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WESTERN AND CENTRAL AFRICA

COWPEA NETWORK

(RENACO)

1987 AND 1988 REGIONAL COWPEA TRIALS

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COWPEA REGIONAL TRIALS

PREFACE

Regional trials may be envisaged as the most appropriate vehicle for the transfer of scientific inormation and new technologies from International Agricultural Research Centres (IARCs) to National Agricultural Research Centres (NARCs) and from one NARC to another. The Regional Trial effort has, as an overall objective to strengthen NARCs in RENACO member countries. This can either be done directly or indirectly.

- Directly, if new technologies met the needs and requirements of farmers and consumers and were released after a long period of extensive testing in a country.

- Indirectly,if the new technologies were refined by NARCs to meet either local adaptation or market exigences or both ways.

In order to attain this goal, new technologies should not be tested only at the main station level, but also at several locations including on-farm and on-station testing. This will require a good number of years of testing before a concrete decision can be arrived, regarding the fate of new introduced technologies. It was along this line of thought, coupled with the limited resources of NARCs in the RENACO member countries that its Steering Committee recommended in its Meeting of November, 1987 at Ouagadougou, that Regional cowpea trials be organized biennially. This will permit NARCs to assess new technologies thouroughly before embarking on a new set of testing. Hence, RENACO did not design new regional trials for the 1988 season. However, various disease resistant nursery regional trial designed in 1987 were sent to certain countries in 1988 upon request.

Regional trials requested in 1987 and 1988 will be reported separately in this report.

1987 REGIONAL COWPEA TRIALS

1987 REGIONAL COWPEA TRIALS

1. COWPEA BREEDING

Two regional trials, one on Striga and another on drought, formed the major regional activities in 1987. The results obtained are described as below :

1.1 Regional Cowpea Striga Trial (RCST)

The trial contained 15 promising cowpea varieties including the susceptible checks and 13 sets of this were sent to 6 countries. The countries that collaborated were Burkina Faso (3), Cameroon (1), Ghana (1), Mali (2), Niger (3) and Nigeria (3). The plot size was a 4 row with a distance between and within the rows of 0.75 m and 0.20 m respectively. Observations were recorded on the central two rows for level of Striga infestation, flowering, diseases, yield and other characters. At the time of this write up data were available from two locations in Burkina Faso, three locations in Nigeria, two locations in Niger, one location in Ghana and two locations in Mali.

The most outstanding observation made was that, as reported earlier, the two varieties, IT82D-849 and B 301 were free of Striga infestation in most of these countries. Also, based on personal communication, they were indicated to be free of Striga infestation in Mali, the data of which was not available. These results are highly encouraging and are a step forward in solving the problem of Striga in West Africa. In terms of performance of individual varieties, the yields varied considerably. The highest yields were obtained at Magaria, followed by Kano, Nigeria and Kamboinse, Burkina Faso.

Striga density for each cultivar, and cultivar seed yield at each location are shown on Tables 1 and 2, respectively. Cultivars KVx 61-1, KVx 183-1 and SUVITA-2 were among the high yielding ; and cultivars B 301 and IT82D-849 were among the low yieldings at most locations (Table 2).

Table 1. *Striga* density as affected by cowpea cultivars under natural infestations in Burkina Faso, Ghana, Mali, Niger, and Nigeria in 1987.

Cultivars	Burkina Faso		Mali		Niger		Ghana	Nigeria		
	Kamboinse	Pobe	Cinzana	Koporo	Tarna	Magaria	Manga	Bakura	Tomas Dan Batta	Sada
	Striga plants/6 m^2									
KVx 61-1	2	0	-	-	3.5	4 4	-	5	3.3	0.5
KVx 61-2	2	0	-	-	1.0	2	-	1	0.5	0.5
KVx 61-74	5	0	-	-	2.0	4	-	1	1.8	0.5
KVx 65-114	1	0	-	-	4.0	3	-	3	0.8	0.3
KVx 68-31-3	4	0	-	-	8.0	7	-	2	9.8	0.0
KVx 183-1	4	0	-	-	5.0	10	-	10	2.3	0.3
B 301	0	0	-	-	0.0	0	-	0	0.0	0.0
VITA 5	46	0	-	-	15.3	6	-	1	0.8	0.5
IT 82D-450-4	11	0	-	-	1.3	1	-	1	0.0	0.0
IT 82D-479-1	7	0	-	-	8.5	5	-	5	1.0	0.0
IT 82D-849	0	0	-	-	0.0	0	-	0	0.3	0.0
SUVITA 2	1	0	-	-	2.3	2	-	2	0.3	0.0
TN 88-63	141	1	-	-	-	8	-	3	9.0	0.0
MOUGNE	186	0	-	-	13.5	12	-	9	6.0	0.0
Local	153	1	-	-	1.3	2	-	2	1.0	1.3
C.V. (%)	85	400	-	-	144	104	-	120	167	222
L.S.D. (5 %)	49	0.6	-	-	10	6	-	5	3	1
Location mean seed yield (kg/ha)	857	538	639	811	290	1286	256	766	800	1069

