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SCIENTIFIC, TECHNICAL AND RESEARCH COMMISSION
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SEMI-ARID FOOD GRAIN RESEARCH AND DEVELOPMENT
(SAFGRAD)

WEST AND CENTRAL AFRICA COWPEA NETWORK

"Réseau Niébé de l'Afrique Centrale et Occidentale"

(RENACO)

RENACO 1991-1992 REGIONAL TRIALS

PRELIMINARY RESULTS

MAY, 1992

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DECLARATION

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

EXECUTIVE SUMMARY

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A total of 85 sets of an observation nursery and four regional cultivar trials were dispatched to RENACO member countries for testing in May/June 1991. The cultivars were supplied by RENACO Lead Centers and IITA. Feedback was received on 61 sets or 71.8% of the total at the time of writing this report. In spite of variable growing conditions and agronomic practices used, very encouraging results were obtained as follows:

- **Observation nursery:** The most promising lines that appeared to be better adapted across locations were: KVx402-5-2, IT89KD-374, IT87D-697-2, KVx295-2-124-51, IT89KD-245 and IT86D-719.

- **Regional *Striga* Resistance Trial**: Although none of the listed cultivars was immune to *Striga* at all the tested locations, B301, IT81D-994 and KVx291-47-222 exhibited the highest level of resistance. With regards to yield, the following cultivars were the best adapted and gave the highest yield across locations B301, KVx402-5-2, KVx402-19-1, KVx291-47-222, KVx397-6-6, KVx402-19-5 and KVx164-65-5. It appears, therefore, that KVx402-5-2 and KVx402-19-5 are able to withstand *Striga* infestation much better, implying that they are *Striga* tolerant.

- **Regional Trial for Adaptation to Sudanian-Sahelian Zones:** The most adapted cultivars were: KVx402-5-2, KVx396-4-5-2D, KB85-18, KVx402-19-5 and B89-504N;

- **Regional Trial for Adaptation to the Northern Guinea Savanna:** The most adapted cultivars were: KVx396-4-5-2D, KN-1 (Vita-7), CR-06-17, KVx402-19-1 and KVx402-5-2.

- **Regional Trial for Adaptation to Transition and Coastal Zones:** The most adapted cultivars were: IT82E-32, CR-06-07 and IT82E-16.

Several national programs were able to identify the most promising lines or cultivars at the end of the first year of cultivar testing. It is expected that further tests will be carried out before considering them for possible release to farmers.

INTRODUCTION

INTRODUCTION

Regional trial is a major component of the Cowpea Network activities. Considered the most appropriate vehicle for technology transfer to participating member countries, its role in strengthening networking efforts can not be questioned, not to talk of its being a practical indicator for measuring progress made in network collaborative research activities.

Until 1987, cowpea crop technology development research activities in the sub-region were ensured either by the International Institute of Tropical Agriculture (IITA) headquarters in Ibadan, Nigeria or its out-reach research activities at Niamey, Niger in collaboration with the International Crop Research Institute for Semi-Arid Tropics (ICRISAT) and the Semi-Arid Food Grain Research and Development (SAFGRAD) project in Ouagadougou, Burkina Faso.

In 1987, a West and Central Africa Cowpea Collaborative Research Network, popularly known by its French acronym as "RENACO" was initiated with the provision of 100% of technologies for regional testing from IITA since the RENACO member countries were not yet in a position to nominate any new technology for testing at that time.

To remedy the situation RENACO organized an aggressive training program consisting of cowpea monitoring tour to some key national programs including IITA headquarters, Ibadan in 1987 followed by a Seminar for RENACO Lead Centers at IITA. The major objective of the training program was to stimulate and boost the initiative and capacity of national scientists to solving cowpea production constraints themselves by exposing them to different types of constraints and the available research methodologies in the sub-region. In addition, some financial assistance and small materials were supplied to RENACO Lead Centers and other member countries to enhance the efficiency of their research activities.

The total number of technologies distributed for regional testing in 1989 was reduced substantially as compared to 1987-88, giving room to the contribution of good quality technologies for regional testing from the RENACO Lead Centers, namely Burkina Faso, Ghana, Niger and Nigeria.

In 1991, the quality of regional trials improved even better, thus, permitting the grouping of trials on agro-ecological basis, involving several cultivars in a given ecology combining good agronomic backgrounds, such as resistance to drought and heat, *Striga*, aphid and bruchid, insect pests or tolerance to excess moisture, etc. Entries included in the trials were developed by Burkina Faso, Ghana, Niger, Nigeria, Senegal and IITA.

A total of 85 sets in one Regional Observation Nursery and four Regional Trials were dispatched to member countries and feedback on 61 sets or 71.8% of them was received:

Name	Number of sets dispatched	Feedback received
1) Regional Observation Nursery	21	13
2) Regional *Striga* Resistance Trial	20	13
3) Regional Trial for Adaptation to Sudanian-Sahelian Zones	15	14
4) Regional Trial for Adaptation to Northern Guinea Savanna	17	14
5) Regional Trial for Adaptation to Transition Zones	12	7
Total	85	61

This report is presented in five parts; each individual Regional Observation Nursery and Regional Trial being treated separately. A combined analysis of variance and stability studies across locations are provided in a summary at the end of each part. The Finlay & Wilkinson (1983) model was used for the stability analysis.

According to the model, high mean yield across locations indicates better adaptation; the slope (ß), with ß = 1.00 means average yield stability; ß<1, below average yield stability and ß>1, above average yield stability; whereas the coefficient of determination (r^2) measures the percentage of sum of squares associated with the regression line. The ideal cultivar is, therefore, the one with high mean across locations, ß>1 and $r^2 = 1$.

Muleba Nyanguila
Cowpea Network Coordinator

MAY, 1992

I

OBSERVATION NURSERY

1. BACKGROUND

The 1991-92 RENACO observatory nursery consisted of 13 lines described in Table 1.1 which were tested against a local check at different locations in West and Central Africa. A total of 21 sets were dispatched to 10 countries: Burkina Faso (3), Cape Verde (2), Ghana (1), Guinea Bissau (1), Guinea Conakry (1), Mali (2), Mauritania (1), Niger (2), Nigeria (2), Senegal (3) and Tchad (3).

Feedback was received from the following countries at the time of this write up: Burkina Faso (3), Cape Verde (1), Ghana (1), Mali (2), Mauritania (1), Niger (2), Nigeria (1) and Tchad (2). However, one nursery each from Niger and Tchad were discarded as the data did not appear to be reliable.

The main aim of the nursery was to permit national scientists to appreciate the new lines and possibly select the most promising ones meeting the interest of their local farmers for further studies before they are considered for eventual release or choose from segregating lines any plants they find to be useful for their selection criteria for further breeding work before incorporating them in preliminary and advanced yield trials prior to their eventual release to farmers.

Table 1.1. Description of cowpea lines used in the RENACO observation nursery: 1991-1992

Variety name	Pedigrée	Origin	Characteristics
1. KVx164-41-64	(IT82D-716 x KVx30-G467-5-10K)	Burkina Faso	Aphid resistant (Sahel, Sudan Guinea savannas)
2. KVx291-47-222	(IT82D-716 x KVx30-G246-2-5K)	-do-	-do-
3. KVx295-2-124-99	(KVx146-44-1 x KVx30-G172-1-6K)	-do-	-do-
4. KVx402-5-2	(B301 x KVx30-166-3G)	-do-	-do-
5. KVx295-2-124-51	(KVx146-44-1 x KVx30-G172-1-6K)	-do-	Bruchid resistant (Sahel, Sudan, Guinea savannas)
6. KVx305-118-31	(KVx145-27-4 x KVx30-G246-2-5K)	-do-	-do-
7. IT86D-719	(TVx6332 x TVx3236) x Kamboinse L. x TVu946-2E)	IITA/ Ibadan	Guinea savanna
8. IT86D-879-1	(TVu2027 x IT82D-889	-do-	-do-
9. IT87D-697-2	(Gorom L. x IT84S-2246-4)	-do-	Sudan savanna
10. IT86D-715	(TVx6332 x TVx3236) x Kamboinse L. x TVu946-2E)	-do-	-do-
11. IT87D-885	(TVu2027 x IT82D-889)	-do-	-do-
12. IT89KD-374	(IT87F-1787-3 x IT84S-2246-4) x IT87F-1787-3	IITA/Kano	Sahel. Sudan savanna
13. IT89KD-245	(IT87F-1772 x IT84S-2246-4)	-do-	-do-
14. Local check	-	-	-

The summary of the results is as follows.

2. RESULTS

a) Burkina Faso

Cooperator: J.T. Ouedraogo

The nursery was established at two locations:

a.1) Farako-Bâ

Farako-Bâ (11°04'N, 0°21'W, 405m above sea level) is located in northern Guinea savanna. The nursery was sown on 31 July 1991 and sprayed twice with insecticide (Deltamethrine and Dimethoate). A total of 956 mm rainfall was received; its distribution during the crop season is shown in Fig.1.1. Cowpea performance is given in Table 1.2. The crop was, crippled by diseases due to protracted rainfall in mid to late August and dry spells in mid to late September. The best cultivars were: KVx402-5-2, IT87D-697-2, IT89KD-374 and IT87D-885.

Promising cultivars identified by the national program: not metioned.

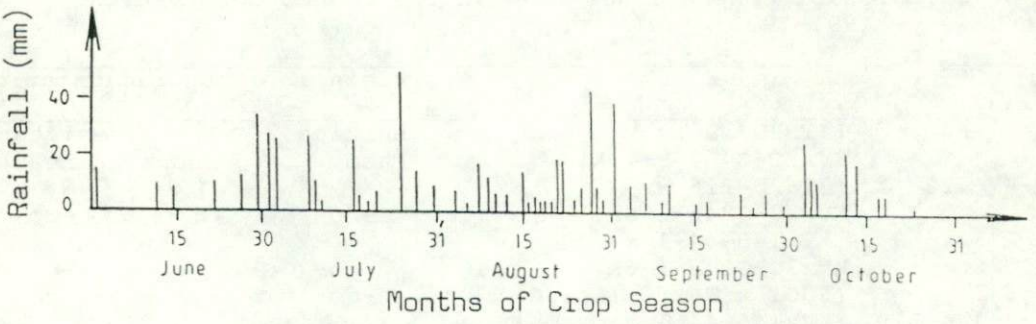


Fig. 1.1. Rainfall distribution at Farako-Bâ, Burkina Faso, 1991.

Table 1.2. Performance of cowpea lines in an observation nursery at Farako-Bâ, Burkina Faso, in the northern Guinea savanna in 1991.

	Days to			Disease attack			
	Flower bud formation	Flowering	Maturity	*Cercospora* leaf spot	Brown blotch	Virus	Seed yield
	----------DAS----------			----------(1-5)----------			--kg/ha--
KVx164-41-64	40	47	70	2.00	1.25	2.00	267
KVx291-47-222	39	48	72	2.50	2.00	2.50	367
KVx295-2-124-99	39	48	72	2.87	2.00	2.50	378
KVx402-5-2	38	45	69	2.75	1.00	2.75	642
KVx295-2-124-51	38	48	71	2.75	2.25	2.50	402
KVx305-118-31	41	51	72	2.00	1.00	2.75	415
IT86D-719	40	49	74	1.75	1.75	1.75	371
IT86D-879-1	36	44	69	1.87	1.00	2.00	548
IT87D-697-2	36	44	68	3.00	2.00	1.50	599
IT86D-715	39	46	70	2.00	1.00	1.75	553
IT87D-885	36	44	68	2.00	1.25	2.25	581
IT89KD-374	37	46	71	2.25	1.50	2.25	589
IT89KD-245	40	51	72	2.50	1.25	2.75	538
Lesso Local	35	44	64	2.87	2.00	2.25	282
L.S.D. (5%)	2	2	2	0.75	0.73	N.S.	174
C.V. (%)	4	3	2	27	34	30	26

a.2) **Kamboinse**

Kamboinse (12°28'N, 01°33'W, 300 m above sea level) is located in the Sudan savanna. The nursery was established in a *Striga* sick plot at two sowing dates. It was sprayed twice with insecticide (Deltamethrine and Dimethoate). A total rainfall of 1022 mm was received; its distribution during the crop season is shown on Fig. 1.2. The performance of cowpea lines at the first sowing date (18 July) is given in Table 1.3, while that of the second date (12 August) is shown in Table 1.4. Lines did not differ significantly from one another within each sowing date.

Promising cultivars identified by the national program: not mentioned.

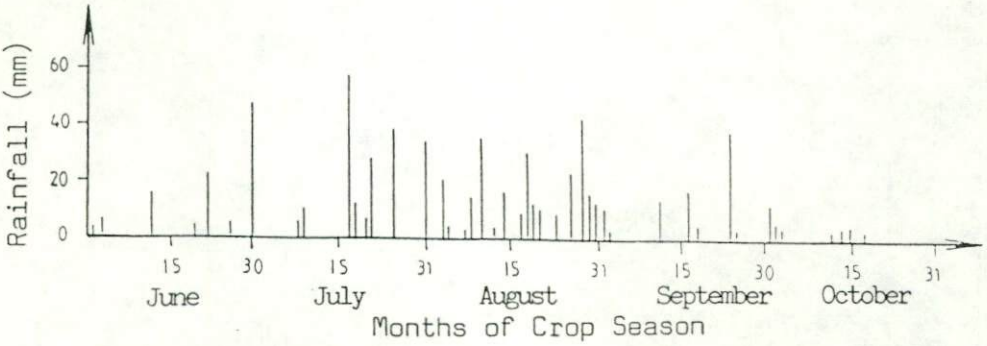


Fig. 1.2. Rainfall distribution at Kamboinse, Burkina Faso, 1991.

Table 1.3. Performance of cowpea lines in an observation nursery at Kamboinse, Burkina Faso (Sudan savanna) in 1991 at the optimum sowing date in *Striga* sick plot.

Line	Number of plants	Days to			Disease attack		*Striga* density	Seed yield
		Flower bud formation	Flowering	Maturity	Bacterial blight	Brown blotch		
	-pl/plot-	----------DAS----------			------(1-5)------		-√x+1-	Kg/ha
KVx164-41-64	23	32	42	65	1.15	1.75	1.08	1312
KVx291-47-222	26	33	43	68	1.00	1.50	1.08	1277
KVx295-2-124-99	23	32	42	64	2.25	2.12	1.08	1190
KVx402-5-2	23	32	42	61	1.00	2.00	1.08	1274
KVx295-2-124-51	25	31	42	63	1.50	3.37	1.08	1377
KVx305-118-31	24	33	44	68	1.00	2.25	1.08	1274
IT86D-719	27	32	41	65	1.00	1.25	1.12	1079
IT86D-879-1	25	32	41	60	1.62	1.50	1.15	1196
IT87D-697-2	27	32	41	67	2.00	2.25	1.21	1443
IT86D-715	27	32	41	65	1.12	1.50	1.29	1126
IT87D-885	23	32	41	61	1.12	2.50	1.13	1063
IT89KD-374	26	30	41	64	1.50	1.50	1.08	1168
IT89KD-245	23	39	49	79	1.50	4.25	1.08	1365
Bousse Local	26	31	41	63	1.00	1.50	1.12	1440
L.S.D. (5%)	N.S.	2	2	5	N.S.	1.08	0.06	N.S.
C.V. (%)	14	4	2	6	43	36	4	14

Table 1.4. Performance late-sown of cowpea lines in an observation nursery at Kamboinse, Burkina Faso (Sudan savanna) in 1991, in *Striga* sick plots.

Line	Number of plants	Days to			Disease attack						*Striga* density	Seed yield
		Flower bud formation	Flowering	Maturity	Cercospora leaf spots	Brown blotch	Leaf smut	Web blight	Bacterial blight	AbMV (virus)		
		DAS			(1-5)						$-\sqrt{x+1}-$	-Kg/ha-
KVx164-41-64	24	30	40	62	3.50	2.75	1.00	2.50	3.25	2.00	1.08	186
KVx291-47-222	19	31	39	60	3.50	2.25	1.00	2.25	3.25	2.00	1.08	168
KVx295-2-124-99	20	30	40	61	2.00	2.50	1.00	2.25	3.00	2.50	1.08	118
KVx402-5-2	24	30	40	59	1.00	2.00	1.50	2.75	2.00	2.50	1.08	259
KVx295-2-124-51	24	30	39	61	1.75	3.75	1.50	3.25	2.75	2.75	1.08	153
KVx305-118-31	21	31	42	61	1.00	3.25	1.00	2.25	2.00	2.75	1.08	183
IT86D-719	17	48	56	70	1.25	1.00	1.00	2.00	1.50	1.25	1.12	146
IT86D-879-1	19	31	40	60	1.00	2.25	1.00	3.75	2.50	1.50	1.13	134
IT87D-697-2	25	30	40	59	4.25	2.75	1.00	2.50	2.75	1.75	1.13	242
IT86D-715	27	31	39	60	1.00	1.75	2.00	2.25	2.25	1.00	1.17	221
IT87D-885	22	30	41	62	1.00	2.00	1.00	3.50	2.00	2.25	1.14	121
IT89KD-374	17	31	39	59	1.00	2.25	1.25	2.75	2.75	2.25	1.10	201
IT89DK-245	19	35	40	62	1.25	3.25	1.00	2.00	2.75	2.50	1.08	290
Bousse Local	22	30	41	59	1.75	2.00	2.25	2.25	3.25	3.00	1.15	190
L.S.D. (5%)	N.S.	N.S.	N.S.	N.S.	1.23	0.98	0.81	0.91	N.S.	1.19	0.04	N.S.
C.V. (%)	31	29	19	9	48	28	45	24	37	39	3	45

b) **Cape Verde**

Cooperator: Carlos Silva

The nursery was established at Sao Jorge (15°04'04"N, 23°35'08", 170 m above sea level). The field plot was not fertilized. The nursery was sown on 5 September 1991. It did not receive any insecticide treatment. It was harvested on 10 December. A total rainfall of 186 mm was received in two major rain storms as shown in Fig. 1.3. The best lines were: IT87D-697-2, IT89KD-374 and KVx295-2-124-51 (Table 1.5).

Promising cultivars identified by the national program: KVx295-2-124-51, IT87D-697-2, IT89K-374 and KN-1.

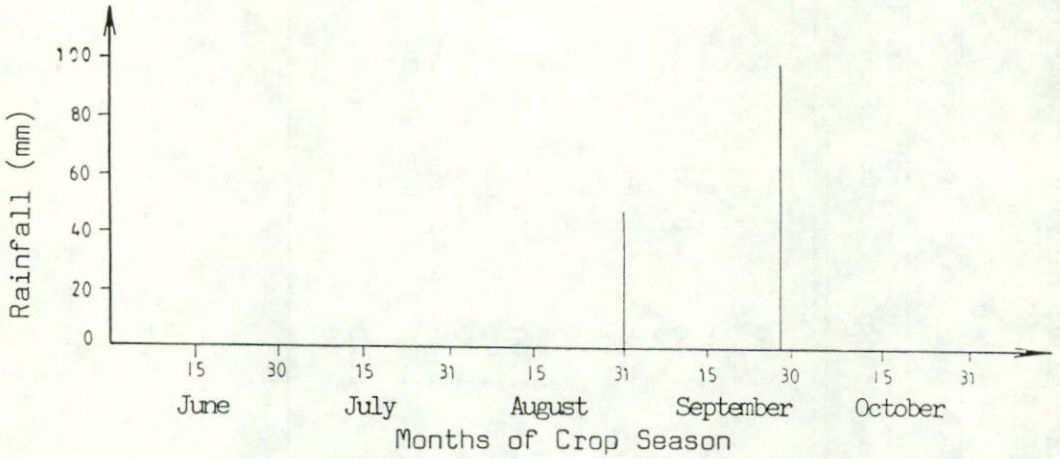


Fig. 1.3. Rainfall distribution at Sao Jorge, Cape Verde, 1991.

Table 1.5. Performance of cowpea lines in an observation nursery at Sao Jorge, Cape Verde (Sudanian- Sahelian zones) in 1991.

Line	Seed yield
	---kg/ha---
KVx164-41-64	35
KVx291-47-222	261
KVx295-2-124-99	281
KVx402-5-2	281
KVx295-2-124-51	708
KVx305-118-31	483
IT86D-719	503
IT86D-879-1	539
IT87D-697-2	845
IT86D-715	247
IT87D-885	362
IT89KD-374	749
IT89KD-245	608
KN-1	678
L.S.D. (5%)	221
C.V. (%)	34

c) **Ghana**

Cooperator: K.O. Marfo

The nursery was established at Nyankpala (9°25'41"N, 0°58'42"W, 183 m above sea level) in the Guinea savanna. The field plot was not fertilized. The nursery was sown on 8 July 1991. It was sprayed four times with an insecticide (Karate 2.5 EC). Rainfall data was not provided. The performance of cowpea lines is given in Table 1.6. Bacterial blight and viral diseases caused severe damages to some of the lines. Lines IT89KD-374, IT87D-885, IT89KD-245 and IT86D-715 gave the highest yields.

Promising cultivars identified by the national program: IT89KD-374.

Table 1.6. Performance of cowpea lines in an observation nursery at Nyankpala, Ghana in the Guinea savanna in 1991 with insecticide protection.

Line	Days to		Disease attack		Seed yield
	Flowering	Maturity	Bacterial blight	AbMV virus	
	--------DAS--------		-----(1-5)------		--kg/ha--
KVx164-41-64	46	72	4.5	4.2	221
KVx291-47-222	48	72	2.5	2.5	339
KVx295-2-124-99	47	71	3.2	2.5	270
KVx402-5-2	45	71	2.0	4.0	327
KVx295-2-124-51	45	71	1.5	3.0	341
KVx305-118-31	49	72	3.5	4.2	278
IT86D-719	45	72	3.5	4.2	298
IT86D-879-1	48	69	3.0	4.0	336
IT87D-697-2	45	71	2.5	2.2	354
IT86D-715	43	68	2.5	2.5	410
IT87D-885	44	67	2.7	4.0	556
IT89KD-374	46	71	1.7	1.7	546
IT89KD-245	54	72	2.5	2.0	419
Local check	45	68	4.0	4.2	209
LSD (5%)	4	3	1.1	1.1	182
C.V. (%)	6	3	27	25	44

d) **Mali**

Cooperator: Aliou Traore

The nursery was established at two locations: Cinzana and Sotuba.

d.1) **Cinzana**

Cinzana is located in the Sudan savanna. The field plot was infested with *Striga gesnerioides*. It was fertilized with 12 kg P_2O_5/ha as ordinary superphosphate. The nursery was sown on 11 July 1991 and sprayed with an insecticide (Karate) during the growth cycle. A total rainfall of 652 mm was received; its distribution during the crop season is given in Fig. 1.4. The performance of lines is given in Table 1.7. The best lines were: IT89KD-245 and KVx402-5-2.

Promising cultivars identified by the national program: not mentioned.

