,International Cooperation, IITA PMB 5320, Ibadan Nigeria |

| Country | Name of scientist | Address |
|---|---|---|
| CRDI-CANADA: | | |
| | 47. Saïdou Koala | Senior Program Officer<br>Crops Production Systems<br>Agriculture, Food and<br>Nutrition, B.P. 11007<br>CD Annexe, Dakar, Sénégal |
| USAID/BURKINA | | |
| | 48. Denis McCarthy | Agriculture Development<br>Officer, ADO<br>USAID/BF, Ouagadougou |
| | 49. Kingma, G. | Senior Project Advisor<br>USAID/SAFGRAD<br>01 B.P. 1783<br>Ouagadougou 01<br>Burkina Faso |
| SAFGRAD: | | |
| | 50. Menyonga, J.M. | International<br>Coordinator<br>OAU/SAFGRAD, 01 BP 1783<br>Ouagadougou 01<br>Burkina Faso |
| | 51. Bezuneh, T. | Director of Research<br>OAU/SAFGRAD<br>01 B.P. 1783<br>Ouagadougou 01<br>Burkina Faso |
| | 52. Adanlete, E. | Accountant,<br>OAU/SAFGRAD<br>01 B.P. 1783<br>Ouagadougou 01<br>Burkina Faso |
| | 53. Ouédraogo, D. | Chef de Personnel<br>et Services Généraux<br>OUA/SAFGRAD<br>01 B.P. 1783<br>Ouagadougou 01<br>Burkina Faso |

# APPENDIX III.

## List of National Scientists whom their Research Work was Presented in Country Reports at the Cowpea Workshop in Niamey, Niger, 8-14 March, 1991

**List of National Scientists whom their Research Work was Presented in Country Reports at the Cowpea Workshop in Niamey, Niger, 8-14 March, 1991**

| Country | Scientist/ Collaborator | Specialization |
|---|---|---|
| **Benin** | 1. Detongnon J. | Cowpea Breeder |
| | 2. Adomou M. | Agronomist |
| | 3. Aihou K. | Agronomist |
| | 4. Arodokoun D. | Entomologist |
| **Burkina Faso:** | 1. Dabire C. (Mme) | Entomologist |
| | 2. Ouedraogo J. | Cowpea Breeder |
| | 3. Sereme P. | Phytopathologist |
| | 4. Konate G. | Virologist |
| **Cape Verde:** | 1. Silva C. | Agronomist |
| **Central African Republic** | 1. Yandia A. | Entomologist |
| **Côte d'Ivoire** | 1. Adou Amalaman | Agronomist |
| **Gambia:** | 1. Bojang M. | Agronomist |
| **Ghana:** | 1. Marfo K.O. | Breeder |
| | 2. Assibi M.A. | Breeder |
| | 3. Tanzubil P.B. | Entomologist |
| | 4. Amankwa G.A. | Breeder |
| | 5. Owusu-Akyaw M. | Entomologist |
| | 6. Twumasi J.K. | Pathologist |
| | 7. Affun V.J. | Entomologist |
| | 8. Agyei J.N.A. | Agronomist |
| **Guinea Bissau:** | 1. Biai A. | Agronomist |
| | 2. Fonsesca D. | Agronomist |
| **Guinea Conakry:** | 1. Guilavogui F.L. | Entomologist |
| **Mali:** | 1. K. Ondie | Breeder |
| | 2. A. Traore | Breeder |
| | 3. Yaro D.N.(Mme) | Entomologist |
| | 4. Sogodogo D. | Agronomist |
| | 5. A. Konate | *Striga* Specialist |

| Country | Scientist/ Collaborator | Specialization |
|---|---|---|
| **Mauritania:** | 1. Sidi R'Chid | Agronomist |
| **Niger:** | 1. Adamou Moutari | Cowpea Breeder |
| | 2. Mohamed Nouhoun | Cowpea Breeder |
| | 3. Ahamadou N'Diaye | Entomologist |
| | 4. Adam Toudou | Pathologist |
| | 5. Hassane Hamma | *Striga* Specialist |
| | 6. Cherif Ari Oumarou | Agronomist |
| **Nigeria:** | 1. Zaria A.A. | Breeder |
| | 2. Emechebe A.M. | Pathologist |
| | 3. Odion E.C. | Agronomist |
| | 4. Amatobi C. | Entomologist |
| | 5. Olufajo O.O. | Agronomist |
| | 6. Adu J.K. | Microbiologist |
| | 7. Sheybayan J.A.Y. | Weed Scientist |
| | 8. Lagoke S.T.O. | Weed Scientist |
| | 9. Yayock J.Y. | Agronomist |
| **Tchad:** | 1. Valenghi D. | Agronomist |
| **Togo:** | 1. Adri K. | Agronomist |
| | 2. Akpaloo A. Yawo | Entomologist |
| | 3. A. Duyiboe(Mme) | Agronomist |
| | 4. Daou Ekou-Edi | Entomologist |
| | 5. Mawuena Gumedzoe | Virologist |
| | 6. Henri Reneaud | Agronomist |
| | 7. Toky Payaro | Agronomist |

1992-02

# COWPEA WORKSHOP: i COUNTRY REPORTS AND OTHER ACTIVITIES

MULEBA, Nyanguila

IITA