Table 2. Performance of cowpea under natural Striga infestations in Burkina Faso, Ghana, Mali, Niger and Nigeria in 1987. quintals/ha.

Cultivars	Burkina Faso		Ghana	Mali		Niger		Nigeria		
	Kamboinse§	Pobe§	Manga§	Cinzana§	Koporo§	Tarna§	Magaria§	Bakura§	Tomas Dan Batta§	Sada§
	Q/ha									
KVx 61-1	10.8ab	6.1ab	2.7defg	9.4abc	9.2ab	3.3bcd	13.8ab	4.4b	7.9abcd	11.2bcdef
KVx 61-2	8.6bcde	✓7.1a	4.2abcd	6.3cdef	8.1abc	4.0abc	13.2abc	7.9ab	9.5abc	8.3gh
KVx 61-74	9.7bcd	5.5abcd	3.2cdefg	6.3cdef	9.0ab	2.6def	12.8abc	8.9ab	8.6abcd	10.0defg
KVx 65-114	7.6cde	6.3ab	5.5a	7.4bcd	9.8ab	2.2ef	12.6abcd	8.5ab	4.0e	10.8bcdef
KVx 68-31-3	12.9a	5.4acd	4.8abc	6.9cd	7.1bc	3.0cde	15.8ab	9.2ab	6.5cde	12.5b
KVx 183-1	9.9abc	✓6.6a	3.7abcdef	✓11.0a	7.5bc	✓4.4a	15.1ab	5.8ab	9.7ab	10.4cdef
B 301	5.8ef	3.8cde	3.7abcdef	4.2def	7.9abc	2.7def	9.6cd	7.7ab	8.7abcd	9.2fgh
VITA-5	7.9bcde	3.3e	2.2efg	3.3ef	4.4cd	2.2ef	8.7d	10.2a	5.7de	7.9h
IT82D-450-4	8.7bcde	6.1ab	3.4bcdefg	6.5cde	9.6ab	2.5def	12.0bcde	5.4ab	8.0abcd	9.6efgh
IT82D-479-1	10.4abc	5.8abc	4.1abcde	6.8cd	8.5ab	3.0cde	12.0bcde	10.2a	9.2abc	11.7bcd
IT82D-849	10.4abc	3.2e	2.1fg	5.6def	11.5a	2.8def	8.6e	✓10.8a	6.8bcde	11.3bcde
SUVITA-2	9.7bcd	✓6.9a	5.2ab	✓10.6ab	9.6ab	✓4.2ab	✓16.0a	6.9ab	✓10.8a	9.6efgh
TN88-63	5.8ef	✓6.6a	1.6g	2.9f	8.3abc	3.5abcd	✓15.2ab	9.0ab	9.8ab	✓14.6a
MOUGNE	4.1f	4.3bcde	3.2cdefg	4.1def	7.5bc	1.8fg	13.2abc	✓10.6a	7.9abcd	12.1bc
LOCAL	6.7def	3.7de	3.6abcdef	4.3def	0.7d	1.1g	14.3ab	3.7b	0.7f	10.8bcdef
C.V. (%)	25	26	38	37	34	25	21	53	26	13
L.S.D. (5 %)	3.1	2.0	1.9	3.4	3.9	1.0	3.9	5.7	3.0	2.0

§ Means followed by the same letter at a given location are not statistically different at 5 % probability level.