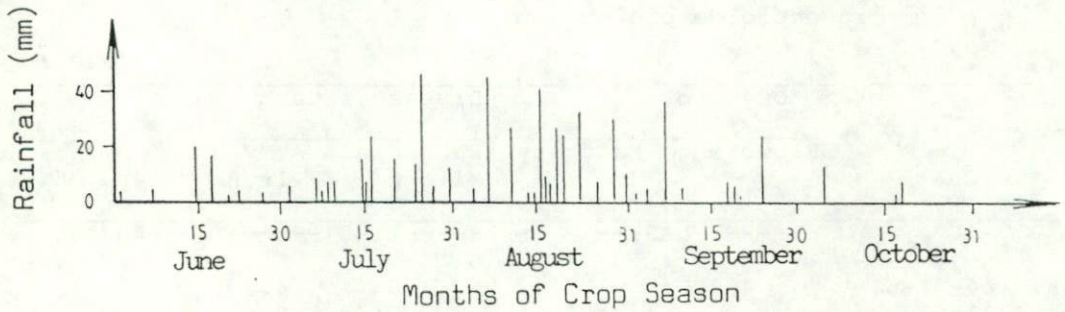


Fig. 1.4. Rainfall distribution at Cinzana, Mali, 1991.

Table 1.7. Performance of cowpea lines in an observation nursery at Cinzana, Mali in the Sudan savanna in *Striga* sick plot in 1991.

Line	Days to			*Striga* density	Seed yield
	flower bud formation	Flowering	Maturity		
	----------DAS----------			--√x+1--	---Kg/ha---
KVx164-41-64	35	51	68	1.00	591
KVx291-47-222	36	50	76	1.00	1085
KVx295-2-124-99	36	49	68	1.20	954
KVx402-5-2	36	49	68	1.02	1649
KVx295-2-124-51	36	49	72	1.00	987
KVx305-118-31	37	52	68	1.07	857
IT86D-719	36	49	68	1.12	720
IT86D-879-1	35	48	68	1.10	530
IT87D-697-2	36	49	68	1.52	844
IT86D-715	37	49	68	1.37	892
IT87D-885	35	48	68	1.15	716
IT89KD-374	37	48	68	1.00	1351
IT89KD-245	40	68	83	1.00	2029
Amary Shô	56	68	81	2.00	845
L.S.D. (5%)	3	2	5	0.30	444
C.V. (%)	5	3	4	17	31

d.2) **Sotuba**

Sotuba (12°39'N, 07°456W, 320 m above sea level) is located in the Sudan savanna. The field plot was fertilized with 12 kg P_2O_5/ha as ordinary superphosphate. The nursery was sown on 3 August 1991 and sprayed with an insecticide (Deltamethrine) during the growth cycle. A total rainfall of 1003 mm was received; its distribution during the crop season is shown in Fig. 1.5. The performance of the lines is given in Table 1.8. Lines KVx402-5-2 and IT89KD-245 and the local check: TVu7607, gave the highest yields.

Promising cultivars identified by the national program: not mentioned.

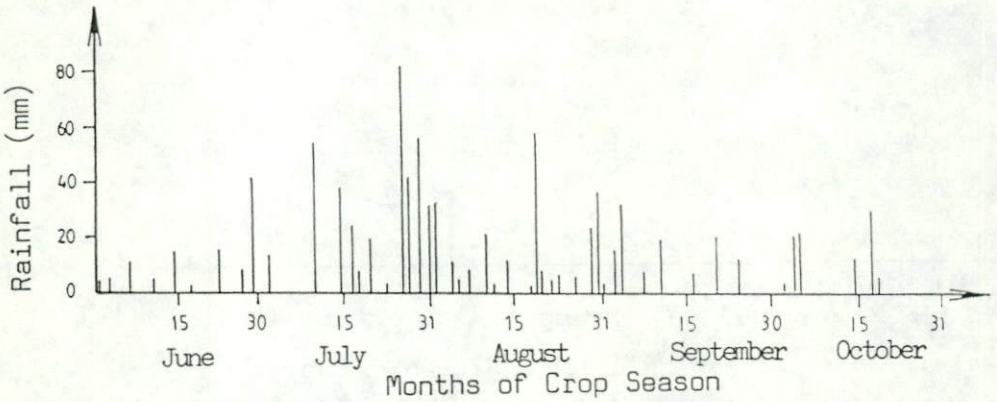


Fig. 1.5. Rainfall distribution at Sotuba, Mali, 1991.

Table 1.8. Performance of cowpea lines in an observation nursery at Sotuba, Mali, in the southern Sudan Savanna in 1991.

Line	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			--Kg/ha--
KVx164-41-64	34	42	64	750
KVx291-47-222	33	43	61	685
KVx295-2-124-99	37	44	62	625
KVx402-5-2	34	41	59	1075
KVx295-2-124-51	35	43	62	825
KVx305-118-31	36	43	61	600
IT86D-719	33	42	58	775
IT86D-879-1	36	42	60	675
IT87D-697-2	33	41	59	950
IT86D-715	36	43	59	575
IT87D-885	35	41	60	850
IT89KD-374	33	40	59	800
IT89KD-245	38	43	66	1000
TVu7607	37	42	58	1025
LSD (5%)	2	1	1	332
C.V. (%)	3	2	2	29

e) **Mauritania**

Cooperator: Sidi R'chid

The nursery was established at Sylla, in southern Mauritania in the Sahel. The field plot was fertilized with 60 kg of N/ha as urea. Lines were sown on 28 July 1991. There was no insecticide treatment during the growth cycle. A total rainfall of 106 mm was received; its distribution is given in Fig. 1.6. The performance of lines is given in Table 1.9. Lines KVx402-5-2, KVx295-2-124-51, IT89KD-374 and IT86D-719 yielded the highest.

Promising cultivars identified by the national program: KVx295-2-124-99, KVx164-41-64, KVx295-2-124-51 and IT82D-719.

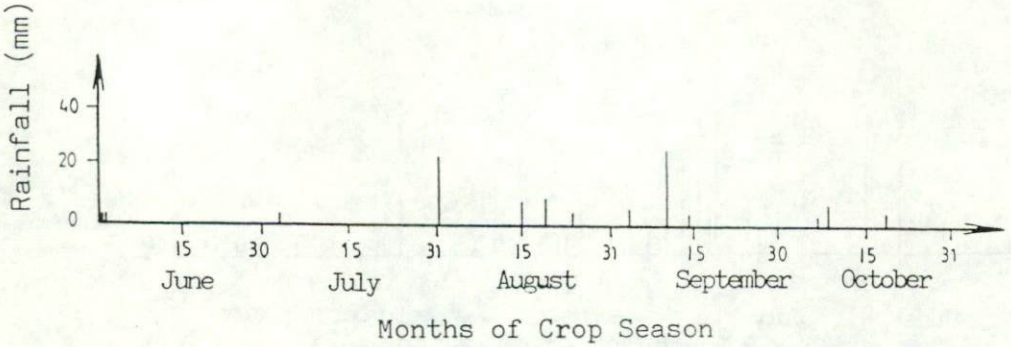


Fig. 1.6. Rainfall distribution at Sylla, Mauritania, 1991.

Table 1.9. Performance of cowpea lines in an observation nursery at Sylla, Mauritania in the Sahel in 1991.

Line	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			-Kg/ha-
KVx164-41-64	39	49	61	631
KVx291-47-222	38	46	61	318
KVx295-2-124-99	40	49	63	254
KVx402-5-2	38	44	59	2099
KVx295-2-124-51	37	44	60	1271
KVx305-118-31	39	49	64	443
IT86D-719	38	43	58	1205
IT86D-879-1	37	42	59	615
IT87D-697-2	36	42	58	743
IT86D-715	37	43	58	769
IT87D-885	39	46	60	373
IT89KD-374	38	46	59	1259
IT89KD-245	39	49	64	541
Kaedi Blanc	39	49	62	373
LSD (5%)	1	3	2	786
C.V. (%)	2	5	2	71

f) **Nigeria**

Cooperator: O.O. Olufajo

The nursery was established at Minjibir (12°10'E, 08°40'N) in the Sudan savanna. The field plot was infested with *Striga gesnerioides* and fertilized with 36 kg of P_2O_5/ha as ordinary superphosphate. Lines were sown on 24 July 1991. Only two replications were sprayed with an insecticide (Sherpa Plus EC). A total rainfall of 965 mm was received; its distribution during the crop season is given on Fig. 1.7. The performance of lines is given in Tables 1.10 & 1.11 for insecticide treated and untreated, respectively. Significant differences between lines were observed for only insecticide untreated lines. Lines IT87D-697-2, KVx295-2-124-51 and IT89KD-374 gave the highest yields.

Promising cultivars identified by the national program: not mentioned.

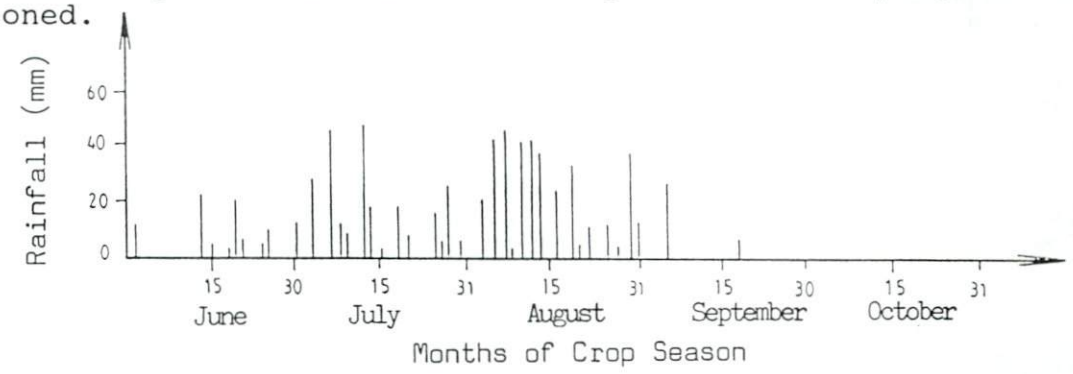


Fig. 1.7. Rainfall distribution at Minjibir, Nigeria, 1991

Table 1.10. Performance of cowpea lines in observatory nurseries at Minjibir, Nigeria in the Sudan savanna in 1991, with insecticide protection.

Line	Days to				Virus attacks	*Striga* density	Seed yield
	Flower bud formation	Flowering	Maturity	Frist *Striga* emergence			
	----------DAS----------				-----(1-5)-----		--KG/ha--
KVx164-41-64	34	58	77	66	1.5	1.2	239
KVx291-47-222	34	60	78	100	1.5	1.0	359
KVx295-2-124-99	34	60	76	77	1.5	1.0	395
KVx402-5-2	36	58	78	50	1.5	1.1	452
KVx295-2-124-51	36	58	77	50	1.0	1.1	419
KVx305-118-31	36	60	78	73	1.5	1.0	392
IT86D-719	36	58	78	50	1.0	1.2	439
IT86D-879-1	34	55	77	77	1.0	1.0	432
IT87D-697-2	33	52	76	43	1.0	1.1	359
IT86D-715	37	56	79	70	1.0	1.0	415
IT87D-885	33	57	76	70	2.0	1.0	379
IT89KD-374	34	60	76	77	1.5	1.1	219
IT89KD-245	38	58	76	100	1.0	1.0	638
SAMPEA-7	34	60	80	43	1.0	1.3	505
L.S.D. (5%)	N.S	N.S	N.S	N.S	N.S	N.S	N.S
C.V. (5%)	4	4	3	27	37	7	32

Table 1.11. Performance of cowpea lines in an observation nursery at Minjibir, Nigeria in the Sudan savanna without insecticide application in 1991.

Line	Days to		*Striga* density	Seed yield
	flower bud formation	Flowering		
	----------DAS--------		-√x+1-	--Kg/ha--
KVx164-41-64	35	60	1.10	0.0
KVx291-47-222	33	60	1.05	0.0
KVx295-2-124-99	34	60	1.05	0.0
KVx402-5-2	34	60	1.10	33.0
KVx295-2-124-51	34	56	1.05	139.0
KVx305-118-31	37	57	1.05	65.5
IT86D-719	36	58	1.00	23.0
IT86D-879-1	33	58	1.00	66.5
IT87D-697-2	33	55	1.30	219.5
IT86D-715	35	58	1.20	0.0
IT87D-885	33	59	1.05	0.0
IT89KD-374	33	55	1.10	0.0
IT89KD-245	38	55	1.10	133.0
Sampea-7	35	60	1.05	0.0
L.S.D. (5%)	2.0	3	0.14	124.3
C.V. (%)	3	3	6.0	118

g) **Tchad**

Cooperator: Komna Nganara Ngawara

The nursery was established at Dougui (15°03'N, 12°09'E) in an unfertilized field plot in the Sahel. Lines were sown on 27 June 1991 and were sprayed with an insecticide (Deltamethrine) during the growth cycle. A total rainfall of 454 mm was received; its distribution is given in Fig. 1.8. The performance of the lines is given in Table 1.12. The highest yielding lines were: IT86D-879-1, KVx305-118-31, IT89KD-374 and IT87D-885.

Promising cultivars identified by national program: IT87D-697-2, IT86D-719, IT86D-879-1.

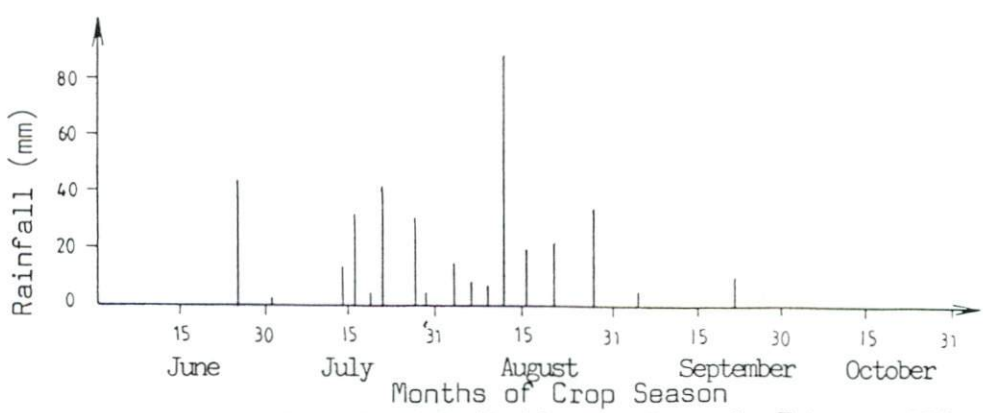


Fig. 1.8. Rainfall distribution at Dougui, Tchad, 1991.

Table 1.12. Performance of cowpea lines in an observation nursery at Dougin, Tchad in the Sahel in 1991.

Line	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			---Kg/ha---
KVx164-41-64	45	54	69	648
KVx291-47-222	44	51	66	947
KVx295-2-124-99	43	51	65	1148
KVx402-5-2	42	50	64	1220
KVx295-2-124-51	44	52	66	1214
KVx305-118-31	45	53	67	1640
IT86D-719	42	50	63	1353
IT86D-879-1	42	50	66	1784
IT87D-697-2	41	51	65	1415
IT86D-715	43	54	68	963
IT87D-885	41	50	65	1517
IT89KD-374	44	54	68	1579
IT89KD-245	45	66	100	0
TN5-78	45	53	67	779
LDS (5%)	3	NS	3	695
C.V. (%)	4	12	3	42

3. CONCLUSION

Seed yield of the lines as affected by location and cultivar is given in Table 1.13. Also included in this table are slope (ß) and coefficient of determination (r^2) associated with the regression lines of mean yield of entries.

Kamboinse, Burkina Faso (the first sowing date only); Dougui, Tchad; and Cinzana, Mali, all located in the Sudanian-Sahelian zones, were the highest yielding locations. Whereas Kamboinse (the second sowing date), Burkina Faso; Minjibir, Nigeria; Nyankpala, Ghana and Sao Jorge, Cape Verde were the lowest yielding locations.

In spite of variable growing conditions and agronomic practices used, lines KVx402-5-2, IT89KD-374, IT87D-697-2, KVx295-2-124-51, IT89KD-245 and IT86D-719 appeared to be the best adapted. They had an average (ß=1.00) or below average (ß<1.00) yield stability. This implied that they maintained good yielding ability across locations.

Table 1.13. Seed yield (kg/ha) of cowpea per location and cultivars, and slope (*B*) and coefficient of determination (r^2) associated with the regression line of mean yield (kg/ha) of cowpea cultivars in observation nursery at several locations in West and Central Africa in 1991.

Location effect		Cultivar effect			
Location	Seed yield (kg/ha)	Cultivar	Seed yield (kg/ha)	*B*	r^2
-Burkina Faso					
.Farako-Ba	467	KVx164-41-64	461	0.86	0.78
.Kamboinse 1	1256	KVx291-47-222	518	0.99	0.82
.Kamboinse 2	187	KVx295-2-124-99	519	0.97	0.87
-Cape Verde		KVx402-5-2	872	1.31	0.61
.Sao Jorge	451	KVx295-2-124-51	734	1.09	0.88
-Ghana		KVx305-118-31	617	1.10	0.82
.Nyankpala	350	IT86D-719	647	0.99	0.81
-Mali		IT86D-879-1	630	1.04	0.71
.Cinzana	1004	IT87D-697-2	740	1.04	0.88
.Sotuba	801	IT86D-715	566	0.83	0.94
-Mauritania		IT87D-885	601	0.93	0.74
.Sylla	778	IT89KD-374	803	1.17	0.84
-Nigeria		IT89KD-245	688	0.78	0.27
.Minjibir	226	Local chek	592	0.91	0.73
-Tchad					
.Dougui	1158	L.S.D. (5%)	239	-	-
L.S.D. (5%)	202				

SUPPLEMENTARY REPORT ON OBSERVATION NURSERY

1. **Tarna, Niger**

Cooperator: Hane Abdou Kadi Kadi

Feedback from Tarna, Niger arrived when the 1991 Regional Trial Report was almost complete. The Tarna trial is, therefore, being reported separately as an annex to the 1991 Regional Observation Nursery Report.

The nursery was sown at Tarna, (13°28'N, 07°25'E, 368 m above sea level) on 22 June 1991 in an an unfertilized plot infested with *Striga*. Two replications were sprayed with insecticides (Karate and Cyalothtrin) against insect pests while the two others did not receive any protection. A total of 399 mm rainfall was received during the crop season. Cowpea plants were harvested on 3 September, 1991.

The performance of lines under no insect pest protection is given in Table 1.14. Although lines did not differ significantly for most of the traits studied, it is worth noting that IT89KD-245 and IT87D-697-2 exhibited high yield and good resistance to aphids and pod sucking bugs.

The performance of lines under insect pest protection is given in Table 1.15. Again lines did not differ significantly for seed yield. However, IT89KD-374, the local check (TN5-78), KVx164-41-64, KVx295-2-124-51 and IT87D-885 gave the highest yields.

Table 1.14. Performance of cowpea lines without protection against insect pests in an observation nursery at Tarna, Niger, in 1991.

Lines	Days to:				*Striga* density	Insect attack		Seed yield
	Flower bud formation	Flowering	Maturity	First *Striga* emergence		Aphids	Pod sucking bugs	
	DAS				$\sqrt{x+1}$	(1-5)		kg/ha
KVx164-41-64	38	46	72	74	1.10	1.5	2.5	265
KVx291-47-222	41	49	72	49	1.35	3.0	2.5	132
KVx295-2-124-99	41	48	72	39	1.25	1.0	1.0	118
KVx402-5-2	41	48	72	48	1.40	1.5	2.0	209
KVx295-2-124-51	41	52	72	53	1.25	1.0	3.0	173
KVx305-118-31	38	49	72	49	1.40	2.0	3.0	332
IT86D-719	38	48	72	71	1.10	2.0	1.0	204
IT86D-879-1	38	44	72	56	1.25	1.5	1.0	203
IT87D-697-2	38	47	72	42	1.30	1.0	1.0	491
IT86D-715	38	48	72	38	1.30	1.5	1.5	261
IT87D-885	38	46	72	63	1.25	1.5	3.0	230
IT89KD-374	41	49	72	38	1.50	1.5	3.0	314
IT89KD-245	44	87	90	75	1.35	1.0	1.0	445
TN5-78	44	53	72	80	1.30	1.5	1.5	231
L.S.D. (5%)	N.S.	5	N.S.	N.S.	N.S.	N.S.	N.S.	
C.V. (%)	6	5	9	32	15	46	61	53

Table 1.15. Performance of cowpea lines under protection against insect pests in an observation nursery at Tarna, Niger, in 1991.

Line	Days to:					Insect attack		Seed yield
	Flower bud formation	Flowering	Maturity	First *Striga* emergence	*Striga* density	Aphids	Pod sucking bugs	
	DAS				$\sqrt{x+1}$	(1-5)		kg/ha
KVx164-41-64	38	45	72	47	1.40	4.0	1.5	321
KVx291-47-222	39	55	72	41	1.45	2.5	3.5	154
KVx295-2-124-99	39	51	72	41	1.35	1.0	3.5	276
KVx402-5-2	41	51	72	69	1.20	3.5	1.5	133
KVx295-2-124-51	39	47	72	52	1.35	1.0	3.0	334
KVx305-118-31	42	51	72	69	1.75	2.5	3.5	270
IT86D-719	39	47	72	83	1.05	1.5	2.0	228
IT86D-879-1	38	42	72	69	1.15	2.0	1.0	263
IT87D-697-2	38	47	72	39	1.75	1.0	2.5	143
IT86D-715	39	44	72	56	1.55	3.0	1.5	71
IT87D-885	38	44	72	69	1.10	2.5	1.0	323
IT89KD-374	41	51	72	52	1.55	4.0	1.5	577
IT89KD-245	41	88	103	53	1.30	1.0	1.0	264
TN5-78	41	54	72	66	1.10	3.5	3.0	439
L.S.D. (5%)	N.S.	5	9	N.S.	N.S.	2.0	1.3	N.S.
C.V. (%)	3	5	6	37	24	39	28	60

II

REGIONAL COWPEA STRIGA RESISTANCE

1. BACKGROUND

Striga genesrioides is one of the major causes of severe seed yield losses throughout the different ecologies in the Sahel and Sudan savanna and in shallow, sandy and gravely soils in West and Central Africa. This calls for an effective and cheap control measure in *Striga* infested areas.

Since new *Striga* resistant cultivars have been identified or developed by RENACO Lead Centers and IITA, they were regionally tested in *Striga* sick plots. The objective of the trial was to permit national scientists examine their performance under *Striga* infestation so that they can eventually select the most promising ones meeting the needs and requirements of their peasant farmers for further testing and subsequent release.

The new lines being tested originated from Burkina Faso and IITA. They are the outcome of crosses involving *Striga* resistant cultivars B301 and Suvita-2 (also known as Gorom local) or its descendents. The lines and other tested cultivars are described in Table 2.1.

A total of 20 sets were sent to 10 countries: Benin (3), Burkina Faso (2), Cameroon (2), Ghana (1), Mali (2), Niger (3), Nigeria (3); Senegal (1), Tchad (1) and Togo (2). At the time of this write up, feedback has been received from Benin (3), Burkina Faso (2), Ghana (1), Mali (1), Niger (3), Nigeria (2), Togo (1). These made up a total of 13 sets. However, one set from Nigeria had to be discarded because the results did not seem to be reliable.

Table 2.1. Description of cultivars tested in the RENACO 1991-92 Regional *Striga* resistant trial.