1.2 Regional Cowpea Drought Trial (RDCT)

This trial comprised of 20 varieties including the check varieties. 18 sets were sent to 10 countries i.e. Benin (1), Burkina Faso (3), Chad (2), Gambia (1), Ghana (2), Guinea-Bissau (1), Nigeria (2), Mali (2), Niger (3) and Senegal (2). The plot size, as in RCST, was a 4 row plot with a distance between and within the rows of 0.75 m and 0.20 m respectively. Observations were recorded on grain yield, diseases and maturity. At the time of this write up, results were received from two locations in Burkina Faso, two in Nigeria, two in Niger, one in Mali and one in Ghana. Yields (Kg/ha) from these locations are reported in Table 3. The most promising varieties were KVx 30-305-3G, KVx 268-K03-3, KVx 60-K26-2, KVx 250-K27-18, TN88-63 and SUVITA-2. Of these KVx 30-305-3G was identified to be one of the most promising drought tolerant varieties in early years.

2. CCWPEA AGRONOMY

2.1 Maize-Cowpea Relay Cropping

In 1987, maize-cowpea relay cropping trials were sent to the following countries : Burkina Faso, one set ; Guinea Conakry, two sets ; Nigeria, one set ; Tchad, one set ; and Togo, one set. As of May 20, 1988, all countries except Nigeria and Tchad had returned their data.

Two types of experiments were included : one tested the effects of different maize and cowpea cultivars, particularly maturity groups, and row-spacings on the performance of both crops ; and the other tested the effect of different cowpea cultivars on the performance of both crops.

Table 3. Seed yield of cowpea cultivars in the Sudano-Sahelian environments in Burkina faso, Nigeria, Ghana, Mali, and Niger in 1987.

Cultivars	Burkina Faso		Nigeria		Ghana	Mali	Niger	
	Kamboinse§	Pobe§	Bakura§	Samaru§$	Manga§	Koporo§	Kollo§	Gabagoura§
					Q/ha			
KVx 30-305-3G	16.3a	4.7abcde	17.7ab	21.6bcd	8.8abc	14.4ab	24.1a	5.6ab
KVx 60-K26-2	11.5bcd	4.5abcde	12.5abcd	26.8ab	5.9efg	13.1bcde	11.2gh	3.5bcdef
KVx 60-P04-1	10.2bcde	6.1ab	13.5abcd	13.7fg	7.0abcde	12.7bcdef	13.6efg	4.8abcd
KVx 61-1	11.8bcd	6.1ab	20.0a	22.1bcd	3.8ghi	16.5a	20.2abc	3.2bcdef
KVx 65-114	11.7bcd	6.8a	12.7abcd	16.8efg	6.5cde	11.1cdef	18.1cde	2.5cdef
KVx 183-1	13.1ab	4.6abcde	12.3abcd	20.4cde	9.0a	13.7abc	14.1defg	3.4bcdef
KVx 249-P37-30	9.3de	3.6cde	12.5abcd	24.5ab	7.2abcde	12.2bcdef	16.3cdef	3.7bcde
KVx 250-K27-18	10.8bcde	4.6abcde	13.1abcd	14.1fg	6.6bcde	11.6bcdef	18.4cd	3.7bcde
KVx 257-K21-3	9.2de	3.2def	9.8cde	22.7bcd	6.4def	11.9bcdef	9.0hi	2.1def
KVx 268-K03-3	12.8bc	5.6abc	18.5ab	24.7abc	8.4abcd	13.3bcd	16.5cdef	3.9bcde
KVx 256-K17-11	10.8bcde	5.2abc	16.9abc	28.8a	5.6efgh	10.4def	12.8fgh	3.4bcdef
IT83S-343-5	10.7bcde	4.9abcde	14.0abcd	23.2abcd	6.0efg	12.1bcdef	11.4gh	2.9bcdef
IT81D-994	2.4f	4.1bcde	6.9de	22.2bcd	4.1fghi	10.1efg	3.2j	3.4bcdef
IT82D-699	10.2bcde	5.2abc	16.3abc	21.6bcd	1.8i	11.2cdef	12.6fgh	2.6cdef
IT82S-2246	9.8bcde	1.0f	16.4abc	17.2def	6.3def	10.6cdef	3.0j	2.3def
IT84S-2137	9.5cde	2.6ef	11.7bcde	15.2efg	4.1fghi	9.6fg	4.7ij	0.9f
IT83S-340-5	10.0bcde	3.9bcde	11.9bcd	17.9def	5.1efgh	11.0cdef	6.5ij	1.7ef
TN 88-63	12.2bcd	5.4abcd	18.5a	12.7fg	7.4abcde	14.5ab	16.6cdef	5.1abc
SUVITA 2	12.0bcd	3.9bcde	16.9abc	11.1g	8.9ab	12.3bcdef	23.3ab	3.7ab
LOCAL	7.4e	3.6cde	3.9e	26.2ab	3.4hi	7.0g	19.3bc	7.1a
C.V. (%)	23	37	40	20	26	18.6	23	53.6
L.S.D. (5 %)	3.4	2.3	7.8	5.7	2.3	3.1	4.5	2.7

§ Means followed by the same letter at given location are not statistically different at 5 % probability level.