Cultivar	Pedigree	Origin	Characteristic
1. KVx164-65-5	(IT82D-716 x KVx30-G467-5-1OK)	Burkina Faso	Resistant to bruchids and *Striga*
2. KVx291-47-222	(IT82D-716 x KVx30-G246-2-5K)	-do-	-do-
3. KVx397-6-6	(Suvita-2 x B301)	-do-	Adapted to Sahel and Sudan savannas. Resistant to *Striga*
4. KVx402-5-2	(KVx30-166-3G x B301)	-do-	-do-
5. KVx402-19-1	-do-	-do-	-do-
6. KVx402-19-5	-do-	-do-	-do-
7. KVx305-118-31	(KVx146-27-4 x KVx30-G246-2-5K)	-do-	Resistant to Aphids, Bruchids and *Striga*
8. IT81D-994	(TVu119O x TVu76) x (TVu2027 x TVu625)	IITA/ Ibadan	Resistant to Bruchids and *Striga*
9. TN5-78	Landrace	Niger/ Burkina	Resistant to *Striga*
10. IT82D-849	(TVx1193-9F x Emmago) ou (TVu119O x Prima)	IITA/ Ibadan	Resistant to *Striga* (resistant check)
11. B301	Landracce	Botswana	Resistant to *Striga* (resistant check)
12. IT82E-32	[P33-1C x (TVu410 x SVS-32)] x TVu119O x TVu2616)	IITA/ Ibadan	(*Striga* susceptible check)

2. RESULTS

a) Benin

Cooperator: Sanni O. Abou

The trial was conducted at three locations in southern Benin-Oueme-Abomey, Tindji and Zakpota.

a.1) Oueme-Abomey

The trial was sown on 13 August 1991 in the Coastal zone in a *Striga* sick plot that was not fertilized. Cowpea plants were protected against insect pests with insecticides (Deltamethrine and Malathion) and were harvested on 13 November 1991. Rainfall data were not provided. The performance of cultivars is given in Table 2.2. There was almost no *Striga* infestation as the first *Striga* shoots emerged very late in the crop season in plots of susceptible cultivars. The yields were very low due to other factors rather than *Striga* infestation.

Promising cultivars identified by the national program: not mentioned.

Table 2.2. Performance of cowpea cultivars in a *Striga* sick plot at Abomey, Benin, in 1991.

Cultivar	Days to		*Striga* density	Seed yield
	Flowering	First *Striga* emergence		
	----------DAS----------		--√x+1--	-KG/ha-
KVx164-65-5	51	100	1.00	184
KVx291-47-222	53	100	1.00	185
KVx397-6-6	53	100	1.00	150
KVx402-5-2	52	100	1.00	223
KVx402-19-1	51	100	1.00	189
KVx402-19-5	51	100	1.00	149
KVx305-118-31	50	100	1.00	221
IT81D-994	51	100	1.00	189
TN5-78	54	100	1.00	149
IT82D-849	51	100	1.00	213
B301	51	100	1.00	201
IT82E-32	50	86	1.05	248
L.S.D. (5%)	2	12	N.S.	N.S.
C.V. (%)	3	2	3	25

a.2) **Tindji (Zakpota)**

Tindji (7°16'23"N, 2°13'41"E) is also located in the Coastal zone. The trial was sown on 21 August 1991 in an unfertilized plot. Plants were sprayed with insecticides (Deltamethrine and Malathion) and were harvested on 14 November 1991. Rainfall data was not provided. The performance of cultivars is given in Table 2.3. The plot was infested with *Striga* as evidenced by the early emergence of *Striga* shoots in the plots of the susceptible check, IT82E-32. The *Striga* density in the plot of the latter cultivar was 3.08 shoots/m^2 on average. All the other tested cultivars exhibited *Striga* resistance even with the presence of a few *Striga* shoots in plots of KVx 402-19-5 and B301 towards the end of the season and complete crop maturity. Cultivars B301, IT82E-32 (the susceptible check), KVx397-6-6 and KVx402-5-2 gave the highest yields.

Promising cultivars identified by the national program: not mentioned.

Table 2.3. Performance of cowpea cultivars in a *Striga* sick plot at Tindji, Benin, in 1989

Cultivar	Days to Flowering	Days to First *Striga* emergence	*Striga* density	Seed yield
	----------DAS----------		--√x+1--	--Kg/ha--
KVx164-65-5	58	100	1.00	216
KVx291-47-222	51	100	1.00	356
KVx397-6-6	46	100	1.00	518
KVx402-5-2	51	100	1.00	516
KVx402-19-1	50	100	1.00	374
KVx402-19-5	51	87	1.07	435
KVx305-118-31	50	100	1.00	305
IT81D-994	47	100	1.00	275
TN5-78	53	100	1.00	302
IT82D-849	55	100	1.00	493
B301 41	87	1.02	793	
IT82E-32	48	41	2.02	597
L.S.D. (5%)	6	15	0.23	319
C.V. (%)	8	12	14	51

a.3) **Zakpota**

Zakpota (7°16'20"N, 2°14'10"E) is located near Tindji in the Coastal zone. The trial was sown on 14 August 1991 applying the same agronomic practices as for Tindji. The reaction of cultivars to *Striga* infestation was very similar to that at Tindji. No *Striga* shoots emerged, however, in plots of B301. In addition to KVx402-19-5, *Striga* shoots emerged very late in the crop season in plots of KVx402-5-2, KVx306-118-31 and IT82D-849; and their density was sparsely distributed than that of the susceptible check, IT82E-32 (Table 2.4). Yields were very low as was the case at Abomey.

Promising cultivars identified by the national program: not mentioned.

Table 2.4. Performance of cowpea in a *Striga* sick plot at Zakpota, Benin, in 1991.

Cultivar	Days to Flowering	Days to First *Striga* emergence	*Striga* density	Seed yield
	----------DAS----------		--√x+1--	--Kg/ha--
KVx164-65-5	48	100	1.00	140
KVx291-47-222	48	100	1.00	179
KVx397-6-6	46	100	1.00	381
KVx402-5-2	46	84	1.02	318
KVx402-19-1	46	84	1.02	175
KVx402-19-5	49	100	1.00	208
KVx305-118-31	47	86	1.02	159
IT81D-994	48	100	1.00	222
TN5-78	48	86	1.02	157
IT82D-849	48	69	1.05	281
B301	47	100	1.00	273
IT82E-32	46	33	2.12	181
L.S.D. (5%)	N.S.	28	0.08	108
C.V. (%)	4	23	5	33

b) **Burkina Faso**

Cooperator: J.T. Ouedraogo

The trial was conducted at two locations in the Sudan savanna.

b.1) **Fada N'Gourma**

The field plot at Fada N'gourma (12°04'N, 00° 21'E, 292 m above sea level) was fertilized with 45 kg of P_2O_5/ha as ordinary superphosphate. The trial was sown on 17 July and cowpea plants were sprayed twice with insecticides (Deltamethrine and Dimethoate). A total rainfall of 684 mm was received; its distribution during the crop season is given in Fig. 2.1. The performance of cultivars is given in Table 2.5. *Striga* shoots emerged very late; a time when cowpea in plots of susceptible check, IT82E-32 with a *Striga* shoot density of 4.76/m^2, had completely ripened. *Striga* shoots even emerged much later with low and sparce density in the other cultivars. There was no evidence of *Striga* infestation being the cause of seed yield losses, since the susceptible check yielded similar to the high yielding and *Striga* resistant cultivars: IT82D-849, KVx402-19-1, KVx402-5-2 and KVx397-6-6.

Promising cultivars identified by the national program: not mentioned.

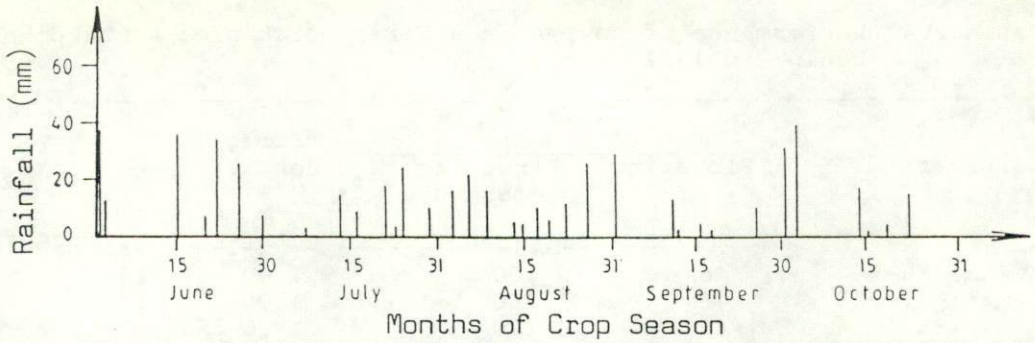


Fig. 2.1. Rainfall distribution at Fada N'Gourma, Burkina Faso 1991.

Table 2.5. Performance of cowpea cultivars in a *Striga* sick plot at Fada N'Gourma, Burkina Faso, in 1991.

Cultivar	Days to Flowering	Days to Maturity	Days to First *Striga* emergence	*Striga* density	Seed yield
	DAS			$\sqrt{x+1}$	Kg/ha
KVx164-65-5	44	68	100	1.1	1199
KVx291-47-222	43	66	100	1.1	1753
KVx397-6-6	40	65	100	1.1	1637
KVx402-5-2	41	62	88	1.1	1836
KVx402-19-1	41	67	100	1.1	1593
KVx402-19-5	41	67	100	1.1	1432
KVx305-118-31	44	68	100	1.1	1266
IT81D-994	50	72	100	1.1	1183
TN5-78	43	67	100	1.1	1172
IT82D-849	41	59	100	1.1	1517
B301	41	63	100	1.1	1339
IT82E-32	39	59	77	2.4	1577
L.S.D. (5%)	2	3	12	0.7	444
C.V. (%)	3	3	11	39	21

b.2. **Kamboinse**

At Kamboinse (described in Part 1), the trial was sown in a *Striga* sick plot on 18 July 1991. The field plot was fertilized with 45 kg of P_2O_5/ha as ordinary superphosphate. Cowpea plants were sprayed twice with insecticides (Deltamethrine and Dimethoate). Rainfall received has been described in Part I (Fig.1.2). The performance of cultivars is given in Table 2.6. *Striga* shoots emerged earlier (before flowering) in plots of the susceptible check, IT82E-32, than any other cultivar. The cultivar also had the highest *Striga* density, 4.75 shoots m_2. For the other cultivars, *Striga* emerged either late (after cowpea ripened) or not at all, indicating their resistance to *Striga*. Cultivars did not differ significantly for seed yield, although KVx402-19-5, KVx291-47-222, KVx397-6-6, TN5-78 and KVx305-118-31 had the highest yields.

Promising cultivars identified by the national program: not mentioned.

Table 2.6. Performance of cowpea cultivars in a *Striga* sick plot at Kamboinse, Burkina Faso, in 1991.

Cultivar	Days to				*Striga* density	Disease		Seed yield
	Flower bud formation	Flowering	Maturity	First *Striga* emergence		Virus	Brown blotch	
	DAS				$\sqrt{x+1}$	(1-5)		Kg/ha
KVx164-65-5	32	46	70	100	1.08	2.0	1.4	546
KVx291-47-222	30	42	68	84	1.08	1.7	1.0	785
KVx397-6-6	30	42	63	91	1.08	1.7	3.4	734
KVx402-5-2	34	42	60	74	1.08	1.5	1.0	622
KVx402-19-1	30	42	63	100	1.08	2.0	1.0	759
KVx402-19-5	30	42	61	73	1.08	1.5	1.0	840
KVx305-118-31	32	45	69	100	1.08	2.2	1.2	715
IT81D-994	38	50	75	86	1.08	1.7	1.0	488
TN5-78	33	43	69	100	1.08	3.5	1.0	733
IT82D-849	29	41	59	88	1.08	1.5	1.0	634
B301	30	42	59	100	1.08	1.5	1.0	623
IT82E-32	28	41	56	33	2.40	1.0	1.0	676
L.S.D. (5%)	3	2	4	27	0.43	0.9	0.4	N.S.
C.V. (%)	6	3	4	22	25	34	23	28

c) **Ghana**

Cooperator: K.O. Marfo

The trial was established at Manga (11°01'N,00°16'W, 249m above sea level), in the Sudan savanna in a *Striga* sick plot and fertilized with 50kg of P_2O_5/ha as ordinary superphosphate. It was sown on 24 June 1991 and sprayed with an insecticide (Karate). A total rainfall of 1036 mm was received; its distribution is given in Fig. 2.2. The performance of the cultivars is given in Table 2.7. The susceptible check, IT82E-32, had the greatest *Striga* density: 3.49 shoots/m^2. With perhaps the exception of KVx305-118-31 and to some extent KVx402-5-2 and TN5-78, other cultivars exhibited good level of resistance to *Striga*. Cultivars KVx402-19-1, KVx164-65-5, KVx291-47-222 and B301 gave the highest yields.

Promising cultivars identified by the national program: B301, KVx402-19-1, KVx164-65-5 and KVx402-19-5.

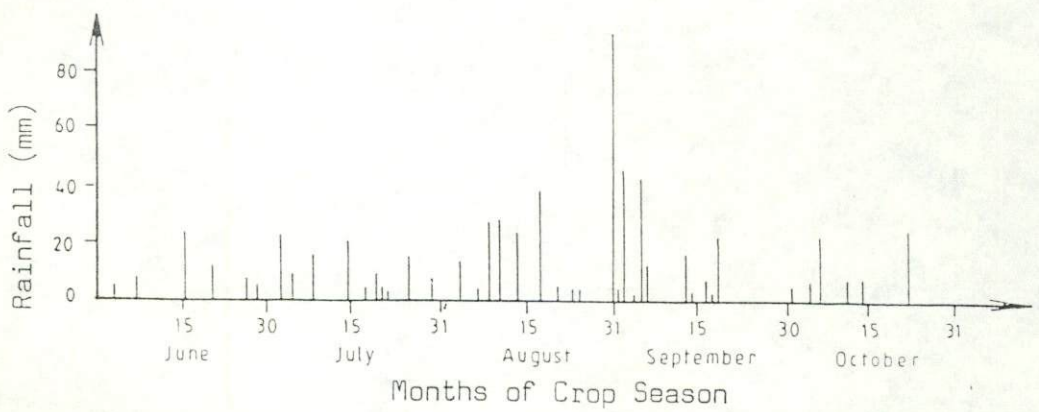


Fig. 2.2. Rainfall distribution at Manga, Ghana, 1991.

Table 2.7. Performance of cowpea cultivars in a *Striga* sick plot at Manga, Ghana, in 1991

Cultivar	Days to			*Striga* density	Seed yield
	Flower bud formation	Flowering	Maturity		
	----------DAS----------			--√x+1--	-Kg/ha-
KVx164-65-5	35	45	64	1.20	954
KVx291-47-222	35	45	63	1.27	943
KVx397-6-6	34	44	64	1.07	699
KVx402-5-2	34	44	60	1.52	877
KVx402-19-1	34	44	64	1.05	960
KVx402-19-5	34	44	64	1.05	837
KVx305-118-31	34	44	60	1.70	766
IT81D-994	43	53	75	1.02	755
TN5-78	35	45	64	1.47	689
IT82D-849	33	43	59	1.02	519
B301	35	45	60	1.00	927
IT82E-32	32	42	57	2.12	718
L.S.D. (5%)	N.S.	N.S.	1	0.42	241
C.V. (%)	0	0	1	22	21

d) **Mali**

Cooperator: Aliou Traore

The trial was conducted at Koporo, in the Sahel in the Seno province of Mali. It was sown in an unfertilized *Striga* sick plot on 8 July 1991. Cowpea plants were sprayed with an insecticide (Karate). A total rainfall of 487 mm was received; its distribution during the crop season is given in Fig. 2.3. The performance of cultivars is given in Table 2.8. *Striga* emerged too late even in the susceptible check to cause any serious yield damage to cowpea crop. The suscepible check, IT82E-32, had *Striga* density of 3.17 shoots/m^2. All other cultivars exhibited good level of *Striga* resistance as they did not differ significantly from the resistant checks: TN5-78, IT82D-849 and B301. Seed yield was not significantly affected by cultivars. However, cultivars KVx305-118-31, KVx402-5-2, KVx397-6-6, KVx164-65-5 and TN5-78 gave the highest seed yields.

Promising cultivars identified by the national program: not mentioned.

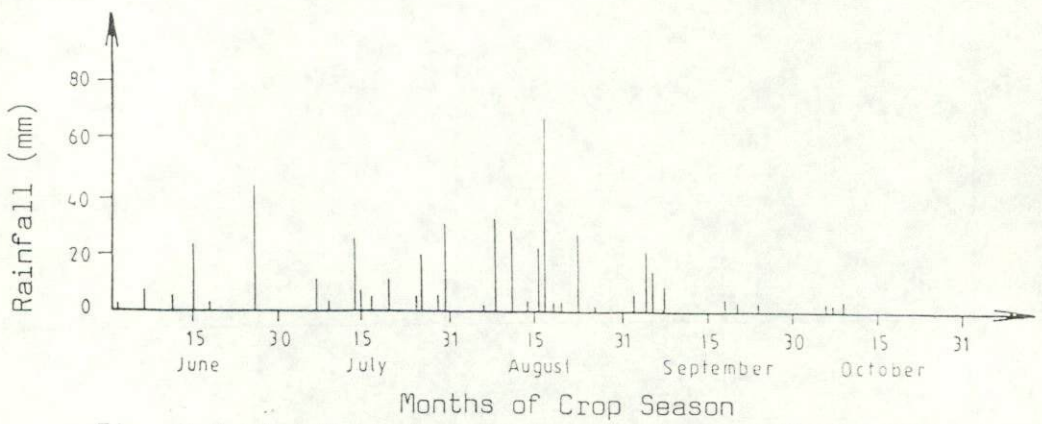


Fig. 2.3. Rainfall distribution at Koporo, Mali, 1991.

Table 2.8. Performance of cowpea cultivars in a *Striga* sick plot at Koporo, Mali, in 1991.

Cultivar	Days to				*Striga* density	Seed yield
	Flower bud formation	Flowering	Maturity	First *Striga* emergence		
	----------DAS----------				--√x+1--	---Kg/ha---
KVx164-65-5	44	47	71	100	1.10	1670
KVx291-47-222	42	47	71	85	1.07	1419
KVx397-6-6	43	45	68	85	1.05	1690
KVx402-5-2	40	45	68	85	1.20	1711
KVx402-19-1	45	51	71	100	1.57	1586
KVx402-19-5	44	46	68	100	1.02	1545
KVx305-118-31	45	52	71	100	1.12	2108
IT81D-994	57	60	83	100	1.07	1377
TN5-78	46	51	74	100	1.02	1670
IT82D-849	44	47	63	100	1.00	1156
B301	45	50	68	100	1.00	1190
IT82E-32	43	50	68	85	2.17	1043
L.S.D. (5%)	N.S.	N.S.	1	N.S.	0.62	N.S.
C.V. (%)	0	0	1	18	36	28

e) **Niger**

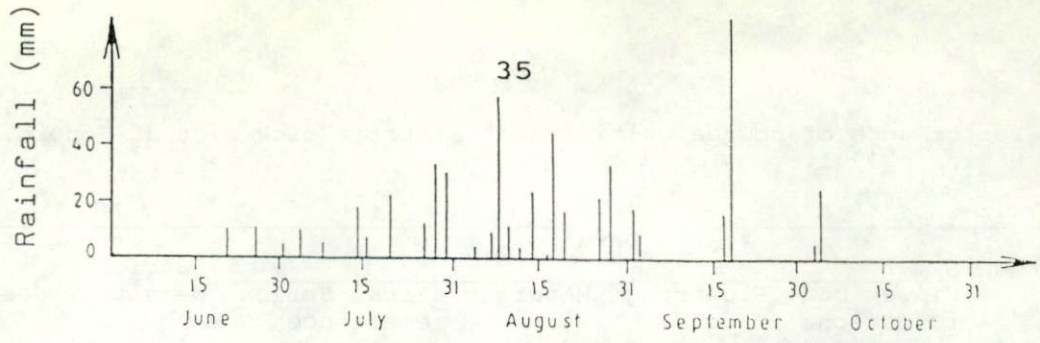
The trial was conducted at three locations in Niger:

e.1) **Birni N'konni**

Cooperator: Hassane Hama

The trial was sown on 4 July 1991 in a *Striga* sick plot at Birni N'konni (13°48'N,05°15'W, 272 m above sea level). The plot was fertilized with 45 kg of P_2O_5/ha as ordinary superphosphate and cowpea plants were sprayed with an insecticide (Sumithion) during the growth cycle. A total rainfall of 691 mm was received; its distribution during the crop season is given in Fig. 2.4. The performance of cultivars is given in Table 2.9. *Striga* emerged early in plots of the following cultivars: KVx305-118-31, KVx402-5-2, KVx291-47-222, TN5-78, KVx397-6-6, KVx402-19-5, IT81D-994 and IT82E-32. Also, cultivars in which *Striga* emerged early tended to have a high *Striga* density. In this respect, the susceptible check was not the most *Striga* susceptible cultivar at that location, instead KVx305-118-31 was the most *Striga* susceptible followed by KVx402-5-2, KVx397-6-6, KVx291-47-222, KVx402-19-5, IT81D-994 and TN5-78. Cultivars TN5-78, KVx402-19-1, IT81D-994 and KVx402-19-5 gave the highest yields.

Promising cultivars identified by the national program: IT81D-994, TN5-78, KVx402-19-1, KVx402-19-5, B301 and KVx305-118-31.



Months of Crop Season

Fig. 2.4. Rainfall distribution at Birni N'Koni, Niger, 1991.

Table 2.9. Performance of cowpea cultivars in a *Striga* sick plot at Birni-N'Koni, Niger, in 1991.

Cultivar	Days to				*Striga* density	Seed yield
	Flower bud formation	Flowering	Maturity	First *Striga* emergence		
	----------DAS----------				--√x+1--	--Kg/ha--
KVx164-65-5	49	52	93	83	1.20	1106
KVx291-47-222	47	50	82	54	1.57	1112
KVx397-6-6	48	49	70	57	1.60	982
KVx402-5-2	47	50	70	45	1.62	1127
KVx402-19-1	47	49	70	87	1.12	1440
KVx402-19-5	46	49	70	57	1.57	1315
KVx305-118-31	50	51	82	43	1.92	1085
IT81D-994	64	70	93	57	1.55	1377
TN5-78	49	51	105	55	1.47	1712
IT82D-849	46	48	60	100	1.00	626
B301	46	49	70	87	1.07	1064
IT82E-32	46	48	70	67	1.32	1002
L.S.D. (5%)	3	1	21	37	0.51	424
C.V. (%)	5	2	19	39	25	25

e.2) **Gabougoura**

Cooperator: Halidou Aboubakar

The trial was sown on 17 July 1991 in a *Striga* sick plot, also infested with *Macrophomina* spp, at Gabougoura (13°33'N, 2°01'E, 200 m above sea level) near Niamey. The plot was fertilized with 45 kg of P_2O_5/ha as ordinary superphosphate; and cowpea plants were sprayed twice with an insecticide (Cymbush Super). The rainfall (326 mm) distribution during the crop season is shown in Fig. 2.5. The performance of cultivars is given in Table 2.10. *Striga* emerged early (25 days after sowing) for all cultivars. Though cultivars did not differ significantly for either *Striga* density or seed yield, it is worth noting that the susceptible check bore the least *Striga* density while cultivars KVx164-65-5, IT82E-32 and B301 gave the highest seed yields.

Promising cultivars identified by the national program: KVx291-47-222, KVx305-118-31, IT81D-994 and IT82E-32.