$ This location is in Northern Guinea Savanna.

2.1.1 Effect of Different Maize and Cowpea Cultivars and Row-Spacings on the Performance of Both Crops in a Relay-Cropping System

This experiment was conducted at Diebougou, Burkina Faso, and Broukou/Kara, Togo. It involved two maize cultivar, three cowpea cultivar treatments and two row-spacings. Maize cultivars used consisted of SAFITA-2 (90 days to maturity), less leafy with short plant stature ; IRAT 171 (105 days to maturity), leafy with tall stature and La Posta (110 days to maturity), leafy and tall plant stature. SAFITA-2 and IRAT 171 were used at Diebougou, and SAFITA-2 and La Posta, at Broukou. Cowpea cultivars consisted of Kaya local, daylength sensitive ; a local check, and a pure-stand maize treatment was used as check. There was no cowpea pure-stand treatment. The row-spacings consisted of 0.75 m x 0.25 m and 1.00 m x 0.25 m. Maize cultivars were sown at the onset of the crop season ; whereas cowpea cultivars were sown four weeks after maize. Maize plants were fertilized with NPK at sowing and N one month after sowing, as side-dress. Cowpea plants were sprayed with insecticides twice. The experimental design used was a factorial combination of two maize cultivars, three cowpea cultivar treatments and two row-spacings in randomized complete blocks.

There was no conspicuous difference in seed yield of maize cultivars SAFITA-2 and IRAT 171 under all cowpea cultivars and row-spacings treatments at Diebougou (Table 1). With regard to cowpea, only the cultivar Diebougou Local gave some seed yield which tended to increase as the row-spacing was accrued from 0.75 to 1.00 m (Table 1). A dry spell in mid-to late-October appeared to have been responsible for the very low cowpea seed yield (Table 1).

At Broukou, Togo, maize cultivar La Posta yielded significantly higher than maize cultivar SAFITA-2 (Table 2). Row-spacings had no significant effect on seed yield of both cultivars.

Table 1. Seed yields of maize and cowpea as affected by row-spacings and cultivars in relay-cropping system at Diebougou, Burkina Faso, in 1987.

Cowpea cultivars	MAIZE CULTIVARS			
	SAFITA-2		IRAT 171	
	(0.75m x 0.25m)	(1.00m x 0.25m)	(0.75m x 0.25m)	(1.00m x 0.25m)
	Q/ha			
1) Maize Seed Yield§				
Kaya local	10.6 abcd	6.3 d	9.0 cd	12.7 abc
Local (Diebougou)	10.1 abcd	11.3 abcd	8.9 cd	9.7 bcd
Maize pure stand	7.9 cd	14.6 a	15.2 a	14.2 ab
L.S.D. (5 %)	5.0			
C.V. (%)	33			
2) Cowpea Seed Yield	Q/ha			
Kaya local	0.0	0.0	0.0	0.0
Local (Diebougou)	2.0	2.6	1.9	3.3
Maize pure stand	0.0	0.0	0.0	0.0
L.S.D. (5 %)	NS			
C.V. (%)	39			

§ Means followed by the same letter are not statistically different at 5 % probability level.

Table 2. Seed yield of maize and cowpea as affected by row-spacings and cultivars in relay-cropping system at Broukou, Togo, in 1987.

Cowpea Cultivars	MAIZE CULTIVARS			
	SAFITA-2		LA POSTA	
	(0.75m x 0.25m)	(1.00m x 0.25m)	(0.75m x 0.25m)	(1.00m x 0.25m)
	Q/ha			
1) Maize Seed Yield§				
Kaya local	28.8 c	25.7 c	49.0 a	42.4 ab
Local (Broukou)	27.5 c	25.9 c	50.0 a	42.3 ab
Maize pure stand	31.0 bc	25.5 c	47.4 a	45.2 a
L.S.D. (5 %)	11.5			
C.V. (%)	22			
2) Cowpea Seed Yield§	Q/ha			
Kaya local	0.0	0.0	0.0	0.0
Local (Broukou)	2.3	2.3	1.3	1.4
Maize pure stand	0.0	0.0	0.0	0.0
L.S.D. (5 %)	NS			
C.V. (%)	55			

§ Means followed by the same letter are not statistically different at 5 % probability level.

As observed for cowpea at Diebougou, only the local Broukou cultivar gave some seed yield (Table 2). Maize cultivar La Posta tended to depress cowpea seed yield as compared to maize cultivar SAFITA-2 (Table 2). Row-spacings had no significant effect on cowpea seed yield.

Severe virus diseases and dry spells in October probably caused the low seed yield of cowpeas.

The depressing effect of La Posta, tall leafy, and late maturing maize cultivar, on seed yield of relay cropped cowpea agreed with the 1982, 1983 and 1984 observations at Farako-Bâ, Burkina Faso.

2.1.2 Effect of Cowpea Cultivars on Seed Yield of Relay Cropped Maize

This experiment was conducted at Bordo/Kankan and Kilissi/Kindia, Guinea Conakry. It involved eight cowpea cultivars of different growth habits. Agronomic practices and the experimental design were as in the preceding row-spacing experiment, earlier reported, except that only one row-spacing, 0.75 m x 0.25 m, was used.

As observed at Farako-Bâ, Burkina Faso, cowpea cultivars relay-cropped four weeks after maize had no significant effect on maize seed yield at both locations (Table 3). Maize seed yield was low at Bordo/Kankan (17.2 to 35.3 Q/ha) than at Kilissi/Kindia (41.4 to 44.7 Q/ha).

Seed yield of cowpea differed significantly at Kilissi/Kindia only (Table 3). Daylength neutral and sensitive cultivars KN-1 and Kaya Local, respectively, yielded similarly to one another and significantly higher than any other cultivar at that location (Table 3). Cowpea seed yield, were lower at Bordo/Kankan (0.0 - 0.9 Q/ha) than at Kilissi/Kindia (4.4 - 11.9 Q/ha).

Table 3. Seed yields of maize and cowpea as affected by cowpea cultivars in relay-cropping at Bordo/Kankan and Kilissi/Kindia, Guinea Conakry, in 1987.

Cowpea Cultivars	SEED YIELD AT			
	Bordo/Kankan &		Kilissi/Kindia &	
	Maize	Cowpea	Maize	Cowpea
	----------Q/ha----------			
1) Maize pure crop	37.2 a	-	43.1	-
2) Cowpea cultivars				
a) Daylength neutral				
TN 88-63	24.0 a	0.9 a	44.7 a	8.1 c
IT81D-994	23.0 a	0.2 a	41.4 a	6.9 d
TVx 3236	30.6 a	0.1 a	42.5 a	4.4 e
KN-1	32.7 a	0.2 a	43.1 a	11.4 a
b) Daylength-sensitive				
KVx 30-G172-16K	35.3 a	0.2 a	44.6 a	5.1 e
Kaya Local	17.2 a	0.1 a	42.0 a	11.9 a
Kamboinse local R.	30.0 a	0.0 a	42.4 a	9.9 b
Local cultivar	29.0 a	0.6 a	44.4 a	8.1 c
L.S.D. (5 %)	N.S.	N.S.	N.S.	0.7
C.V. (%)	38	124	11	6

& Means followed by the same letter are not statistically different 5 % probability level.

A short crop season and poorly distributed rainfall at Bordo/Kankan as compared to Kilissi/Kindia were believed to have caused the lower seed yield of both crops at the former than the latter locations (Table 3).

As observed in Burkina Faso in 1981, 1982, 1983 and 1984 and in regional testing in Togo, Gambia, Nigeria and Benin in 1983, 1984 and 1985, cowpea sown one month after maize had no detrimental effect on maize seed yield. Cowpea performance under maize depended on environmental conditions (i.e., rainfall intensity and distribution and probably on disease incidence). Where environmental conditions were good up to October, cowpea yields greater than 70.0 Q/ha were observed with some daylength sensitive as well as insensitive cultivars. Also dependent on crop management levels and environmental conditions good yields of maize and cowpeas, greater than 30.0 Q/ha and 5.0 Q/ha respectively, were observed at some sites. Results of Regional Trials, in general, agree with those obtained in Burkina Faso. They suggest that maize/cowpea relay-cropping system can be successfully extended to Northern Guinea Savanna in other West African countries.