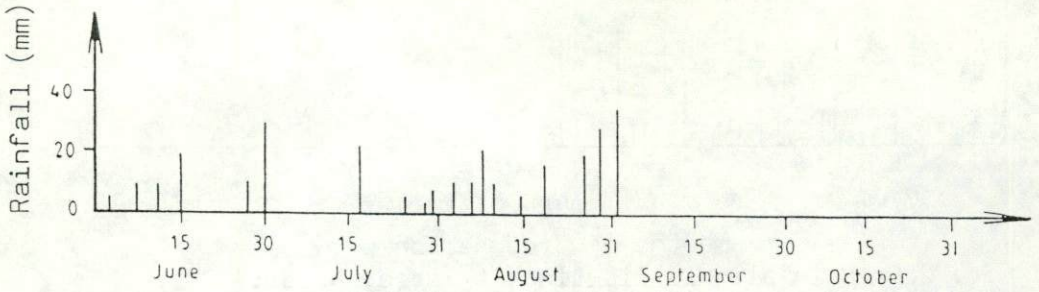


Fig. 2.5. Rainfall distribution at Gabougoura, Niger, 1991.

Table 2.10. Performance of cowpea cultivars in a *Striga* sick plot at Gabougoura, Niger, in 1991.

Cultivar	Days to				*Striga* density	Seed yield
	Flower bud formation	Flowering	Maturity	*Striga* first emergence		
	----------DAS----------				-√x+1-	--Kg/ha--
KVx164-65-5	34	50	69	25	3.80	1174
KVx291-47-222	32	45	64	25	2.00	352
KVx397-6-6	23	39	61	25	3.60	747
KVx402-5-2	30	48	68	25	4.40	800
KVx402-19-1	25	41	61	25	3.20	651
KVx402-19-5	27	43	64	25	5.22	758
KVx305-118-31	34	50	66	25	3.25	480
IT81D-994	34	57	72	25	2.32	598
TN5-78	32	48	67	25	3.75	566
IT82D-849	20	34	58	25	5.02	790
B301	32	47	66	25	3.62	982
IT82E-32	20	36	58	25	1.97	993
L.S.D. (5%)	5	5	6	N.S.	N.S.	N.S.
C.V. (%)	11	8	7	0	63	60

e.3) **Tarna**

Cooperator: Hassane Hama

The trial was conducted in a *Striga* sick plot at Tarna (13°28'N, 07°07' W, 350 m above sea level). The trial was sown on 21 June 1991. Rainfall (401 mm) distribution during the crop season is given in Fig. 2.6. *Striga* density and seed yield of cultivars are given in Table 2.11. The level of *Striga* infestation was low and there was no significant cultivar difference. However, *Striga* resistant checks: B301, IT82D-849 and TN5-78 had the least *Striga* density. Cultivars KVx402-5-2, KVx305-118-31, KVx164-65-5, TN5-78, KVx291-47-222 and B301 gave the highest seed yields.

Promising cultivars identified by the national program: not mentioned.

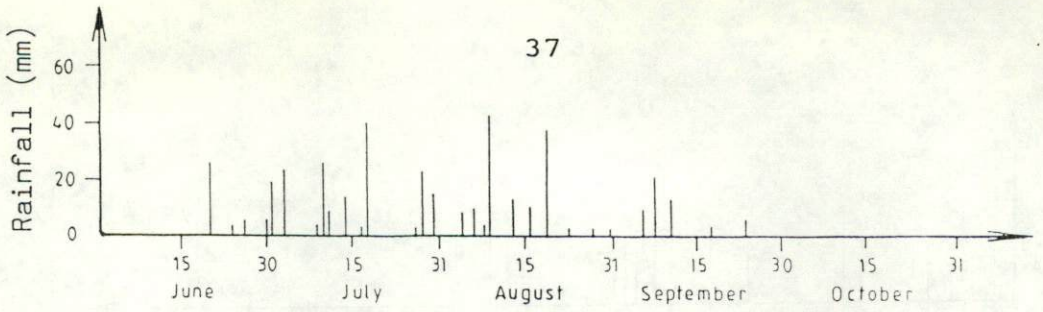


Fig. 2.6. Rainfall distribution at Tarna, Niger, 1991.

Table 2.11. Performance of cowpea cultivars in a *Striga* sick plot at Tarna, Niger, in 1991.

Cultivar	*Striga* density	Seed yield
	------$\sqrt{x+1}$------	----kg/ha----
KVx164-65-5	1.27	1432
KVx291-47-222	1.55	1216
KVx397-6-6	1.30	815
KVx402-5-2	1.32	1587
KVx402-19-1	1.12	937
KVx402-19-5	1.20	957
KVx305-118-31	1.40	1581
IT81D-994	1.22	47
TN5-78	1.05	1233
IT82D-849	1.05	757
B301	1.02	1049
IT82E-32	1.52	915
L.S.D. (5%)	N.S.	506
C.V. (%)	24	34

f) **Nigeria**

Cooperators: O.O. Olufajo and A.A. Zaria

The trial was conducted at two locations: Mafara and Minjibir. However, the results from Mafara had to be discarded as they did not seem to be reliable.

Minjibir

A description and agronomic practices used at this location is given in Part I, "Regional Observatory Nursery". The trial was sown on 23 July 1991. Rainfall distribution during the crop season is given in Fig. 2.7 (Part I). The performance of cultivars is given in Table 2.12. *Striga* emerged early in the plots of cultivars: IT82E-32, IT81D-994, KVx 164-65-5, KVx402-5-2, KVx291-47-222, KVx305-118-31 and TN5-78. The level of *Striga* infestation was low and cultivars: KVx402-5-2, IT82E-32, KVx305-118-31 and KVx164-65-5 exhibited the highest *Striga* density. Seed yield was not significantly affected by cultivars, however, cultivars IT82E-32, B301, KVx397-6-6 and IT81D-994 gave the highest yields.

Promising cultivars identified by the national program: not mentioned.

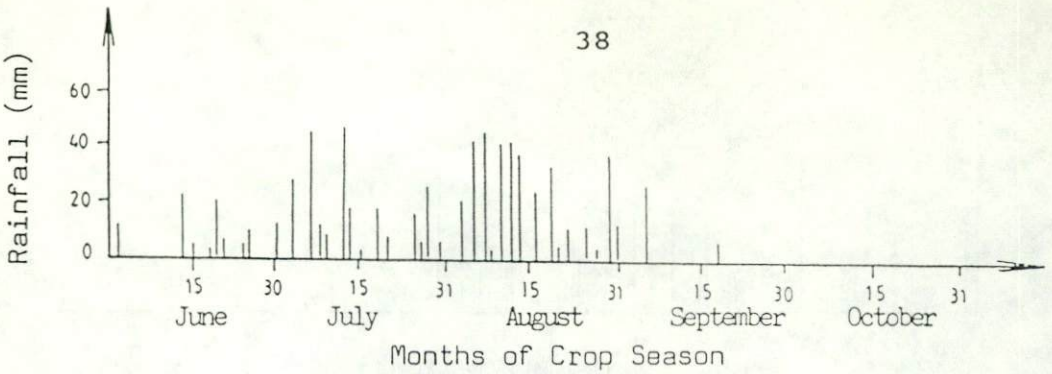


Fig. 2.7. Rainfall distribution at Minjibir, Nigeria, 1991

Table 2.12. Performance of cowpea cultivars in a *Striga* sick plot at Minjibir, Nigeria, in 1991.

Cultivar	Days to			*Striga* density	Viral disease	Seed yield
	Flowering	Maturity	First *Striga* emergence			
	----------DAS----------			$-\sqrt{x+1}-$	-(1-5)-	-Kg/ha-
KVx164-65-5	51	80	46	1.40	2.50	392
KVx291-47-222	51	78	59	1.22	2.75	518
KVx397-6-6	51	78	89	1.05	1.50	693
KVx402-5-2	50	77	56	1.75	1.00	530
KVx402-19-1	50	82	90	1.02	1.75	446
KVx402-19-5	51	77	100	1.00	1.50	584
KVx305-118-31	52	81	61	1.55	1.25	304
IT81D-994	54	82	45	1.22	1.50	647
TN5-78	50	78	68	1.17	2.50	567
IT82D-849	51	79	100	1.00	1.75	559
B301	50	78	100	1.00	1.00	710
IT82E-32	50	77	43	1.67	1.00	755
L.S.D. (5%)	2	3	25	0.44	0.83	N.S.
C.V. (%)	3	3	25	24	35	41

g) **Togo**

Cooperator: Toky Payaro

The trial was conducted at Pissare in northern Togo, in a *Striga* sick plot, fertilized with 22.5:22.5:22.5 kg of $N:P_2O_5:K_2O$/ha. It was sown on 8 July 1991 and cowpea plants were sprayed with insecticides (Cypermethrine and Dimethoate). A total rainfall of 1434 mm was received; its distribution during the crop season is given in Fig. 2.8. The performance of cultivars is given in Table 2.13. *Striga* emerged early in the plots of the susceptible check, IT82E-32, and cultivars: KVx305-118-31, KVx164-65-5, KVx402-5-2, KVx402-19-5, KVx291-47-222 and KVx402-19-1. The susceptible check IT82E-32 and cultivars KVx402-5-2 and KVx305-118-31 had the highest *Striga* density. Cultivar B301 was free from *Striga* infestation. The latter cultivar and KVx291-47-222, KVx402-19-1, KVx402-5-2, KVx397-6-6, KVx402-19-5 and IT82D-849 gave the highest seed yields.

Promising cultivars identified by the national program: IT81D-994.

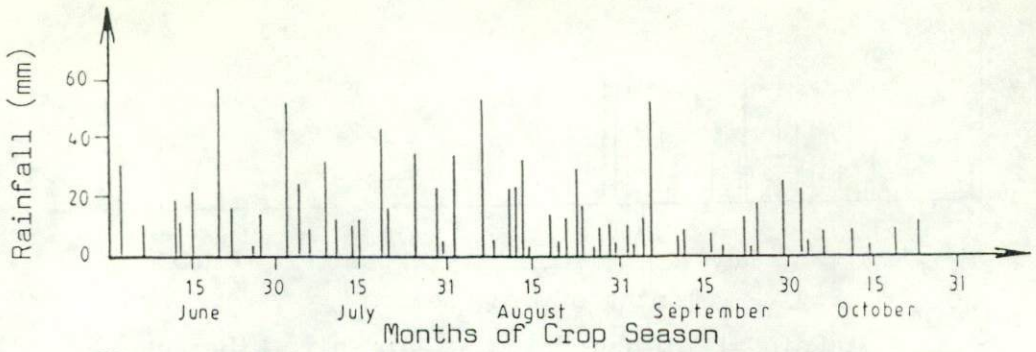


Fig. 2.8. Rainfall distribution at Pissare, Togo, 1991.

Table 2.13. Performance of cowpea cultivars in a *Striga* sick plot at Pissaré, Togo, in 1991.

Cultivar	Days to				*Striga* density	Seed yield
	Flower bud formation	Flowering	Maturity	First *Striga* emergence		
	----------DAS----------				--√x+1--	--Kg/ha--
KVx164-65-5	37	46	68	43	1.55	868
KVx291-47-222	36	46	68	46	1.52	1336
KVx397-6-6	35	41	62	79	1.15	1062
KVx402-5-2	38	43	66	44	3.60	1068
KVx402-19-1	36	43	67	47	1.67	1095
KVx402-19-5	35	43	67	45	1.80	1062
KVx305-118-31	38	46	67	42	3.40	795
IT81D-994	41	47	65	64	1.30	845
TN5-78	37	45	66	63	1.95	549
IT82D-849	35	40	61	65	1.42	1050
B301	35	41	63	100	1.00	1452
IT82E-32	35	40	61	38	3.47	814
L.S.D. (5%)	2	2	2	21	0.99	453
C.V. (%)	3	3	2	26	35	31

3. CONCLUSION

Striga Infestation

Gabougoura, Niger, was the most *Striga* infested location, followed by Pissare, Togo; whereas Abomey, Benin was almost free from *Striga* infestation. Other locations were intermediate between Pissare and Abomey, (Table 2.14). The susceptible check, IT82E-32, was consistently infested with *Striga* at all locations; the variation of its sum of squares was not associated with the regression line of mean *Striga* densities. It, therefore, distinguished itself from other cultivars that exhibited some level of *Striga* resistance. Cultivars B301, IT81D-994 and KVx291-47-222, although not immune, exhibited the highest level of *Striga* resistance. Other cultivars were intermediate between the susceptible check IT82E-32, and the resistant check B301. However, cultivars KVx402-19-5, IT82D-849 and KVx402-5-2 distinguished themselves from others as their susceptibility increased under heavy *Striga* infestation conditions (Table 2.14).

Table 2.14. *Striga* density ($\sqrt{x+1}$, with x = *Striga* shoots/m^2) as affected by location and cultivar; and slope (*B*) and coefficient of determination (r^2) associated with the regression lines of mean *Striga* densities of cultivar on mean *Striga* density after different *Striga* sick locations in West Africa in 1991.

Location effect		Cultivar effect			
Location	*Striga* density	Cultivar	*Striga* density	*B*	r^2
-Benin					
. Abomey	1.00	KVx164-65-5	1.39	1.10	0.95
. Tindji	1.09	KVx291-47-222	1.28	0.38*	0.72
. Zakpota	1.11	KVx397-6-6	1.33	0.99	0.88
-Burkina Faso		KVx402-5-2	1.72	1.50*	0.88
. Fada N'Gourma	1.22	KVx402-19-1	1.33	0.87	0.93
. Kamboinse	1.19	KVx402-19-5	1.51	1.69**	0.96
-Ghana		KVx305-118-31	1.63	1.03	0.71
. Manga	1.29	IT81D-994	1.24	0.51**	0.88
-Mali		TN5-78	1.43	1.12*	0.98
. Koporo	1.20	IT82D-849	1.40	1.59**	0.92
-Niger		B301	1.24	1.01	0.87
. Birni N'Konni	1.42	IT82E-32	2.02	0.19*	0.05
. Gabougoura	3.51				
. Tarna	1.25	L.S.D. (5%)	0.29	-	-
-Nigeria		C.V. (%)	49	-	-
. Minjibir	1.26				
-Togo					
. Pissare	1.99				
L.S.D. (5%)	0.22				
C.V. (%)	49				

*, ** = *B* significant at 5 and 1% probability level, respectively.

Seed Yield

Koporo, Mali and Fada N'gourma, Burkina Faso, were the highest yielding locations; whereas the three locations in Benin and Minjibir, Nigeria, were the lowest yielding locations (Table 2.15). The low yields were due to other factors rather than *Striga* infestation as correlation studies did not reveal any significant results.

The resistant check, B301, and KVx402-5-2, KVx402-19-1, KVx291-47-222, KVx397-6-6, KVx402-19-5 and KVx164-65-5, were the highest yielding cultivars across locations. Their regression lines accounted for 0.75 to 0.96 of variation of the sum of squares for yield. The cultivars, especially KVx291-47-222 appeared to be the most promising ones; KVx402-5-2 and KVx402-19-5 exhibited a good level of tolerance to *Striga* infestation.

Table 2.15. Seed yield (kg/ha) as affected by location and cultivar; and slope (*B*) and coefficient of determination (r^2) associated with the regression of mean yields of cultivars on mean yield at different locations in *Striga* sick locations in West Africa in 1991.

Location effect		Cultivar effect			
Location	Seed yield	Cultivar	Seed yield	*B*	r^2
-Benin					
.Abomey	192	KVx164-65-5	824	1.07	0.81
.Tindji	431	KVx291-47-222	846	1.14	0.88
.Zakpota	223	KVx397-6-6	842	1.00	0.91
-Burkina Faso		KVx402-5-2	935	1.19	0.92
.Fada	1459	KVx402-19-1	850	1.14+	0.96
.Kamboinse	680	KVx402-19-5	842	1.03	0.97
-Ghana		KVx305-118-31	816	1.24	0.81
.Manga	804	IT81D-994	667	0.82	0.61
-Mali		TN5-78	792	1.09	0.78
.Koporo	1515	IT82D-849	717	0.75+	0.78
-Niger		B301	884	0.77	0.75
.Birni N'Konni	1162	IT82E-32	793	0.75+	0.79
.Gabougoura	741				
.Tarna	1044	L.S.D. (5%)	113	-	-
-Nigeria		C.V. (%)	34	-	-
.Minjibir	559				
-Togo					
.Pissare	1000				
L.S.D. (5%)	184				
C.V. (%)	34				

III

REGIONAL TRIAL FOR ADAPTATION TO SUDANIAN AND SAHELIAN ZONES

1. BACKGROUND

Sorghum, millet and cowpea are the most common staple foods of the Sudanian-Sahelian zones. However during droughty years, usually causing complete failure of millet crop, cowpea then consumed as "cous-cous" becomes the only food source for this zone.

In addition to *Striga,* bacterial, fungal and viral diseases (such as bacterial blight, ashy stem rot, and aphid borne mosaic virus) and insect pests, cowpea production in the Sudanian-Sahelian zones can be crippled by moisture shortage and heat stress or excess moisture. Cowpea cultivars intended for these zones should be well buffered against all these environmental hazards if sustainable productivity and production by peasant farmers is to be ensured.

A number of new cultivars well adapted to Sudanian-Sahelian zones have been developed by RENACO Lead Centers in Burkina Faso, Niger (including IITA-ICRISAT) and Senegal. They have been subjected to regional testing with the view of exposing them to other national programs to examine and select some of them for further testing before releasing them to farmers of their respective countries.

The cultivars are described in Table 3.1. A total of 15 sets were dispatched to 8 countries as follows: Benin (3), Burkina Faso (2), Cameroon (2), Mali (2), Mauritania (1), Niger (1), Nigeria (1) and Tchad (3). Feedback (13) was received from all participating countries except Tchad from which no feedback was received for one of the trials. The results of one trial from Benin was discarded because they did not seem to be relialble.

The results are reported as follows:

Table 3.1. Description of cultivars used in the regional trial for adaptation to Sudanian-Sahelian zones in 1991.

Cultivar	Pedigree	Origin	Characteristics
1. KVx396-4-5-2D	(IAR1696 x Vita-7) x Suvita-2	Burkina Faso	Adapted to the Sahel and Sudan & northern Guinea savannas
2. KVx164-41-64	(IT82D-716 x KVx30-G467-5-10K)	-do-	Resistant to bruchids and *Striga*
3. KVx402-5-2	(KVx30-166-3G- x B301)	-do-	Adapted to the Sahel and Sudan savanna and Resistant to *Striga*
4. KVx402-19-5	-do-	-do-	-do-
5. IS86-275N	(58-57 x IT81D-1137)	ISRA/ Senegal	Adapted to the Sahel and Sudan savannas
6. B89-504N	-	-do-	-do-
7. ITN89E-4$	-	IITA/	-do-
8. ITN89E-3	-	INRAN/Niger	-do-
9. KC85-7$	-	INRAN/Niger	-do-
10. KB85-18	-	IITA/ Ibadan	Adapted to the Sahel, sudan & northern Guinea savannas
11. TVx3236	(TVx1509 x Ife brown)	-	-
12. Local check	-	-	-

$ Due to insufficient seeds of these two cultivars, ITN89E-4 was replaced by KVx396-18-10 and KCB5-7 by KVx396-16-10-1 for Kamboinse, Burkina Faso and Gueringue and Mouda, Cameroon.

2. RESULTS

a) Benin

Cooperator: Sanni O. Abou

The trial was conducted at two locations, Adjohoun and Niaouli.

a.1) Adjohoun

Adjohoun is located in the south-eastern Benin in the Coastal zone. The trial was sown on 12 September 1991 in a field plot fertilized with 45 kg of P_2O_5/ha as triple superphosphate. Cowpea plants were sprayed with insecticides (Deltamethrine and Malathion) and harvested on 12 December, 1991. Rainfall data were not provided. The performance of cultivars is presented in Table 3.2. Cultivars KVx402-5-2, KVx402-19-5, KVx396-4-5-2D, Kpodiguegue and B89-504N gave the highest yields.

Promising cultivars identified by the national program: KVx402-5-2, KVx396-4-5-2, KVx402-19-5 and B89-504N.

Table 3.2. Performance of cowpea cultivars at Adjohoun/ Porto-Novo, Benin, in the coastal savanna in 1991.

Cultivar	Days to flowering	Seed yield
	-------DAS-------	---kg/ha---
KVx396-4-5-2D	44	927
KVx164-41-64	48	200
KVx402-5-2	44	1069
KVx402-19-5	43	1060
IS86-275N	44	501
B89-504N	43	835
ITN89E-4	45	726
ITN89E-3	45	568
KC85-7	46	133
KB85-18	42	555
TVx3236	47	442
Kpodjiguegue	44	918
L.S.D. (5%)	1	375
C.V. (%)	2	39

a.2) **Niaouli**

Niaouli experimental station is located 50 km north of Cotonou, in the Coastal zone. The trial was sown on 19 September, 1991 on a field plot fertilized with 45 kg of P_2O_5/ha as triple phosphate. Cowpea plants were sprayed with insecticides (Deltamethrine and Malathion); diseases harmed plants during the season; harvest was done on 9 December, 1991. Rainfall distribution during the crop season is given in Fig. 3.1. The performance of cultivars is given in Table 3.3. No significant cultivar difference was noticed.

Promising cultivars identified by the national program: ITN89E-3, IT89E-4, KVx402-5-2.

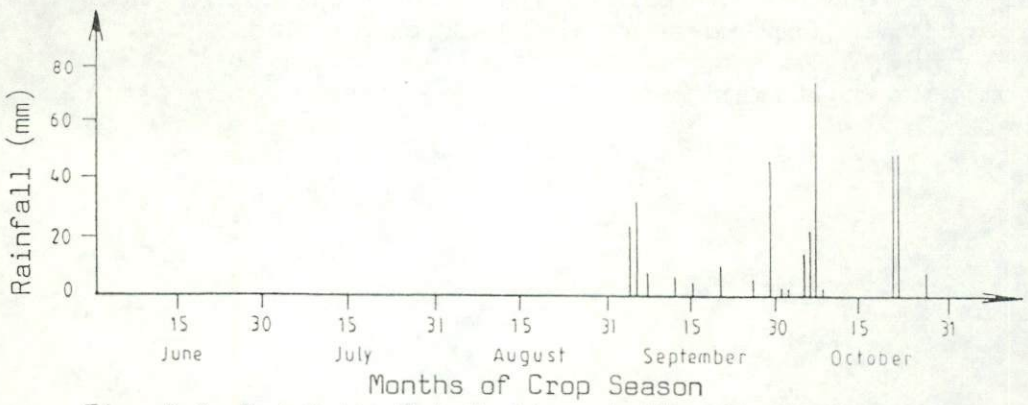


Fig. 3.1. Rainfall distribution at Niaouli, Benin, 1991.

Table 3.3. Performance of cowpea cultivars at Niaouli, Benin in the coastal zone in 1991

Cultivar	Days to flowering	Disease attack		Seed yield
		Virus	*Cercospora* leaf spots	
	---DAS---	-------(1-5)------		-kg/ha-
KVx396-4-5-2D	40	2.50	2.25	313
KVx164-41-64	41	2.25	2.25	225
KVx402-5-2	38	2.50	2.25	313
KVx402-19-5	40	2.75	2.00	250
IS86-275N	39	2.50	2.00	229
B89-504N	40	2.50	2.25	313
ITN89E-4	39	2.00	2.25	292
ITN89E-3	40	2.50	2.25	334
KC85-7	40	2.50	2.25	313
KB85-18	38	2.25	2.75	229
TVx3236	41	2.25	2.25	334
Kpodjiguegue	40	2.25	2.75	229
L.S.D. (5%)	N.S.	N.S.	N.S.	N.S.
C.V. (%)	4	14	20	46

b) **Burkina Faso**

Cooperator: J.T. Ouedraogo

The trial was conducted at two locations: Kamboinse in the Sudan Savanna and Pobe/Djibo in the Sahel.

b.1) **Kamboinse**

At this location, agronomic practices applied and the amount and distribution of rainfall received have been described in Part I. Cowpea was sown on 18 July 1991 and plants were attacked by certain diseases and *Striga gesnerioides*. The performance of cultivars is given in Table 3.4. Cultivars did not differ significantly as far as seed yield is concerned.