2.2 Sorghum-Cowpea intercropping

Sorghum-cowpea intercropping trials were conducted at Oronkua/Diebougou, Burkina Faso ; Tilli/Bolgatanga, Ghana ; Bordo/Kankan, Guinea Conakry ; Maroua, Cameroon ; and Broukou/Kara and Atekou/Kante, Togo in 1987. The objectives consisted of testing three cowpea cultivars : TVx 3236, KN-1 and a farmers' local cowpea, under two insecticide treatments : no insecticide application ; and, two sprays: one at flower bud formation and the other, at the onset of pod filling to control flower thrips and other insect pests. TVx 3236 and KN-1 are daylength-neutral cultivars : the first has moderate level of resistance or tolerance to flower thrips while the second is susceptible. Experiments conducted in the Sudan Savanna at Kamboinse (Burkina Faso)

from 1981 to 1985 have shown TVx 3236 to give up to 300 kg/ha of seed yield without insecticide protection in inter-cropping. Whereas the same cultivar in pure-stand cropping would give 0 kg/ha as does KN-1 in both pure-stand and inter-croppings when insecticides are not applied to suppress flower thrips.

The sorghum cultivar Framida, was sown early in the crop season at all locations, except at Tilli/Bolgatanga, Ghana, and Maroua, Cameroon, using 1.25 m x 0.25 m spacings. Seedlings were thinned to one plant per hill within three weeks after sowing. Sorghum plants received NPK fertilizer at sowing and additional N fertilizer as side dressing one month after sowing. Cowpea was sown two to three weeks after sorghum in solid rows : 1.25 m x 0.20 m apart, alternating with sorghum. Two seeds were sown and seedlings thinned to one plant per hill two weeks after sowing.

Rainfall started late --i.e., early July-- and ended early --i.e., late September at Tilli/Bolgatanga, Ghana ; and, Maroua, Cameroon. Excessive rains were recorded at Bordo/Kankan, Guinea Conakry, in August and early-September. In other locations, rainfall was fairly well distributed.

Sorghum seed yields were high at Oronkua/Diebougou, Burkina Faso and Broukou/Kara, Togo ; intermediate at Maroua, Cameroon,Atekou/Kante, Togo ; very low at Bordo/Kankan ; and nil at Tilli/Bolgatanga, Ghana (Table 4). Late sowing caused by late establishment of rainfall and the early cessation of rains were responsible for the failure of the sorghum crop at Tilli/Bolgatanga and the low sorghum yields at Maroua, Cameroon. On the other hand heavy rainfall and the ensuing water logging, drastically reduced sorghum seed yield at Bordo/Kankan, while a severe sorghum foliar disease reduced sorghum yield at Atekou/Kante, Togo.

Table 4. Sorghum and cowpea seed yields as affected by insecticide sprayings and intercropping at Oronkua/Diebougou, Burkina Faso ; Tilli/Bolgatanga, Ghana ; Bordo/Kankan, Guinea-Conakry ; Maroua, Cameroon; and Broukou/Kara and Atekou/Kante, Togo in 1987.

Treatments	SEED YIELD																	
	Oronkua/Diebougou (Burkina Faso)			Tilli/Bolgatanga (Ghana)			Bordo/Kankan (Guinea-Conakry)			Maroua (Cameroun)			Broukou/Kara (Togo)			Atekou/Kante (Togo)		
	Sorghum[&]	Cowpea[&]	LER[£] (%)	Sorghum	Cowpea	LER (%)	Sorghum	Cowpea	LER (%)	Sorghum	Cowpea	LER (%)	Sorghum	Cowpea	LER (%)	Sorghum	Cowpea	LER (%)
	Q/ha																	
a) No insecticide spraying																		
1) Intercrop treatments																		
TVx 3236	20.7 b	3.5 cd	1.11	0	0.0 c	N/A	3.1 a	1.3 de	0.73	10.5 c	3.0 ef	1.39	22.8 a	0.0	N/A	8.2 a	0.1 c	N/A
KN-1	19.7 b	2.0 d	0.89	0	0.0 c	N/A	4.1 a	1.0 de	0.79	9.5 c	3.2 ef	1.40	20.2 a	0.0	N/A	9.0 a	0.0 c	N/A
Local	19.7 b	1.7 d	0.85	0	0.0 c	N/A	4.1 a	2.0 cd	1.04	10.7 c	0.9 f	0.82	18.8 a	0.5	N/A	9.4 a	0.0 c	N/A
2) Pure-Crop Treatments																		
Sorghum : Fromida	31.3 a	-	1.00	0	-	N/A	7.8 a	-	1.00	18.7 a	-	1.00	26.4 a	-	N/A	9.8 a	-	N/A
TVx 3236	-	7.7 ab	(1.00)	-	0.0 c	N/A	-	4.4 ab	(1.13)	-	9.0 bc	(2.50)	-	0.3	N/A	-	0.4 b	N/A
KN-1	-	7.1 abc	(0.92)	-	0.0 c	N/A	-	4.2 ab	(1.08)	-	8.2 c	(2.28)	-	0.0	N/A	-	0.0 c	N/A
Local	-	7.7 ab	1.00	-	0.0 c	N/A	-	3.9abc	1.00	-	3.6def	1.00	-	0.0	N/A	-	0.0 c	N/A
b) Insecticide spraying§																		
1) Inter-crop Treatments																		
TVx 3236	21.6 b	2.9 d	1.05	0	5.0 b	N/A	3.6 a	1.6 de	0.76	12.9 bc	6.7 cd	1.24	19.0 a	0.1	N/A	8.4 a	1.7 b	N/A
KN-1	21.1 b	5.2bcd	1.31	0	4.4 b	N/A	4.5 a	0.8 de	0.73	13.6 bc	4.5 de	1.10	20.4 a	0.0	N/A	9.5 a	1.4 bc	N/A
Local	14.6 d	2.6 d	0.79	0	5.4 b	N/A	3.1 a	1.3 de	0.64	17.1 ab	4.8 de	1.31	18.6 a	0.6	N/A	9.1 a	0.0 c	N/A
2) Pure-Crop Treatments																		
TVx 3236	-	10.0 a	(1.23)	-	8.5 a	N/A	-	2.6bcd	(0.49)	-	16.3 a	(1.33)	-	0.0	N/A	-	3.5 a	N/A
Local	-	8.1 ab	1.00	-	7.9 a	N/A	-	5.3 a	1.00	-	12.1 b	1.00	-	0.5	N/A	-	0.0 c	N/A
L.S.D. (5 %)	3.2	3.6	-	-	2.5	-	NS	1.9	-	4.4	3.2	-	NS	NS	-	NS	1.5	-
C.V. (%)	10	47	-	-	26	-	46	51	-	22	34	-	20	167	-	28	67	-

§ Two insecticide sprays at flower bud formation and pod formation.

& Means followed by the same letter are not statistically different at 5 % probability level.

£ LER = Land equivalent ratio was computed using the yield of the pure crop local cowpea variety under each spray regime.

Intercropped cowpea reduced sorghum seed yield only at Oronkua/Diebougou, Burkina Faso and Maroua, Cameroon (Table 4). Cowpea cultivars, with the exception of local cultivars did not appear to compete differently from sorghum at all locations.

Cowpea seed yield was : nil at Broukou/Kara, Togo ; very low at Atekou/Kante, Togo (0.0 to 3.5 Q/ha) ; Bordo/Kankan, Guinea Conakry (0.8 to 5.3 Q/ha) and Tilli/Bolgatanga, Ghana (0.0 to 8.5 Q/ha) ; intermediate at Oronkua/Diebougou, Burkina Faso (1.7 to 10.0 Q/ha) ; and high (0.9 to 16.3 Q/ha) at Maroua, Cameroon (Table 4). High viral and fungal diseases as well as pod sucking bug pressures and high rainfall were responsible for the low cowpea seed yield at Broukou and Atekou (Togo). Similarly, water logging at Bordo/Kankan, Guinea Conakry reduced cowpea seed yield (Table 4).

Intercropping cowpea with sorghum reduced cowpea seed yields significantly at all locations (Table 4). Similarly, omission of insecticide application significantly reduced seed yield in both pure and the intercropped cowpea at all locations. At Tilli/Bolgatanga (Ghana) and Atekou/Kante (Togo) which are located closely together in a similar ecological zone, cowpea seed yield dropped to 0.0 Q/ha when the crop was not sprayed. This contrasted with locations such as Oronkua/Diebougou (Burkina Faso) and Maroua (Cameroon) where good yields 0.0 to 3.5 Q/ha) in intercropping and (3.6 to 9.0 Q/ha) pure-stand were obtained without insecticide protection.