Promising cultivars identified by the national program: not mentioned.

Table 3.4. Performance of cowpea cultivars at Kamboinse, Burkina Faso, in the Sudan savanna in 1991.

Cultivar	Days to		Disease attack			*Striga* density	Seed yield
	Flowering	Maturity	Virus	Leaf smut	Web blight		
	----------DAS-------		--------(1-5)-------			--√x+1--	--kg/ha--
KVx396-4-5-2D	43	66	1.50	1.00	2.00	1.22	724
KVx164-41-64	45	69	1.75	1.00	1.25	1.08	766
KVx402-5-2	41	61	1.50	1.00	1.87	1.08	758
KVx402-19-5	41	63	1.50	1.12	2.12	1.08	840
IS86-275N	41	62	4.25	1.12	2.12	1.08	694
B89-504N	40	60	2.50	1.00	3.12	1.13	709
KVx396-18-10	44	65	1.75	1.00	1.75	1.27	805
ITN89E-3	46	69	2.25	1.00	1.50	1.08	719
KVx396-16-10-1	42	64	1.00	1.00	1.87	1.08	707
KB85-18	41	63	3.25	1.00	2.12	1.08	770
TVx3236	44	69	2.00	1.00	1.87	1.27	650
Boussé Local	45	71	2.00	1.62	1.75	1.35	776
L.S.D. (5%)	3	4	0.95	0.25	0.65	0.08	N.S.
C.V. (%)	4	4	31	16	23	5	24

b.2) **Pobe/Djibo**

Pobe is located 20 km south of Djibo (14°06'N,01°37'E, 274m above sea level) in the Sahel. The trial was sown on 1 July 1991 in a field plot fertilized with 45 kg of P_2O_5/ha as ordinary superphosphate. Cowpea plants were sprayed twice with insecticides (Deltamethrine and Dimethoate). Some disease attacks on plants were noticed. A total rainfall of 550 mm was received; its distribution during the season is given in Fig. 3.2. The performance of cultivars is given in Table 3.5. Cultivars ITN89E-3, KVx396-4-5-2D and KB85-18 gave the highest seed yields.

Promising cultivars identified by the national program: not mentioned.

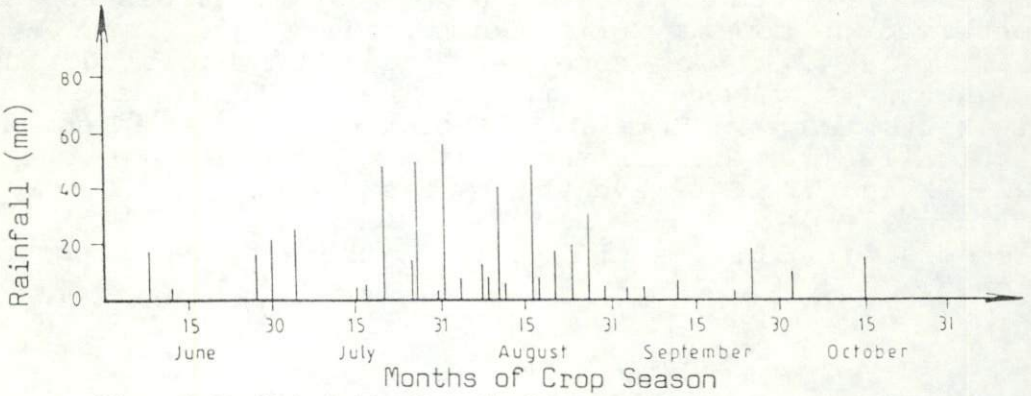


Fig. 3.2. Rainfall distribution at Pobe, Burkina Faso, 1991.

Table 3.5. Performance of cowpea cultivars at Pobe/Djibo, Burkina Faso, in the Sahel in 1991.

	Days to			Disease attack		Seed yield
	Flower bud formation	Flowering	Maturity	Virus	Bacterial blight	
	----------DAS----------			------(1-5)-------		--kg/ha--
KVx396-4-5-2D	35	47	69	1.50	1.75	720
KVx164-41-64	32	45	67	1.37	1.75	520
KVx402-5-2	33	43	63	2.00	2.25	485
KVx402-19-5	35	44	65	1.50	3.00	565
IS86-275N	28	42	64	2.75	1.00	415
B89-504N	29	41	60	1.75	1.50	505
ITN89E-4	35	46	69	2.00	1.75	600
ITN89E-3	37	51	74	2.00	1.75	760
KC85-7	37	47	73	1.75	1.75	375
KB85-18	35	45	71	1.50	1.25	630
TVx3236	35	46	67	1.25	2.50	490
Pobé Local	37	45	66	3.87	2.00	465
L.S.D. (5%)	3	2	2	1.33	0.68	158
C.V. (%)	6	3	2	48	25	20

c) **Cameroon**

Cooperator: Chevalier Endondo

The trial was conducted at two locations in the Sudan savanna zone - Guering and Mouda.

c.1) **Guering**

This location is situated north-west of Maroua (10°30'N,14°30E, 400 m above sea level). The trial was sown on 15 July 1991 in a plot fertilized with 40:30:30 kg of $N:P_2O_5:K_2O$/ha. Cowpea plants were sprayed with an insecticide (Sherpa-plus). A moderate to high level of viral disease attack was observed on cowpea plants during the crop season. A total rainfall of 1041 mm was received; its distribution during the crop season is given in Fig.3.3. The performance of cowpea cultivars is given in Table 3.6. Though cultivars did not differ statistically from one another, it is notable that cultivars KVx402-5-2 and TVx3236 gave the lowest yields.

Promising cultivars identified by the national program: not mentioned.

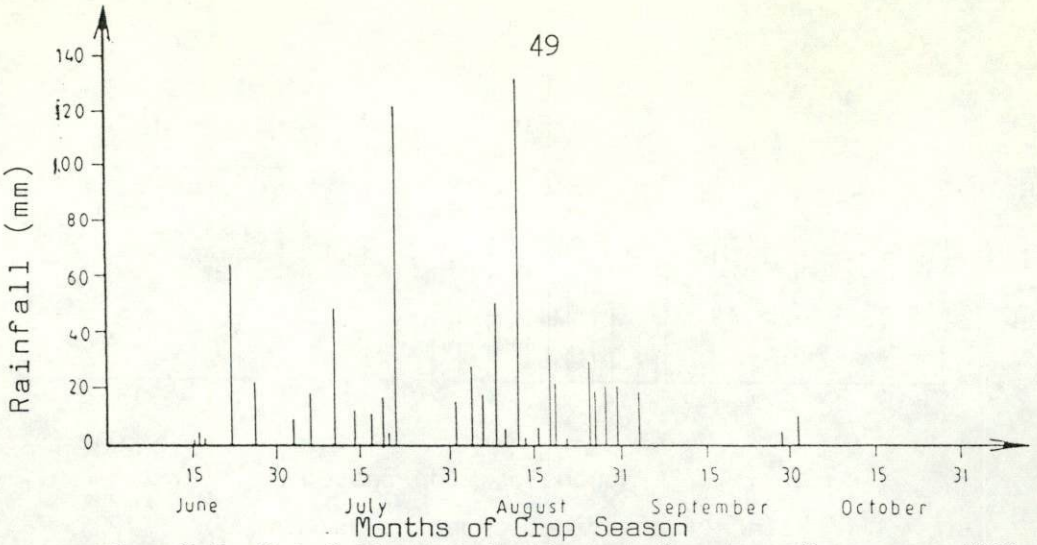


Fig. 3.3. Rainfall distribution at Guering, Cameroon, 1991.

Table 3.6. Performance of cowpea cultivars at Gueringue/Maroua, Cameroon, in the Sudan savanna, in 1991.

Cultivar	Days to		Viral disease	Seed yield
	Flowering	Maturity		
	---------DAS----------		--(1-5)--	---kg/ha---
KVx396-4-5-2D	44	67	2.75	1371
KVx164-41-64	44	66	3.00	1579
KVx402-5-2	45	70	3.62	633
KVx402-19-5	44	65	3.37	1496
IS86-275N	44	64	2.75	1533
B89-504N	44	67	3.25	1471
KVx396-18-10	44	66	3.00	1513
ITN89E-3	44	65	3.00	1517
KVx396-16-10-1	44	67	3.25	1117
KB85-18	43	66	2.62	1313
TVx3236	44	67	3.00	912
VYA	44	64	2.37	2309
L.S.D. (5%)	N.S.	N.S.	N.S.	N.S.
C.V. (%)	2	5	20	50

c.2) **Mouda**

This location is situated about 15 km south-east of Maroua. The trial was sown on 15 July, 1991. All agronomic practices used were as described for Guering (see c.1 above). The viral disease incidence was not as severe as in Guering. A total rainfall of 986 mm was received; its distribution during the crop season is shown in Fig. 3.4. The performance of cultivars is given in Table 3.7. Cultivars KVx396-4-5-2D, KVx396-18-10, KVx396-16-10-1, ITN89E-3, KVx 402-5-2 and KVx402-19-5 gave the highest seed yield.

Promising cultivars identified by the national program: not mentioned.

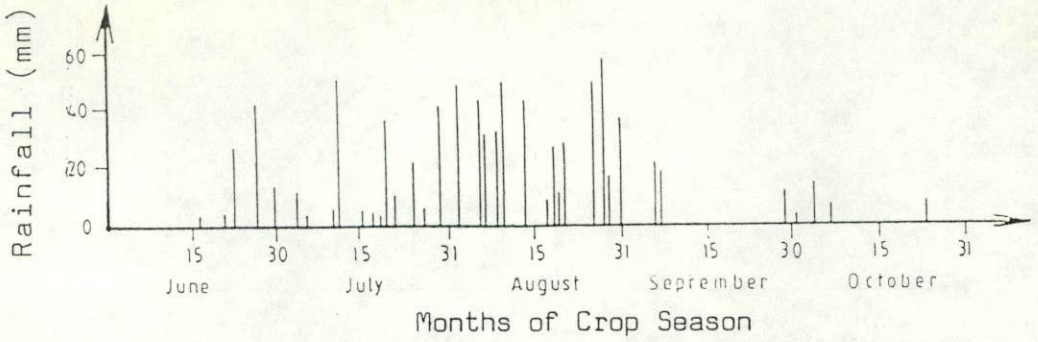


Fig. 3.4. Rainfall distribution at Mouda, Cameroon, 1991.

Table 3.7. Performance of cowpea cultivars at Mouda/Maroua, Cameroon, in the Sudan savanna, in 1991.

Cultivar	Days to			Viral disease	Seed yield
	Flower bud formation	Flowering	Maturity		
	----------DAS----------			--(1-5)--	--kg/ha--
KVx396-4-5-2D	39	52	72	1.00	1792
KVx164-41-64	41	54	75	1.75	1117
KVx402-5-2	35	45	63	1.62	1634
KVx402-19-5	35	45	63	2.00	1533
IS86-275N	35	45	65	2.00	1250
B89-504N	35	45	64	1.25	1375
KVx396-18-10	36	46	66	1.00	1709
ITN89E-3	40	53	74	2.00	1638
KVx396-16-10-1	35	45	63	1.00	1659
KB85-18	35	45	64	1.50	1433
TVx3236	41	55	76	1.00	1433
VYA	41	53	75	1.50	1254
L.S.D. (5%)	3	4	4	0.75	266
C.V. (%)	5	5	4	36	12

d) **Mali**

Cooperator: Aliou Traore

The trial was conducted at two locations: Cinzana and Koporo.

d.1) **Cinzana**

Agronomic practices used and the rainfall received and its distribution at the Cinzana location is described in Part I: Observation Nursery. The trial was sown on 17 July 1991. The performance of cultivars is given in Table 3.8. Cultivars KVx402-5-2, KVx396-4-5-2D; KC85-7 and B89-504N were the highest yielders.

Promising cultivars identified by the national program: not mentioned.

Table 3.8. Performance of cowpea cultivars at Cinzana, Mali, in the Sudan savanna in 1991.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			--kg/ha--
KVx396-4-5-2D	38	50	63	1474
KVx164-41-64	38	50	63	654
KVx402-5-2	38	45	63	1578
KVx402-19-5	38	50	63	1228
IS86-275N	37	45	63	1066
B89-504N	38	45	63	1286
ITN89E-4	38	50	63	1224
ITN89E-3	38	50	63	1089
KC85-7	38	47	73	1369
KB85-18	37	47	63	1058
TVx3236	38	50	67	889
Amary shô	50	63	77	777
L.S.D. (5%)	1	2	4	349
C.V. (%)	2	2	4	21

d.2) **Koporo**

A description of the agronomic practices used and the rainfall received and its distribution during the season for Koporo is in Part II: *Striga* Resistance Trial. The trial was sown on 8 July 1991. The performance of cultivars is given in Table 3.9. KC85-7, KVx402-5-2, KVx402-19-5, IS86-275N and KB85-18 were the highest yielding cultivars.

Promising cultivars identified by the national program: not mentioned.

Table 3.9. Performance of cowpea cultivars at Koporo, Mali, in the Sahel in 1991.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			---kg/ha---
KVx396-4-5-2D	48	52	70	1607
KVx164-41-64	43	49	71	1211
KVx402-5-2	43	47	71	1837
KVx402-19-5	40	46	67	1837
IS86-275N	41	45	67	1837
B89-504N	32	39	60	1357
ITN89E-4	51	57	74	1315
ITN89E-3	52	57	75	1586
KC85-7	50	54	74	2108
KB85-18	50	54	71	1795
TVx3236	47	52	71	1023
Kougnékou	52	57	83	83
L.S.D. (5%)	N.S.	N.S.	N.S.	419
C.V. (%)	0	0	0	20

e) **Mauritania**

Cooperator: Sidi R'chid

The trial was conducted at Sylla, of which a description of the agronomic practices used, rainfall received and its distribution during the season are in Part I: Observatory Nursery. The trial was sown on 23 July 1991. The performance of cultivars is given in Table 3.10. The highest yielding cultivars were TVx3236, KBS85-18 and KVx402-5-2.

Promising cultivars identified by the national program: TVx3236, KC87-7, KVx402-5-2, IS86-275N, KB85-18 and KVx396-4-5-2D.

Table 3.10. Performance of cowpea cultivars at Sylla, Mauritania in the Sahel, in 1991.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			---kg/ha---
KVx396-4-5-2D	40	48	61	2138
KVx164-41-64	43	50	64	1098
KVx402-5-2	45	55	66	2292
KVx402-19-5	42	49	64	1325
IS86-275N	40	48	61	1467
B89-504N	36	42	57	1594
ITN89E-4	39	46	62	1537
ITN89E-3	41	52	65	1734
KC85-7	41	48	62	1496
KB85-18	39	46	61	2659
TVx3236	38	46	61	2963
Kaedi Blanc	41	51	65	1265
L.S.D. (5%)	4	6	N.S.	724
C.V. (%)	7	9	6	28

f) **Niger**

Cooperator: Adamou Moutari

The trial was conducted at Kolo (13°18°N,2°21'E, 210 m above sea level) in the Sudanian Sahelian zone. It was sown on 5 July 1991 in a field plot fertilized with 18 kg of P_2O_5/ha as ordinary superphosphate. Cowpea plants were protected against insect pests with an insecticide (Cymbush super). Some insect damage was recorded during the crop season. A total rainfall of 414 mm was received; its distribution is shown in Fig. 3.5. The performance of cultivars is given in Table 3.11. Although cultivars did not differ significantly from one another, TN5-78, KVx402-5-2, KB85-18 and KVx402-19-5 gave the highest yields.

Promising cultivars identified by the national program: TN5-78, KVx402-5-2, KC85-7, KB85-18 and KVx402-19-5.

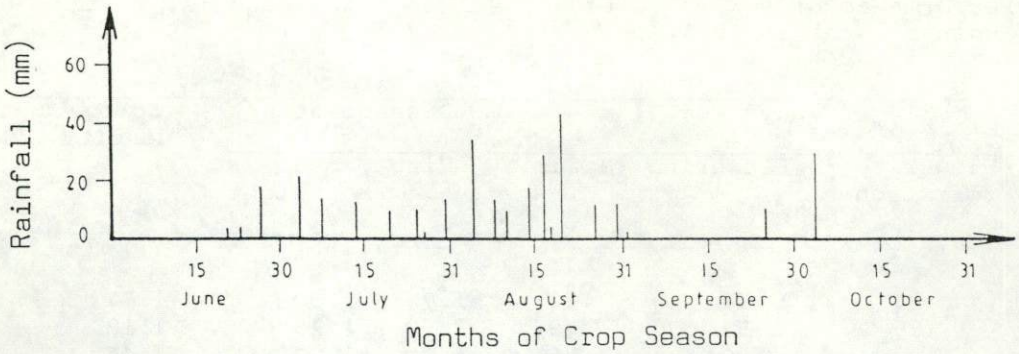


Fig. 3.5. Rainfall distribution at Kolo, Niger, 1991.

Table 3.11. Performance of cowpea cultivars at Kolo, Niger, in the Sudanian-Sahelian zones in 1991.

Cultivar	Days to		Insect attack		Seed yield
	Flowering	Maturity	Aphids	Pod sucking bugs	
	---DAS---		---(1-5)---		--kg/ha--
KVx396-4-5-2D	46	67	2.25	1.25	1829
KVx164-41-64	45	67	1.00	2.75	1822
KVx402-5-2	44	65	1.50	1.25	2408
KVx402-19-5	44	66	1.00	1.50	2175
IS86-275N	45	65	1.00	2.25	1977
B89-504N	41	60	1.00	1.00	1906
ITN89E-4	45	67	1.00	1.00	1881
ITN89E-3	46	69	1.25	1.75	1836
KC85-7	46	69	1.25	1.00	1995
KB85-18	45	69	1.75	1.25	2349
TVx3236	44	67	1.25	1.00	1992
TN5-78	45	67	1.50	1.00	2463
L.S.D. (5%)	2	2	N.S.	0.82	N.S.
C.V. (%)	3	2	41	40	20

g) **Nigeria**

Cooperators: O.O. Olufajo and A.A. Zaria

The trial was conducted at Minjibir. The agronomic practices used and rainfall received and its distribution have been described in Part I: Observation Nursery. The trial wa sown on 24 July 1991 in a *Striga gesnerioides* infested field plot; disease attack was recorded on some plants. The performance of cultivars is given in Table 3.12. Cultivars ITN89E-3, KVx396-4-5-2D and B89-504N gave the highest yields.

Promising cultivars identified by the national program: not mentioned.

Table 3.12. Performance of cowpea cultivars at Minjibir, Nigeria, in the Sudan savanna in 1991.

Cultivar	Days to			Disease attack		*Striga* density	Seed yield
	Flower bud formation	Flowering	Maturity	Virus	Web blight		
	----------DAS----------			-----(1-5)-----		-√x+1-	--kg/ha--
KVx396-4-5-2D	34	51	82	1.75	1.00	1.77	634
KVx164-41-64	35	52	79	2.50	1.25	1.18	181
KVx402-5-2	33	50	78	1.00	1.00	1.46	255
KVx402-19-5	34	51	82	2.00	1.50	1.02	313
IS86-275N	35	51	79	2.00	1.00	1.17	319
B89-504N	37	50	76	1.00	1.00	1.39	561
ITN89E-4	35	51	84	2.75	1.00	1.60	288
ITN89E-3	37	52	80	2.25	1.00	1.45	818
KC85-7	34	52	84	1.75	1.00	1.25	288
KB85-18	33	50	80	1.25	1.00	1.43	338
TVx3236	34	50	77	1.25	1.00	1.27	413
Sampea-7	34	55	84	1.50	1.00	1.27	108
L.S.D. (5%)	0.4	1	5	0.78	0.31	0.32	277
C.V. (%)	1	2	4	31	20	16	51

h) **Tchad**

The trial was conducted at two locations: Dougui and Gassi.

h.1) <u>Dougui</u>

Cooperator: Komna Nganara, Ngawara

Dougui is located in the Sahel; agronomic practices used and the rainfall received and its distribution have been described in Part I: Observation Nursery. The trial was sown on 3 July 1991. The performance of cultivars is given in Table 3.13. Though cultivars did not differ significantly, the highest yields were produced by B89-504N, KVx402-5-2 and IS86-275N.

Promising cultivars identified by the national program: KVx396-4-5-2D, KVx402-19-5 and IS86-275N.

Table 3.13. Performance of cowpea cultivars at Dougui, Tchad, in the Sahel, in 1991.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			---kg/ha---
KVx396-4-5-2D	42	53	67	638
KVx164-41-64	44	55	70	451
KVx402-5-2	41	50	67	722
KVx402-19-5	39	51	64	227
IS86-275N	38	48	63	705
B89-504N	42	52	65	952
ITN89E-4	41	51	75	522
ITN89E-3	45	55	86	242
KC85-7	44	53	70	242
KB85-18	41	51	67	678
TVx3236	43	52	67	649
TN5-78	41	51	65	417
L.S.D. (5%)	N.S.	N.S.	10	N.S.
C.V. (%)	10	9	10	62

h.2) **Gassi**

Cooperator: D. Valingui

Gassi (12°05',15°03'E) is located in the Sudan savanna. The trial was sown on 14 July 1991. Cowpea plants were protected against insect pests with an insecticide (Bestox). Rainfall distribution is given in Fig. 3.6. The performance of cultivars is given in Table 3.14. Although cultivars did not differ significantly for seed yield, TN5-78, KVx164-41-64 and KVx402-5-2 gave the highest yields.

Promising cultivars identified by the national program: TN5-78, KVx402-19-5, IS86-275N and ITN89E-4.

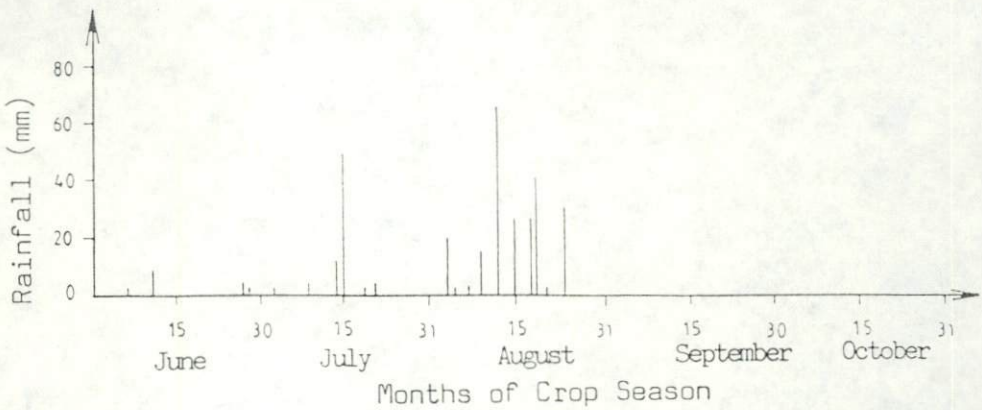


Fig. 3.6. Rainfall distribution at Gassi, Tchad, 1991.

Table 3.14. Performance of cowpea cultivars at Gassi, Tchad, in the Sudanian-Sahelian zones, in 1991.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			---kg/ha---
KVx396-4-5-2D	44	54	74	465
KVx164-41-64	46	57	69	855
KVx402-5-2	42	51	66	802
KVx402-19-5	53	62	72	497
IS86-275N	38	48	63	695
B89-504N	41	51	63	516
ITN89E-4	41	51	64	691
ITN89E-3	45	55	77	451
KC85-7	45	54	85	415
KB85-18	40	52	73	374
TVx3236	45	53	73	701
TN5-78	40	50	64	1030
L.S.D. (5%)	N.S.	N.S.	N.S.	N.S.
C.V. (%)	23	16	18	65

3. CONCLUSION

Kolo, Niger, and Sylla, Mauritania, were the highest yielding locations. Whereas Niaouli, Benin; Dougui, Tchad; Pobe/Djibo, Burkina Faso; Gassi, Tchad; and Adjohounu, Benin were the lowest yielding locations (Table 3.15). The remaining locations were intermediate between the former and the latter groups.

The most adapted cultivars to the Sudanian-Sahelian zones were: KVx402-5-2, KVx396-4-5-2D, KB85-18, KVx402-19-5 and B89-504N (Table 3.15). They had above average ($\beta < 1$) to average ($\beta = 1$) yield stability, except for KB85-18. Their regression lines accounted for 0.79 to 0.94 variation of sum of squares for yields.

Table 3.15. Seed yield (kg/ha) of cowpea as affected by location and cultivar; and slope (*B*) and coefficient of determination (r^2) associated with regression line of mean yields of cultivars on mean yield after different locations in West and Central Africa in 1991.

Location effect		Cultivar effect			
Location	Seed yield	Cultivar	Seed yield	*B*	r^2
-Benin					
.Adjohoun, Porto novo	661 9	KVx396-4-5-2D	1148	0.97	0.90
. Niaouli	281 10	KVx164-41-64	804	0.86	0.83
-Burkina Faso		KVx402-5-2	1167	1.12	0.79
. Kamboinse	988 13	KVx402-19-5	1060	1.01	0.86
. Pobe/Djibo	544 12	IS86-275N	1010	0.94	0.88
-Cameroon		B89-504N	1046	0.82*	0.92
. Gueringue/Maroua	1397 2	ITN89E-4/KVx396-18-10	1039	0.91	0.94
. Mouda/Maroua	1486 3	ITN89E-3	1019	0.95	0.85
-Tchad		KC85-7/KVx396-16-10-1	949	1.15	0.84
. Dougui	537 4	KB85-18	1110	1.29*	0.91
. Gassi	624 7	TVx3236	1002	1.10	0.72
-Mali		Local check	973	0.88	0.44
. Cinzana	1141 6				
. Koporo	1466 5	L.S.D. (5%)	135	-	-
-Mauritania		C.V. (%)	34	-	-
. Sylla	1797 1				
-Niger					
. Kolo	2053 11				
-Nigeria					
. Minjibir	377 8				
L.S.D. (5%)	269				
C.V. (%)	34				

* = *B* significant at 5% probability level.

IV

NORTHERN GUINEA SAVANNA

1. BACKGROUND

Although the growing season is longer and rainfall more reliable in the northern Guinea savanna than the Sudan savanna and the Sahel, cowpeas can suffer severe yield losses in the Guinea savanna due to either biological or physical constraints or both caused by frequent and protracted rainy conditions in the months of July, August and September. Major biological constraints, in addition to insect pests are viral and fungal diseases: Aphids borne Cowpea Mosaic virus (AbCMV), web blight (*Corticium solani*), brown blotch (*Colletotrichum capsici*), scab (*Elsionoe phaseoli*) and *Septoria* leaf spots (*S. vignae* and *S. vignicola*). Whereas the physical constraints are soil water saturation in late July to early September caused by excess moisture and/or water logging, thereby preventing oxygen diffusion in the soil. Cowpea cultivars intended for this ecology should therefore, tolerate excess moisture and resist diseases, insect pests and drought (particularly in the months of July and September).

Cultivars developed by RENACO Lead Centers of Burkina Faso, Ghana and Nigeria described in Table 4.1 were tested in a regional trial for adaptation to northern Guinea savanna in 1991. A total of 17 sets were dispatched to 10 countries as follows: Burkina Faso (2), Cameroon (2), Central African Republic (2), Côte d'Ivoire (1), The Gambia (2), Ghana (1), Guinea Bissau (2), Guinea Conakry (1), Mali (1), Nigeria (1), Togo (2). Feedback was received from all participating countries except Guinea Bissau and Guinea Conakry. The results are as follows:

Table 4.1. Description of cultivars tested in a regional trial for adaptation to northern Guinea savanna in 1991.

Cultivar	Pedigree	Origin	Characteristics
1. CR-06-07	(IT82E-32 x Amantin)	Ghana	-
2. KVx305-2-118-23-2	(KVx146-27-4 x KVx30-G246-2-5K)	Burkina Faso	Resistant to Aphids, Bruchids and *Striga*
3. KVx305-118-31	-do-	-do-	-do-
4. KVx402-5-2	(KVx30-166-3G x B301)	-do-	Resistant to *Striga*
5. KVx402-19-1	-do-	-do-	-do-
6. IAR7/180-4-5	-	Nigeria	Adapted to Guinea savanna
7. IAR7/180-4-5-1	-	Nigeria	-do-
8. KVx398-7-1	(KVx61-74 x B301)	Burkina Faso	Resistant to *Striga*
9. KVx396-4-5-2D	(Vita-7 x Suvita-2) x IAR-1696	IITA/ Ibadan	Adapted to Sahel, Sudan Guinea savannas
10. KN-1 (Vita-7)	(TVu37- x TVu530) x (TVu115 x TVu1038)	IITA/ Ibadan	Adapted to Guinea savanna
11. TVx3236	(TVu1509 x Ife brown)	-do-	Adapted to Sahel, Sudan & Guinea savannas
12. Local check	-	-	-

2. RESULTS

a) Burkina Faso

Cooperator: Mr. J.T. Ouedraogo

The trial was conducted at two locations in the northern Guinea savanna: Farako-Bâ and Niangoloko.

a.1) Farako-Bâ

Agronomic practices used and rainfall received at Farako-Bâ and its distribution have been described in Part I: Regional Observation Nursery. The trial was sown on 19 July 1991; cowpea plants were attacked by Aphid borne Cowpea Mosaic Virus and scab. Yields were low due to a combination of disease attacks and excess moisture. The performance of cultivars is given in Table 4.2. Cultivars KN-1, KVx402-5-2 and KVx396-4-5-2D were the highest yielders.

Promising cultivars identified by the national program: not mentioned.

Table 4.2. Performance of cowpea cultivars at Farako-Bâ, Burkina Faso, in the northern Guinea savanna in 1991

Cultivar	Days to			Disease attack		Seed yield
	Flower bud formation	Flowering	Maturity	Virus	Scab	
	----------DAS----------			----(1-5)----		--kg/ha--
CR-06-07	36	44	74	1.12	1.37	342
KVx305-2-118-23-2	36	47	75	2.75	1.12	218
KVx305-118-31	40	49	75	2.62	2.00	288
KVx402-5-2	38	44	70	1.75	2.25	522
KVx402-19-1	39	48	74	2.50	2.00	357
IAR7/180-4-5	40	49	74	2.00	1.87	394
IAR7/180-4-5-1	39	48	75	2.12	2.50	294
KVx398-7-1	38	46	74	2.00	2.12	332
KVx396-4-5-2D	40	47	73	1.87	3.75	455
KN-1 (Vita-7)	37	47	67	2.50	1.75	539
TVx3236	41	48	75	1.25	2.12	390
Lesso Local	35	43	64	3.12	1.25	308
L.S.D. (5%)	2	2	1	1	0.60	141
C.V. (%)	4	2	1	31	21	27

a.2) **Niangoloko**

The trial was sown at Niangoloko (10°16'N,04°55'W, 320 m above sea level) on 18 July 1991. The plot was fertilized with 45 kg P_2O_5/ha as ordinary phosphate. Cowpea plants were protected against insect pests with insecticides (Deltamethrine and Dimethoate). Rainfall data were not provided. The performance of cultivars is given in Table 4.3. Cultivars IAR/180-4-5-1, TVx3236, KVx396-4-5-2D, KVx305-118-31 and KVx398-7-1 were the highest yielders.

Promising cultivars identified by the national program: not mentioned.

Table 4.3. Performance of cowpea cultivars at Niangoloko, Burkina Faso, in the northern Guinea savanna in 1991.

Cultivar	Days to		Disease attack					
	Flowering	Maturity	Virus	Web blight	Brown blotch	Scab	*Cercospora* leaf spot	Seed yield
	---DAS---		---(1-5)---					--kg/ha--
CR-06-07	43	70	1.50	1.75	1.50	2.00	1.50	497
KVx305-2-118-23-2	47	71	2.50	2.75	1.75	1.25	2.50	409
KVx305-118-31	47	70	2.75	2.75	1.50	1.50	1.75	661
KVx402-5-2	47	69	1.50	2.50	1.50	1.00	2.75	519
KVx402-19-1	47	70	1.75	2.25	1.75	1.00	2.25	412
IAR7/180-4-5	47	70	2.75	2.75	1.25	2.00	2.00	558
IAR7/180-4-5-1	46	70	2.75	3.75	1.75	2.75	1.75	813
KVx398-7-1	47	70	2.00	1.75	1.75	1.25	3.00	638
KVx396-4-5-2D	47	70	2.25	2.25	1.50	1.00	2.25	756
KN-1 (Vita-7)	44	67	2.50	3.00	2.00	1.00	1.75	534
TVx3236	47	70	2.75	2.50	1.75	1.25	1.75	777
Niangoloko Local	50	63	2.25	2.75	1.00	1.00	3.25	313
L.S.D. (5%)	1	1	0.87	0.99	0.77	0.78	0.96	233
C.V. (%)	2	1	27	27	34	38	30	28

b) **Cameroon**

Cooperator: Chevalier Endondo

The trial was conducted at two locations in the northern Guinea savanna: Sanguere and Touboro.

b.1) **Sanguere**

The trial was sown at Sanguere (8°N, 15°30'E, 800 m above sea level) on 17 July 1991 on an unfertilized plot. Cowpea plants were protected against insect pests with an insecticide (Sherpa plus). A total rainfall of 1016 mm was received; its distribution is given in Fig. 4.1. Aphid borne Cowpea Mosaic virus attack was observed in certain cultivars. The performance of cultivars is given in Table 4.4. The highest yielding cultivars were CR-06-07, KVx396-4-5-2D, KN-1 and TVx3236.

Promising cultivars identified by the national program: not mentioned.

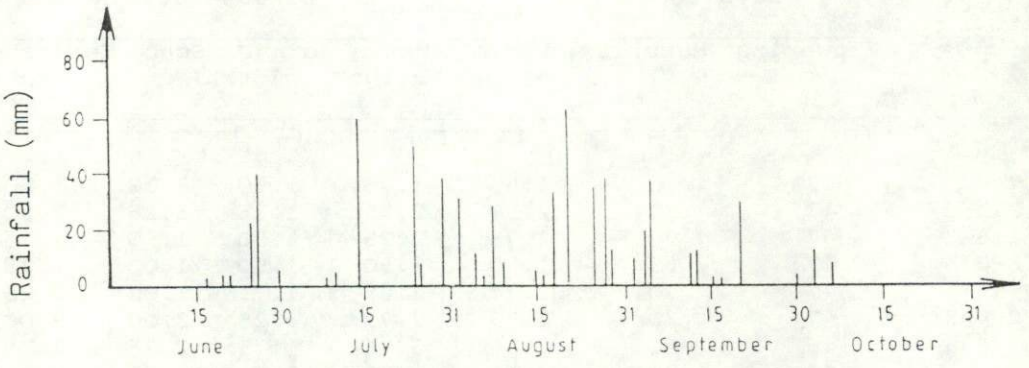


Fig. 4.1. Rainfall distribution at Sanguere, Cameroon, 1991.

Table 4.4. Performance of cowpea cultivars at Sanguere, Cameroon, in the northern Guinea savanna in 1991.

Cultivar	Days to		Viral disease	Seed yield
	Flowering	Maturity		
	---------DAS----------		-(1-5)-	--kg/ha--
CR-06-07	46	74	1.00	1621
KVx305-2-118-23-2	49	72	1.50	429
KVx305-118-31	51	73	1.75	1329
KVx402-5-2	45	70	1.00	1400
KVx402-19-1	49	71	1.25	1209
IAR7/180-4-5	52	71	1.25	1117
IAR7/180-4-5-1	51	70	1.00	1146
KVx398-7-1	50	71	2.50	1342
KVx396-4-5-2D	52	71	1.00	1616
KN-1 (Vita-7)	59	73	1.50	1617
TVx3236	50	70	1.00	1621
VYA	52	74	1.25	1446
L.S.D. (5%)	N.S.	N.S.	N.S.	453
C.V. (%)	15	11	55	24

b.2) **Touboro**

The trial was sown at Touboro on 19 July 1991 in an unfertilized plot, using the same agronomic practices as at Sanguere. A total rainfall of 1176 mm was received; its distribution during the growing season is given in Fig. 4.2. The cowpea cultivar performance is given in Table 4.5. Cultivars did not differ significantly, although KVx305-2-118-23-2 and KN-1 appeared to have produced the highest yields.

Promising cultivars identified by the national program: not mentioned.

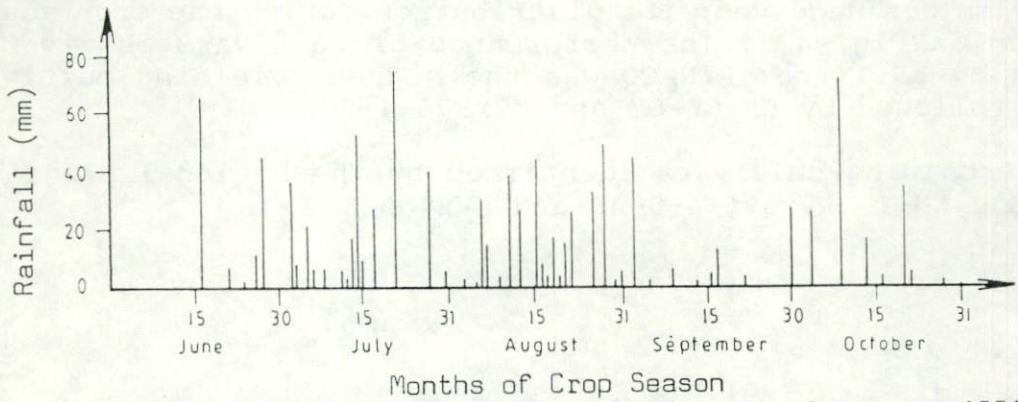


Fig. 4.2. Rainfall distribution at Touboro, Cameroon, 1991.

Table 4.5. Performance of cowpea cultivars at Touboro, Cameroon, in the northern Guinea savanna in 1991.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			--kg/ha--
CR-06-07	50	55	65	987
KVx305-2-118-23-2	49	54	63	1275
KVx305-118-31	48	53	65	987
KVx402-5-2	48	53	63	1113
KVx402-19-1	47	51	62	1025
IAR7/180-4-5	49	54	64	1141
IAR7/180-4-5-1	49	53	63	979
KVx398-7-1	48	54	64	1108
KVx396-4-5-2D	49	55	65	1104
KN-1 (Vita-7)	49	53	63	1263
TVx3236	48	55	64	996
VYA	49	54	65	1033
L.S.D. (5%)	N.S.	N.S.	N.S.	N.S.
C.V. (%)	3	5	3	24

c) Central African Republic

The trial was conducted at two locations in the northern Guinea savanna: Poumbaïdi/Paoua and Soumbe.

c.1) Poumbaïdi/Paoua

Cooperator: Rodrigue, Prosper Yakende

The trial was sown on 15 July 1991 in an unfertilized field plot. Cowpea plants were sprayed with an insecticide (Dimethoate) to protect them against insect pests. However, this insecticide is not effective against flower thrips. The cowpea rust disease caused damage to some cultivars. A total rainfall of 1192 mm was received; its distribution during the crop season is given in Fig. 4.3. The performance of cultivars is given in Table 4.6. KN-1 from RENACO was the highest yielding cultivar; it was followed by CR-06-07 and KVx396-4-5-2D.

Promising cultivars identified by the national program: CR-06-07, KN-1, KVx396-4-5-2D and KVx402-5-2.

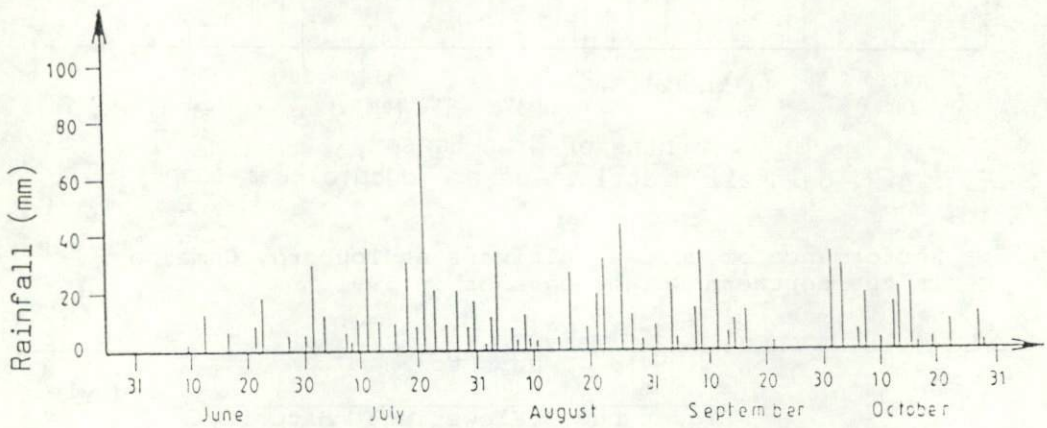


Fig. 4.3. Rainfall distribution at Poumbaïdi, Central African Republic, 1991.

Table 4.6. Performance of cowpea cultivars at Poumbaïdi/Paoua, Central African Republic in the northern Guinea savanna in 1991.

Cultivar	Days to maturity	Rust disease	Seed yield
	---DAS---	----(1-5)----	---kg/ha---
CR-06-07	74	1.00	1061
KVx305-2-118-23-2	83	2.25	130
KVx305-118-31	74	1.50	215
KVx402-5-2	74	2.25	612
KVx402-19-1	74	2.50	381
IAR7/180-4-5	81	2.25	273
IAR7/180-4-5-1	83	2.50	273
KVx398-7-1	83	1.25	804
KVx396-4-5-2D	74	2.50	1313
KN-1 (Vita-7)	74	1.25	483
TVx3236	83	2.00	717
KN-1 (RCA)	74	2.00	196
L.S.D. (5%)	2	0.86	196
C.V. (%)	2	31	25

c.2) **Soumbe**

Cooperator: Aloise Kessema

The trial was sown on 16 July 1991 at Soumbe (5-6°N, 17-18°E, 465m above sea level) in an unfertilized field plot. Cowpea plants were sprayed with insecticides (Deltamethrine and Dimethoate). Virus attack was observed on some cultivars. A total rainfall of 1735 mm was received; its distribution during the crop season is given in Fig. 4.4. The performance of cultivars is given in Table 4.7. The highest yielding cultivars were KN-1, KVx396-4-5-2D, CR-06-07 and KVx402-5-2.

Promising cultivars identified by the national program: KN-1, KVx396-4-5-2D, CR-06-07, KVx402-5-2- and KVx402-19-1.

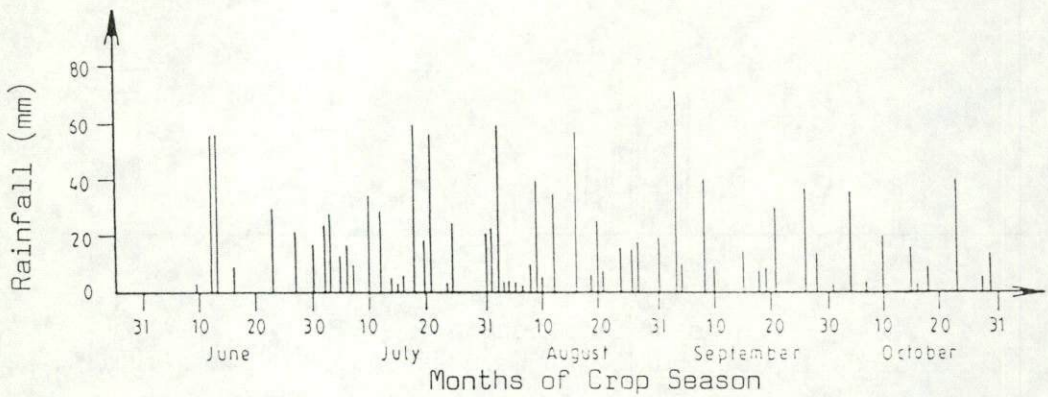


Fig. 4.4. Rainfall distribution at Soumbe, Central African Republic, 1991.

Table 4.7. Performance of cowpea cultivars at Soumbé, Central African Republic, in the northern Guinea savanna in 1991.

	Days to		Viral disease	Seed yield
	Flowering	Maturity		
CR-06-07	47	76	1.25	912
KVx305-2-118-23-2	48	82	1.50	153
KVx305-118-31	48	76	1.25	492
KVx402-5-2	46	76	1.50	867
KVx402-19-1	46	76	1.75	720
IAR7/180-4-5	49	76	1.50	452
IAR7/180-4-5-1	47	82	1.00	189
KVx398-7-1	46	80	1.75	267
KVx396-4-5-2D	47	76	1.50	925
KN-1 (Vita-7)	46	77	1.25	979
TVx3236	49	82	1.25	633
Local Bac	90	90	1.00	0
L.S.D. (5%)	1	2	N.S.	412
C.V. (%)	2	1	38	52

d) **Côte d'Ivoire**

Cooperator: Adou Amalaman

The trial was sown on 1st August 1991 at Ferekessedougou (09°35'N,05°12'E, 323 m above sea level) in a field plot fertilized with 25:45:45: kg of $N:P_2O_5:K_2O$/ha. Cowpea plants were protected against insect pests with the application of insecticides (Deltamethrine and Dimethoate). A total rainfall of 1218 mm was received; its distribution during the crop season is given in Fig. 4.5. The performance of cowpea cultivars is given in Table 4.8. Although seed yield was low, cultivars CR-06-07, KVx 402-5-2 and TVx 3236 were the best yielders.

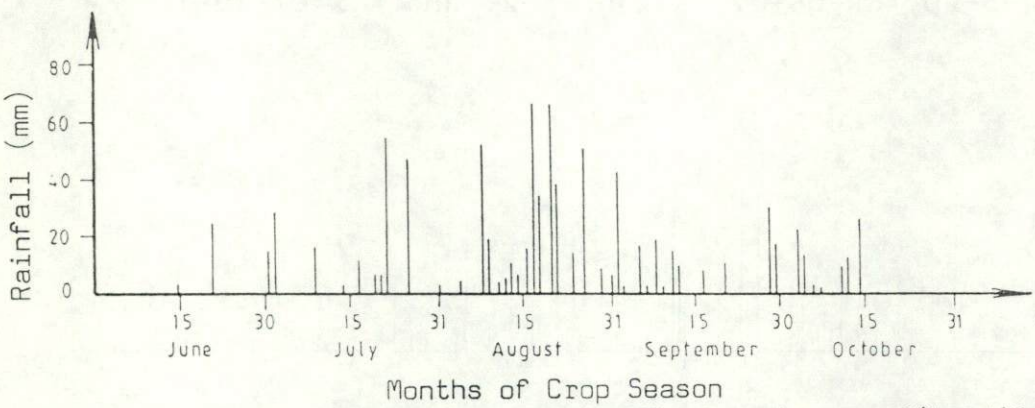


Fig. 4.5. Rainfall distribution at Ferekesedougou, Côte d'Ivoire, 1991

Table 4.8. Performance of cowpea cultivars at Ferekessedougou, Côte d'Ivoire, in the northern Guinea savanna, in 1991.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			--kg/ha--
CR-06-07	42	46	66	654
KVx305-2-118-23-2	45	49	64	94
KVx305-118-31	47	52	66	395
KVx402-5-2	43	47	66	434
KVx402-19-1	46	55	66	339
IAR7/180-4-5	47	52	66	214
IAR7/180-4-5-1	45	49	64	314
KVx398-7-1	46	52	66	221
KVx396-4-5-2D	46	52	66	385
KN-1 (Vita-7)	46	52	66	201
TVx3236	46	52	66	432
Ferke local	47	52	66	352
L.S.D. (5%)	1.0	3.0	N.S.	258
C.V. (%)	1.0	4	9	53

e) The Gambia

Cooperator: Musa Bojang

The trial was conducted at two locations in the northern Guinea savanna at Somipa and Yundum.

e.1) Somipa

The trial was sown on 2nd August 1991 at Somipa (13°21'N, 16°40'W,25 m above sea level) on a deep loamy sand soil fertilized with 8:24:24 kg of N: P_2O_5:K_2O/ha. The soil has a low water holding capacity. Cowpea plants received insecticide (Deltamethrine) sprays twice against insect pests. A total rainfall of 905 mm was received; its distribution during the crop season is given in Fig. 4.6. A 6-day dry, hot spell was experienced by the crop at planting; thus impeding seed germination and resulting in poor stand establishment of some cultivars. Some viral diseases were also recorded on some cultivars (Table 4.9). The performance of cultivars is given in Table 4.7. Cultivars KVx402-5-2 and KVx396-4-5-2D gave the highest seed yields.

Promising cultivars identified by the national program: KVx305-118-31 and KVx402-5-2.

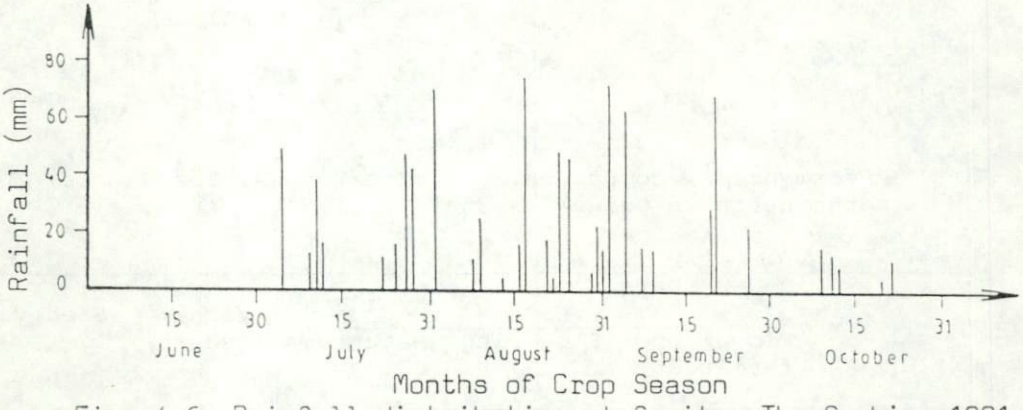


Fig. 4.6. Rainfall distribution at Somita, The Gambia, 1991.

Table 4.9. Performance of cowpea cultivars at Somipa, The Gambia, in the northern Guinea savanna in 1991.

Cultivar	Number of plants	Days to			Viral disease	Seed yield
		Flower bud formation	Flowering	Maturity		
		----------DAS----------			-(1-5)-	-kg/ha-
CR-06-07	21	31	41	66	1.00	568
KVx305-2-118-23-2	26	34	45	70	1.75	605
KVx305-118-31	14	32	43	67	2.00	745
KVx402-5-2	24	30	42	67	1.00	1027
KVx402-19-1	25	32	43	66	1.00	710
IAR7/180-4-5	29	35	44	70	1.50	595
IAR7/180-4-5-1	28	35	44	71	2.75	468
KVx398-7-1	20	30	41	70	2.25	630
KVx396-4-5-2D	31	31	43	66	1.00	910
KN-1 (Vita-7)	30	35	43	67	1.00	747
TVx3236	22	34	43	71	2.50	589
Mougne	11	35	45	71	1.50	509
L.S.D. (5%)	7	1	1	1	0.81	216
C.V. (%)	20	2	2	1	35	22

e.2) **Yundum**

The trial was sown on 23 July 1991 at Yundum (13°21'N,16°40'W, 25m above sea level) in a loamy sand soil. Agronomic practices used were as described for Somipa. The rainfall (689 mm) distribution during the crop season is given in Fig. 4.7. Some viral diseases were recorded on some cultivars (Table 4.10). The performance of cultivars is given in Table 4.10. Cultivars CR-06-07, KVx402-19-1, KVx402-5-2 and KVx396-4-5-2D were the highest yielders.

Promising cultivars identified by the national program: CR-06-07, KVx402-5-2, KVx402-19-1 and KVx396-4-5-2D.

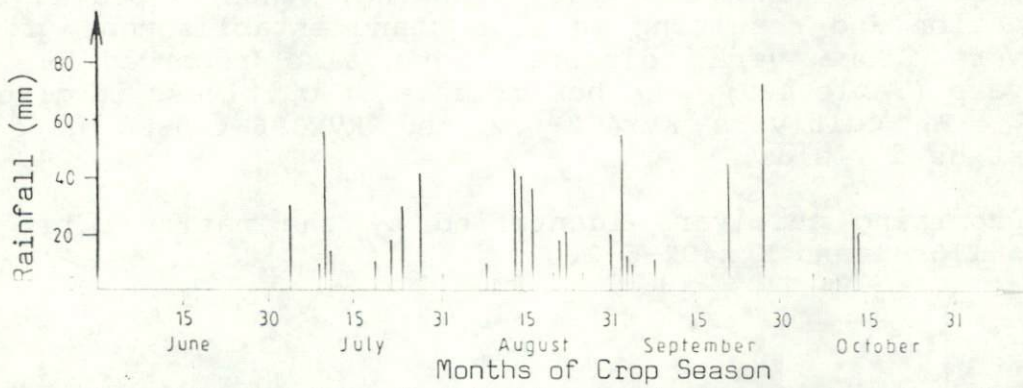


Fig. 4.7. Rainfall distribution at Yundum, The Gambia, 1991.

Table 4.10. Performance of cowpea cultivars at Yundum, The Gambia, in the northern Guinea savanna, in 1991.

Cultivar	Days to			Viral disease	Seed yield
	Flower bud formation	Flowering	Maturity		
	----------DAS----------			-(1-5)-	--kg/ha--
CR-06-07	30	41	65	1.00	1708
KVx305-2-118-23-2	35	45	70	1.75	601
KVx305-118-31	32	43	65	2.00	1248
KVx402-5-2	30	41	67	1.00	1586
KVx402-19-1	32	43	65	1.00	1645
IAR7/180-4-5	35	44	70	1.50	910
IAR7/180-4-5-1	35	44	70	2.75	776
KVx398-7-1	30	41	70	2.25	676
KVx396-4-5-2D	31	42	65	1.00	1519
KN-1 (Vita-7)	35	44	67	1.00	1044
TVx3236	34	43	70	2.50	1140
Mougne	35	45	70	1.50	902
L.S.D. (5%)	1	1	N.S.	0.81	352
C.V. (%)	2	1	0	35	21

f) **Ghana**

Cooperator: K.O. Marfo

The trial was sown on 16 July 1991 at Wa, in the northern Guinea savanna in an unfertilized field plot. Cowpea plants were sprayed with an insecticide (Karate). No local check was used. Also no rainfall data was provided. The performance of cultivars is given in Table 4.11. No significant yield difference was observed among cultivars. However, cultivar KVx396-4-5-2D had the highest yield.

Promising cultivars identified by the national program: KVx396-4-5-2-D.

Table 4.11. Performance of cowpea cultivars at Wa, Ghana, in the northern Guinea savanna, in 1991.

Cultivar	Days to		Seed yield
	Flowering	Maturity	
	---DAS---		---kg/ha---
CR-06-07	48	70	939
KVx305-2-118-23-2	51	73	1106
KVx305-118-31	51	71	1106
KVx402-5-2	48	70	1294
KVx402-19-1	52	71	1085
IAR7/180-4-5	56	73	1252
IAR7/180-4-5-1	55	73	1064
KVx398-7-1	49	70	960
KVx396-4-5-2D	51	72	1482
KN-1 (Vita-7)	49	70	1273
TVx3236	52	73	1294
L.S.D. (5%)	2	1	N.S.
C.V. (%)	2	1	26

g) **Mali**

Cooperator: Aliou Traore

The trial was sown on 14 July 1991 at Katibougou (12°55'N,07°33'W 326m above sea level). The agronomic practices used were as for Cinzana in Part I: "Observation Nursery". The trial was harvested on 3 October 1991. A total rainfal of 812 mm was received; its distribution during the crop season is given in Fig. 4.8. The local check and KVx398-7-1 gave the lowest yield while the other cultivars did not differ significantly from one another (Table 4.12).

Promising cultivars identified by the national program: not mentioned.

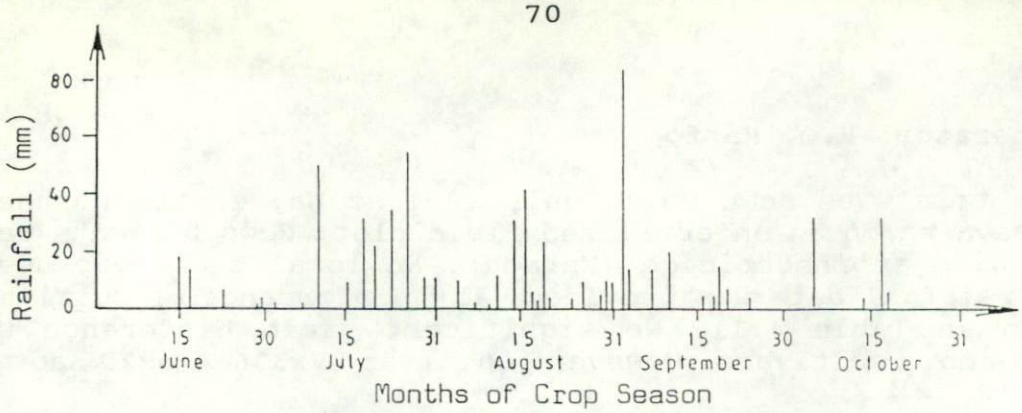


Fig. 4.8. Rainfall distribution at Katibougou, Mali, 1991.

Table 4.12. Performance of cowpea cultivars at Katibougou, Mali, in the northern Guinea savanna in 1991.

Cultivar	Days to flowering	Seed yield
	----DAS----	----kg/ha----
CR-06-07	49	1210
KVx305-2-118-23-2	51	1023
KVx305-118-31	52	1210
KVx402-5-2	48	1002
KVx402-19-1	53	1002
IAR7/180-4-5	51	1231
IAR7/180-4-5-1	51	1231
KVx398-7-1	49	563
KVx396-4-5-2D	52	1169
KN-1 (Vita-7)	51	1169
TVx3236	52	1022
Local check	61	751
L.S.D. (5%)	2	360
C.V. (%)	2	24

h) **Nigeria**

Cooperators: O.O. Olufajo & A.A. Zaria

The trial was sown on 23 July 1991 at Zaria (11°11N,07°38E, 686 m above sea level) in a field plot fertilized with 36 kg of P_2O_5/ha as ordinary superphosphate. Cowpea plants were sprayed five times with a mixture of insecticides (Cymbush 10EC and Rogor EC) and once with a fungicide (Benlate). Scab disease and some attacks by insect pests were recorded during the crop season. A total rainfall of 1010 mm was received; its distribution during the crop season is given in Fig. 4.9. The performance of cultivars is given in Table 4.13. No significant cultivar differences were observed. KVx398-7-1 and KVx396-4-5-2D tended to yield the highest.

Promising cultivars identified by the national program: not mentioned.

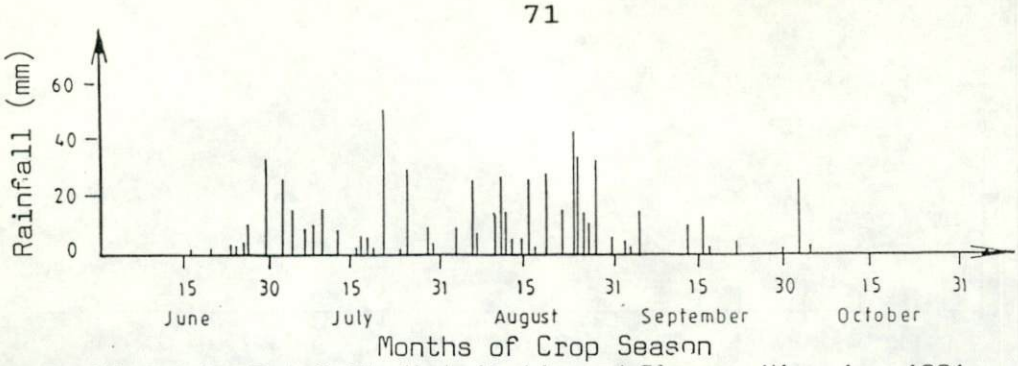


Fig. 4.9. Rainfall distribution at Samaru, Nigeria, 1991.

Table 4.13. Performance of cowpea cultivars at Samaru, Nigeria, in the northern Guinea savanna in 1991.

Cultivar	Days to flowering	Scab disease	Insect attack			Seed yield
			Otheca	*Clavigralla*	*Mylabris*	
	--DAS--	-(1-5)-	----------(1-5)----------			--kg/ha--
CR-06-07	53	1.75	2.00	2.75	1.00	2297
KVx305-2-118-23-2	56	2.62	2.37	2.50	1.00	1993
KVx305-118-31	55	1.87	2.25	2.75	1.00	1995
KVx402-5-2	55	2.62	1.87	2.50	1.12	1794
KVx402-19-1	53	2.25	2.00	1.62	1.00	2264
IAR7/180-4-5	55	2.37	2.00	2.62	1.12	2013
IAR7/180-4-5-1	56	2.37	1.75	2.62	1.75	2116
KVx398-7-1	54	1.75	1.75	2.37	1.00	2394
KVx396-4-5-2D	56	1.75	2.50	2.50	2.00	2341
KN-1 (Vita-7)	55	2.25	2.12	2.12	1.00	2260
TVx3236	52	1.75	2.25	2.12	2.12	1880
Sampea-7	53	2.12	2.00	2.62	2.62	2208
L.S.D. (5%)	N.S.	N.S.	N.S.	N.S.	0.58	N.S.
C.V. (%)	5	30	30	22	29	17

i) **Togo**

Cooperators: Akossiwa Duyiboe, T. Payaro & H. Renaud

The trial was conducted at two locations in Togo at Ativeme and Tantiegou.

i.1) **Ativeme**

The trial was sown on 27 June at Ativeme (06°25'N,01°07'E, 40 m above sea level) in the coastal zone. The field plot was fertilized with 6.75:6.75:6.75 Kg of $N:P_2O_5:K_2O$/ha. Cowpea plants were protected against insect pests with the application of an insecticide (Deltamethrine). Some attacks by insect pests were recorded. A total rainfall of 876 mm was received; its distribution during the crop season is given in Fig. 4.10. No significant differences in seed yield were observed among cultivars. However, cultivar KVx402-19-1, IAR/180-4-5-1, KVx398-7-1, KVx396-4-5-2D and KN-1 tended to give the highest yields.

Promising cultivars identified by the national program: none of them was satisfactory.

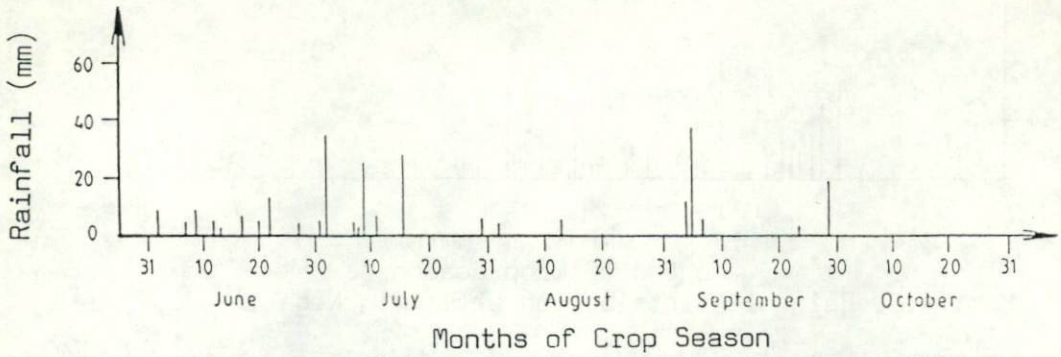


Fig. 4.10 Rainfall distribution at Ativeme, Togo, 1991.

Table 4.14. Performance of cowpea cultivars at Ativeme, Togo, in the coastal zone, in 1991.

Cultivar	Days to		Insect attack			Seed yield
	Flowering	Maturity	*Ootheca Mutabilis*	*Medythia quaterna*	Aphids	
	---DAS---		---(1-5)---			---kg/ha---
CR-06-07	46	65	3.00	3.75	1.00	1991
KVx305-2-118-23-2	46	68	3.75	3.75	1.00	1051
KVx305-118-31	48	66	2.25	3.25	1.00	1598
KVx402-5-2	45	63	2.25	3.75	1.12	1762
KVx402-19-1	45	68	2.75	3.50	1.00	2978
IAR7/180-4-5	46	66	2.75	3.75	1.00	1849
IAR7/180-4-5-1	45	63	3.25	4.25	1.12	2355
KVx398-7-1	46	65	3.75	4.00	1.00	2380
KVx396-4-5-2D	46	65	4.25	3.75	1.00	2016
KN-1 (Vita-7)	46	65	3.00	3.75	1.00	2096
TVx3236	46	69	4.50	3.75	1.00	1607
Local check	42	61	3.75	3.75	1.62	1561
L.S.D. (5%)	N.S.	N.S.	1.11	N.S.	0.35	N.S.
C.V. (%)	5	6	23	25	23	51

i.2) **Tantiegou**

The trial was sown on 21 June 1991 at Tantiegou (10°52'N,0°10'E) in the northern Guinea savanna . The field plot was fertilized with 22.5:22.5:22.5 Kg of $N:P_2O_5:K_2O$/ha. Cowpea plants were protected against insect pests with insecticides (Dimethoate and Cypermethrine). A total rainfall of 1049 mm was received; its distribution during the crop season is given in Fig. 4.11. The performance of cultivars is given in Table 4.15. Cultivars did not differ significantly.

Promising cultivars identified by national program:
KVx402-5-2 (brown seeded) not selected because of white colour seed preference.

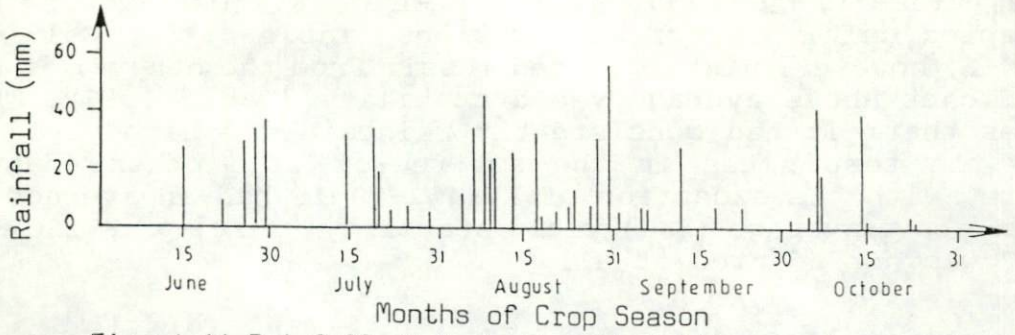


Fig. 4.11 Rainfall distribution at Tantiegou, Togo, 1991.

Table 4.15. Performance of cowpea cultivars at Tantiegou, Togo, in the northern Guinea savanna, in 1991.

Cultivar	Days to Flowering	Days to Maturity	Seed yield
	---DAS---	---DAS---	---kg/ha---
CR-06-07	56	85	927
KVx305-2-118-23-2	58	86	851
KVx305-118-31	58	85	946
KVx402-5-2	56	88	898
KVx402-19-1	58	86	1031
IAR7/180-4-5	60	90	1131
IAR7/180-4-5-1	57	89	763
KVx398-7-1	55	85	979
KVx396-4-5-2D	57	81	1054
KN-1 (Vita-7)	57	81	1056
TVx3236	59	90	1033
58-146	58	83	1340
L.S.D. (5%)	2	2	N.S.
C.V. (%)	2	1	22

CONCLUSION

The location at Wa, Ghana, was not included in the combined analysis of variance and yield stability study, because only 11 instead of 12 cultivars were tested. Samaru, Nigeria and Ativeme, Togo, were the highest yielding locations (Table 4.15). It should, however, be noted that Ativeme is in the coastal zone and not northern Guinea savanna. The lowest yielding locations were Ferekessedougou, Côte d'Ivoire, Poumbaïdi/Paoua and Soumbe, Central African Republic and Somipa and Yundum, The Gambia.

In spite of variable environmental conditions, K8Vx396-4-5-2D, KN-1 (Vita-7), CR-06-17, KVx402-19-1 and KVx402-5-2 were the best adapted cultivars across locations (Table 4.15). Cultivar KVx402-5-2, however, distinguished itself from the others: it had a significant above average yield stability (Table 4.16). This indicates that: it had consistently maintained a high yield at most of the test sites in the sub-region. The other adapted cultivars, with the exception of KVx402-19-1, had an average (ß =1.00) to above average (B<1) yield stability. Cultivar KVx305-2-118-23-2 was not adapted at all.

Table 4.16. Seed yield (kg/ha) of cowpea as affected by location and cultivar; and slope (*B*) and coefficient of determination (r^2) associated with regression lines of mean yields of cultivar on mean yield after different locations in West and Central Africa in 1991.

Location effect		Cultivar effect			
Location	Seed yield	Cultivar	Seed yield	*B*	r^2
	---kg/ha---		---kg/ha---		
-Burkina Faso		KVx305-06-07	1215	0.90	0.79
.Farako-Bâ	1275	KVx305-2-118-23-2	738	0.84	0.67
.Nyangoloko	1146	KVx305-118-31	1021	0.93	0.90
-Cameroon		KVx402-5-2	1139	0.71*	0.81
.Sanguere	1325	KVx402-19-1	1155	1.29	0.82
.Touboro	1084	IAR7/180/-4-5	1003	1.00	0.93
-Central African Republic		IAR7/180-4-5-1	1005	1.26+	0.88
		KVx398-7-1	1002	1.32*	0.92
.Pounmbaïdi/Paoua	549	KVx396-4-5-2D	1272	0.99	0.94
.Soumbe	547	KN-1 (Vita-7)	1240	0.90	0.79
-Côte d'Ivoire		TVx3236	1079	0.86	0.85
.Ferekessedougou	337	Local check	938	0.97	0.77
-The Gambia					
.Somipa	675	L.S.D. (5%)	142	-	-
.Yundum	821	C.V. (%)	34	-	-
-Mali					
.Katibougou	1049				
-Nigeria					
.Samaru	2130				
-Togo					
.Ativeme	1937				
.Tantiegou	1001				
L.S.D. (5%)	215				
C.V. (%)	34				

+, * = *B* significant at 10 and 5% probability level, respectively.

V

TRANSITION AND COASTAL ZONES

1. BACKGROUND

Transition and coastal zones are characterized by a bimodal rainfall, which permits two distinct major and minor crop seasons. The major season extends from March to July and the minor from August to November. Traditionally, cereals are grown in the major season; whereas cowpea and peanut are grown in the minor season. Annual and biennial root and tuber crops are also planted in the minor season. Cowpea cultivars grown in the major crop season should be the erect plant type, disease resistant with thin pods and smooth seed coat in order to resist pod and seed rot when maturity is under overcast rainy conditions.

Cowpea cultivars developed at Ibadan, Nigeria, and Kumasi, Ghana, described in Table 5.1 were tested for adaptation to coastal and transition zones, including the Sahel, in Mauritania, under irrigation during the off-season. A total of 12 sets were dispatched as follows: Central African Republic (1), Côte d'Ivoire (1), Ghana (1), Guinea Bissau (2), Guinea Conakry (2), Mauritania (1), Sierra-Leone (3), and Togo (1). Feedback was received from Central African Republic (1), Côte d'Ivoire (1), Ghana (1), Guinea Conakry (1), Sierra-Leone (2) and Togo (1); giving a total of 7 sets. The results are as follows:

Table 5.1. Description of cultivars tested in the regional trial for adaptation for transition and coastal zones in 1991.

Cultivar	Pedigree	Origin
1. CR-0607	(IT82E-32 x Amantin)	Ghana
2. IT86D-641	IT82D-889 x (IT82D-716 x IT81D-1020)	IITA/ Ibadan
3. IT81D-1137	(TVx1193-7D x TVu2027)	-do-
4. IT86D-444	(IT82D-789 x IT82D-716) x IT84E-1-108	-do-
5. IT85D-3577	(IT82E-60 x TVu801) x TVx1850-01F	-do-
6. IT82E-16	(TVu201-1D x (TVu37 x TVu530)	-do-
7. IT82E-18	(TVu1190 x TVu1247) x TVu2616	-do-
8. IT83S-818	[(TVx33 x TVu6203) x TVx33-1J] x (TVx6332 x TVu625)	-do-
9. IT82E-32	[P33-1C x (TVu410 x SVS-32)] x (TVu1190 x TVu2616)n	-do-
10. Local check	-	-

2. RESULTS

a) Central African Republic

Cooperator: Clement Ganglaou

The trial was sown on 30 July 1991 at Bambari (05°48',N20°40'E, 450m above sea level) in an unfertilized plot. Cowpea plants were sprayed three times with an insecticide (Systoate). A total rainfall of 1339 was received; its distribution during the crop season is given in Fig. 5.1. The performance of cultivars is given in Table 5.2. IT86D-444 and the local check, TVx24, were the highest yielding cultivars.

Promising cultivars identified by the national program: IT82E-32, IT86D-444, IT86D-641 and CR-06-07.

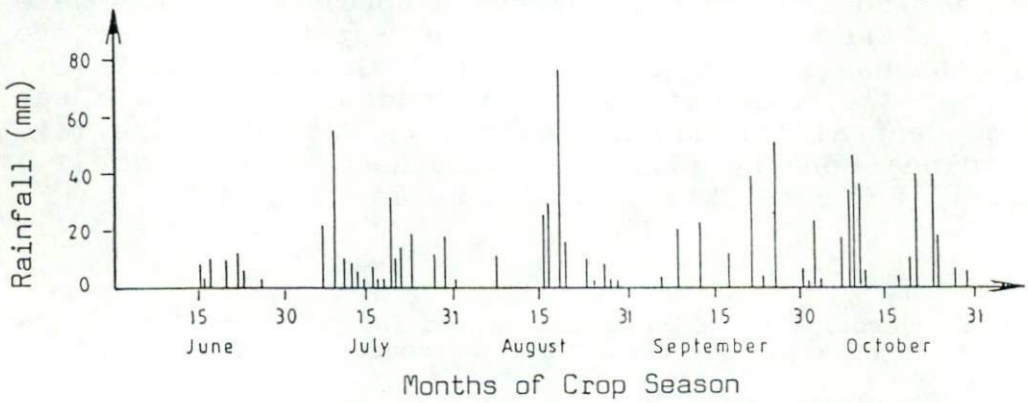


Fig. 5.1. Rainfall distribution at Bambari, Central African Republic, 1991.

Table 5.2. Performance of cowpea cultivars at Bambari, Central African Republic in the transition zones in 1991.

Cultivar	Days to		Seed yield
	Flowering	Maturity	
	---------DAS---------		---kg/ha---
CR-06-07	43	67	495
IT86D-641	45	69	383
IT81D-1137	45	70	492
IT86D-444	51	75	517
IT85D-3577	48	72	238
IT82E-16	49	73	383
IT82E-18	49	73	407
IT83S-818	49	73	178
IT82E-32	45	73	496
TVx24	53	77	710
L.S.D. (5%)	0.5	N.S.	204
C.V. (%)	1	0	33

b) **Côte d'Ivoire**

Cooperator: Adou Amalaman

The trial was sown on 6 August 1991 at Bouake (7°44'N,5°02'W, 375 m above sea level) in a transition zone in a field plot fertilized with 25:45:45 kg of $N:P_2O_5:K_2O$ /ha. Cowpea plants were sprayed with insecticides (Deltamethrine and Dimethoate). A total rainfall of 941 mm was received; its distribution during the crop season is given in Fig. 5.2. The yield of cultivars is given in Table 5.3. CR-06-07 outyielded all other tested cultivars; it was followed by IT82E-32.

Promising cultivars identified by the national program: CR-06-07.

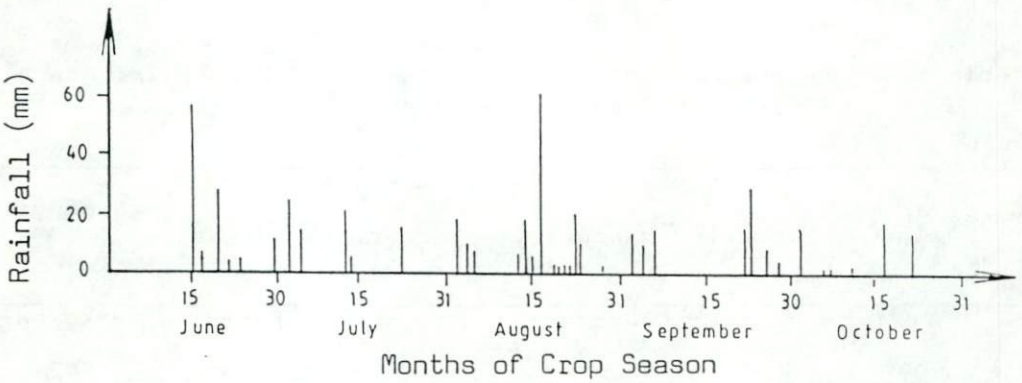


Fig. 5.2. Rainfall distribution at Bouake, Côte d'Ivoire, 1991.

Table 5.3. Performance of cowpea cultivars at Bouake, Côte d'Ivoire, in the transition zone in 1991.

Cultivar	Seed yield
	----kg/ha---
CR-06-07	1104
IT86D-641	458
IT81D-1137	250
IT86D-444	416
IT85D-3577	625
IT82E-16	625
IT82E-18	479
IT83S-818	417
IT82E-32	792
Ferké Local	542
L.S.D. (5%)	231
C.V. (%)	28

c) **Ghana**

Cooperator: K.O. Marfo

The trial was sown on 5 July 1991 at Nyankpala (9°25'41"N, 0°58'42"W, 183 m above sea level) in the northern Guinea savanna. The field plot was not fertilized. Cowpea plants were sprayed four times with an insecticide (Karate 2.5 EC). Bacterial blight and Aphid borne Cowpea Mossaic Virus caused severe damage to the crop. No rainfall data was provided. The performance of cultivars is given in Table 5.4. Although no significant differences were observed among cultivars, IT86D-641, IT82E-16 and IT85D-3577 gave the highest yields.

Promising cultivars identified by the national program: IT82E-16.

Table 5.4. Performance of cowpea cultivars at Nyankpala, Ghana, in the northern Guinea savanna in 1991.

Cultivar	Days to		Disease attack		Seed yield
	Flowering	Maturity	Bacterial blight	Virus	
	----------DAS--------		-------(1-5)------		--kg/ha--
CR-06-07	47	74	4.00	4.00	642
IT86D-641	46	70	3.25	3.75	901
IT81D-1137	47	75	2.75	4.25	734
IT86D-444	48	73	4.50	4.25	193
IT85D-3577	46	70	3.00	3.00	832
IT82E-16	48	68	1.50	2.75	858
IT82E-18	50	72	3.25	3.00	425
IT83S-818	45	67	2.00	2.00	730
IT82E-32	46	67	2.75	2.25	750
Local check	48	71	4.50	4.25	217
L.S.D. (5%)	2	3	1.02	1.26	N.S.
C.V. (%)	3	3	22	26	56

d) **Guinea Conakry**

Cooperator: Fode L. Guilavogui

The trial was sown on 19 September 1991 at Foulaya (10°03'N,12°52'W, 380 m above sea level) in the coastal zone in a field plot fertilized with 37.5:37.5:37.5 kg of $N:P_2O_5:K_2O$/ha. Cowpea plants were sprayed with an insecticide (Cyperal-50). Some diseases attacked the crop during the growth cycle. The rainfall distribution from sowing to cowpea maturity is given in Fig. 5.3. The performance of cowpea cultivars is given in Table 5.5. Cultivars IT86D-444, IT85D-3577, IT82E-18 and IT82E-32 were the highest yielders.

Promising cultivars identified by the national program: IT86D-444, IT85D-3577, IT82E-32 and IT82E-18.

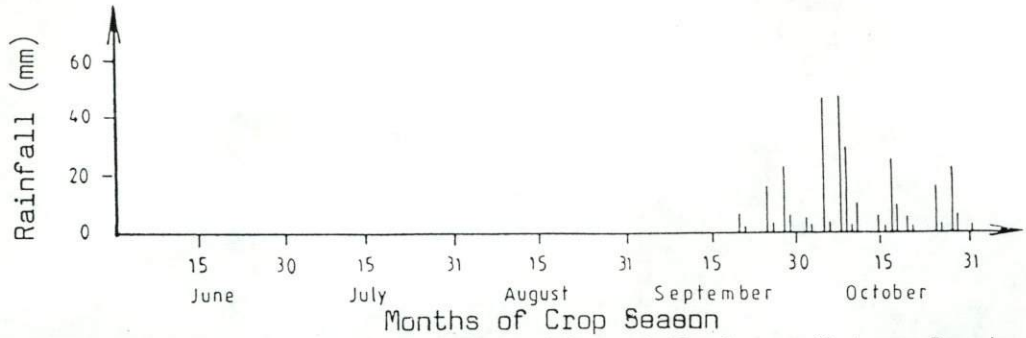


Fig. 5.3. Rainfall distribution at Foulaya, Guinea Conakry, 1991

Table 5.5. Performance of cowpea cultivars at Foulaya, Guinea Conakry in the humid zone in 1991.

Cultivar	Days to			Disease attack			Seed yield
	Flower bud formation	Flowering	Maturity	Web blight	Rust	*Cercospora* leaf spot	
	DAS			(1-5)			kg/ha
CR-06-07	35	44	66	3.00	1.00	1.00	738
IT86D-641	36	48	71	1.00	1.50	1.25	631
IT81D-1137	37	51	75	1.00	1.00	2.50	441
IT86D-444	39	50	74	1.00	1.00	3.00	1047
IT85D-3577	35	48	73	1.00	3.25	1.75	893
IT82E-16	36	47	68	2.50	2.50	1.00	655
IT82E-18	39	49	71	1.50	1.00	1.00	846
IT83S-818	36	48	68	1.50	1.50	1.00	756
IT82E-32	36	46	68	2.50	3.00	1.00	854
Pkaku Toghoi	35	45	66	2.00	3.50	2.00	732
L.S.D. (5%)	2	3	3	1.36	1.36	1.09	324
C.V. (%)	4	4	3	55	49	48	29

e) **Sierra Leone**

The trial was conducted at two locations: Kabala and Njala, in the coastal zone.

e.1) **Kabala**

Cooperator: A.R. Tarawali

The trial was sown on 27 September 1991 at Kabala in a *Striga* sick plot, fertilized with an unspecified amount of P_2O_5/ha as ordinary superphosphate fertilizer. Cowpea plants were not protected against insect pests. A total rainfall of 1526 mm was received; its partitioning during the crop season is given in Fig. 5.4. The performance of cultivars is given in Table 5.6. All cultivars, except the local check, Temne, and IT86D-444 and IT82E-18, exhibited susceptibility to *Striga*. Yields were very low probably due to insect pest damage. However, cultivars IT82E-32 and IT82E-16 gave some acceptable yields that were greater than that of the local check, Temne.

Promising cultivars identified by the national program: IT82E-16, IT82E-18 and IT83S-818.

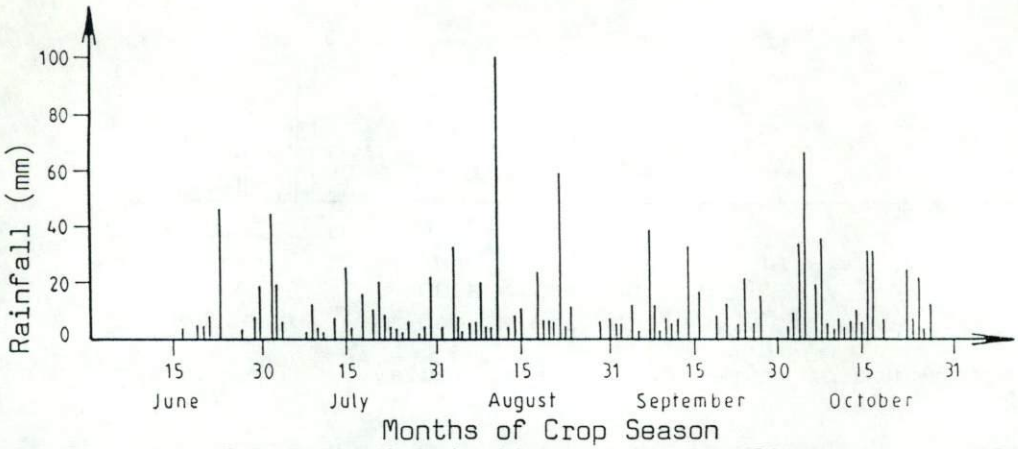


Fig. 5.4. Rainfall distribution at Kabala, Sierra Leone, 1991.

Table 5.6. Performance of cowpea cultivars at Kabala, Sierra Leone, in the coastal/transition zones in 1991.

Cultivar	Days to		*Striga* density	Seed yield
	Flowering	Maturity		
	---------DAS---------		--√x+1--	--kg/ha--
CR-06-07	35	71	1.05	169
IT86D-641	35	71	1.17	0
IT81D-1137	35	71	1.20	0
IT86D-444	51	78	1.00	0
IT85D-3577	35	71	1.17	23
IT82E-16	35	71	1.27	216
IT82E-18	35	71	1.00	79
IT83S-818	35	71	1.07	27
IT82E-32	35	71	1.12	286
Temne	31	66	1.00	168
L.S.D. (5%)	N.S.	N.S.	N.S.	121
C.V. (%)	28	7	22	86

e.2) **Njala**

Cooperator: Abu Sesay

The trial was sown on 17 September 1991 at Njala (08°06'N, 12°05'W, 55 m above sea level) in a field plot fertilized with an unspecified type and quantity of fertilizer. Cowpea plants were treated thrice with insecticide (Sumithion 50EC). A total rainfall of 2173 mm was received; its distribution during the crop sason is given in Fig. 5.5. The highest yielding cultivars were IT82E-16, IT82E-32 and CR-06-07.

Promising cultivars identified by the national program: CR-06-07 and IT82E-32.

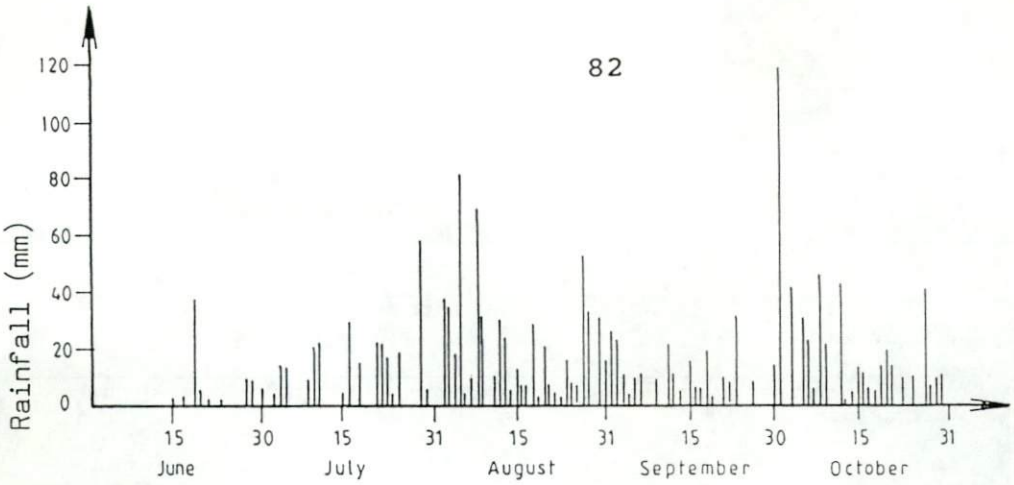


Fig. 5.5. Rainfall distribution at Njala, Sierra Leone, 1991.

Table 5.7. Performance of cowpea cultivars at Njala, Sierra Leone, in the coastal/transition zones in 1991.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	----------DAS----------			--kg/ha--
CR-06-07	40	45	70	513
IT86D-641	39	46	71	330
IT81D-1137	40	47	76	409
IT86D-444	41	47	78	346
IT85D-3577	40	47	73	313
IT82E-16	39	45	68	605
IT82E-18	40	46	70	346
IT83S-818	38	45	70	292
IT82E-32	38	44	66	534
Tamne	38	44	66	271
L.S.D. (5%)	2	2	3	231
C.V. (%)	3	3	3	31

f) **Togo**

Cooperator: Akossiwa Duyiboe

The trial was sown on 5 July 1991 at Ativeme. Agronomic practices used and rainfall received at that location and its distribution have been described in Part IV. Scab disease damaged plants. The performance of cultivars is given in Table 5.8. The highest yielding cultivars were: IT82E-32, CR-06-07, IT82E-16 and IT86D-641.

Promising cultivars identified by the national program: not mentioned.

Table 5.8. Performance of cowpea cultivars at Ativeme, Togo, in the coastal zone in 1991.

Cultivar	Days to			Scab disease	Seed yield
	Flower bud formation	Flowering	Maturity		
	----------DAS----------			-(1-5)-	--kg/ha--
CR-06-07	42	46	60	3.50	1912
IT86D-641	41	44	62	4.25	1586
IT81D-1137	45	48	60	3.50	952
IT86D-444	45	48	61	3.25	1277
IT85D-3577	41	44	60	3.00	1144
IT82E-16	41	44	59	4.00	1866
IT82E-18	42	46	58	3.75	1465
IT83S-818	41	44	60	3.75	1060
IT82E-32	40	43	60	4.00	2070
IT82D-889	38	41	59	3.75	1089
L.S.D. (5%)	3	3	N.S.	N.S.	592
C.V. (%)	5	5	3	27	28

3. CONCLUSION

With the exception of Ativeme, Togo, yields were generally very low in the transition zones in spite of rainfall greater than 900 mm. Cowpea diseases, insect pests and excess moisture could have been responsible for the low yields (Table 5.9).

IT82E-32, CR-06-07 and IT82E-16 were the best adapted cultivars (Table 5.9). Their yield increased positively in high yielding environments. Unfortunately, their seeds are coloured, and might not meet the preference of countries such as Togo whose preference is white seeded cultivars.

Table 5.9. Seed yield (kg/ha) of cowpea cultivars as affected by location and cultivar; and slope (*B*) and coefficient of determination (r^2) associated with regression lines of mean yields of cultivars on mean yield after different locations in the transition and coastal zones in West and Central Africa in 1991.

Location effect		Cultivar effect			
Location	Seed yield	Cultivar	Seed yield	*B*	r^2
	--kg/ha--		--kg/ha--		
-Central African Republic		CR-06-07	796	1.27	0.88
.Bambari	430	IT86D-641	611	1.17	0.93
-Côte d'Ivoire		IT81D-1137	468	0.62+	0.72
.Bouake	571	IT86D-444	542	0.95	0.76
-Ghana		IT85D-3577	581	0.87	0.82
.Nyankpala	628	IT82E-16	744	1.22	0.92
-Guinea Conakry		IT82E-18	578	1.05	0.96
.Foulaya	758	IT83S-818	494	0.81	0.86
-Sierra Leone		IT82E-32	826	1.36*	0.96
.Kabala	97	Local check	533	0.66	0.67
.Njala	396				
-Togo		L.S.D. (5%)	127	-	-
.Ativeme	1442	C.V. (%)	39	-	-
L.S.D. (5%)	242				
C.V. (%)	39				

+, * = *B* significant at 10 and 5% probability level, respectively.

COMMENTS

COMMENTS

Although there has been an impressive improvement as compared to the 1989-90 regional trials, there is still a lot more to be done by national scientists in order to facilitate interpretation of the results of regional trials.

In particular, the accompanying information sheets for each trial should be filled correctly. The type or name of fertilizers and pesticides used and doses per hectare, name of the local check variety or cultivar used and its origin should be indicated. Where insecticides are used, time and number of application should be stated.

Very often certain national programs forget to include a local check cultivar in their trials. Thus, the performance of introduced cultivars in a given trial and location cannot be properly assessed in the absence of a bench mark from a local check. The best commercially released cultivar of one's country should always be compared with the improved or introduced cultivars.

As far as *Striga* resistance trial is concerned the following information is vital in order to properly assess the resistance of cultivars: date a *Striga* shoot first emerged in the plot and the *Striga* density (or number of *Striga* shoots in the harvested area) at cowpea maturity (i.e., when 50% of cowpea plants bear matured pods).

A visit to the trial site between flowering and maturity time to rate cultivars on a scale of 1-5 for any disease outbreak is very necessary. Not noting cultivars for diseases can be assumed that there was no disease problem at that location. This can be misleading if actually there were disease problems, but the scientist did not score them. No susceptible cultivar can therefore be identified this way from that location when in fact such an information is needed by the scientist who developed the cultivar to further improve on it if need be.

1992-05

RENACO 1991-1992 Regional trials, preliminary results

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