The high pressure of pod sucking bugs, observed at Atekou/Kante, could have contributed to the drastic seed yield drop.

TVx 3236 yielded similarly or higher than KN-1 without insecticide application whether in pure-stand or intercropped plots ; the yield difference was, however, not significant. Local cultivars yielded either equally to or significantly less than TVx 3236 (Table 4).

With insecticide application, intercrop yields of the three cultivars were similar at all locations (Table 4). In pure-stand plots TVx 3236 produced significantly higher yields than the local cultivars at Maroua (Cameroon) and Atekou/Kante (Togo) and was outyielded by the local variety at Bordo/Kankan (Guinea). Pure-stand yields of both cultivars did not differ significantly at other locations.

Yield advantages in intercropping (LER greater than 1) were observed under both spraying regimes at Oronkua/Diebougou, Burkina Faso, and Maroua, Cameroon, where adverse environmental conditions to growth/development of both cowpea and sorghum crops were low.

From experimental results, cowpea performance without insecticide protection appeared to depend on the location ; intercropping did not enhance seed yield on plots that were not chemically protected against insect pests ; similarly the cultivars TVx 3236 and the local cowpea had no significant yield advantage over KN-1 in those plots. Therefore, wide spread testing should be conducted over several years in each country to identify locations which require less insecticide protection than others in other to make appropriate recommendations to farmers.

3. MINIMUM INSECTICIDE PROTECTION TRIAL

During the cowpea and maize workshop in March, National scientists expressed interest in conducting the SAFGRAD Regional Entomology Trial on Minimum Insecticide protection of cowpea insect pests under the original format. A trial was therefore established to assess the performance of 10 cowpea varieties (8 improved entries of varying maturity periods with multiple resistance to insects, diseases, Striga and drought, and 2 local late photosensitive cultivars) under minimum insecticide protection, i.e. two sprays of deltamethrin + dimethoate (12.5 + 400 g a.i./ha) at floral bud formation and podding (30 to 35

and 45 to 55 DAP respectively). Twelve sets were sent upon request to 8 national programs in Central and West Africa, and collaborators were requested to take observations on insect pest incidence, flower production and grain yield.

Trials in Burkina Faso were conducted at Pobe, Kamboinse and Farako-Bâ using a split plot design with insecticide protection as main plots and cowpea varieties as sub-plots, and four replications. In other locations a randomised complete block design with four replications was used.

At Pobe the trial was planted on July 10, 1987. Crop establishment was good but later growth and development were hampered by sand blast, heat and drought stress. Results appear in Tables 1 and 2. Insect pest incidence was low. Significant differences emerged among varieties in respect of flower Thrips incidence on racemes and flowers : TVx 3236 supported lower Thrips populations than local varieties - Gorom Local (SUVITA-2), Pobe Local (Table 1). Maruca Pod Borer and Pod Sucking Bug infestations were mild and similar among varieties. Flower production, grain yields were modest in all varieties. Gorom Local (SUVITA-2) produced the best yield (0.4 T/ha) followed by KVx 165-14-1, KVx 30-G172-1-6K, TVx 3236, IT82E-32 and IT84S-2246-4 (0.2-0.3 T/ha). Insecticide application significantly reduced Thrips population densities on cowpea racemes and flowers and markedly increased flower production (Table 2). However, grain yield was only marginally improved by insecticide protection.

The trial at Kamboinse was sown on July 13, 1987 : Germination and development were satisfactory. Insect pest density levels were in general low, significant varietal differences in Flower Thrips, Maruca Pod Borer and Pod Sucking Bug incidence notwithstanding (Table 3). Flower production was moderate and markedly higher in improved varieties (KVx 165-14-1, IT84S-2246-4, TVx 3236) than local cultivars. Seed yields yields of 0.7 - 0.9 T/ha were produced by IT84S-2246-4, IT84S-2231-15,

Table 1. Flower Thrips, Maruca Pod Borer and Pod Sucking Bug Incidence, Flower Production and Grain Yields (Kg/ha) of 10 Improved and Local Cowpea Varieties with and without Minimum Insecticide Protection 1/ at Pobe, Burkina Faso, 1987.

Varieties	Flower Thrips per 10		Maruca larvae per 10 flowers	Pod Sucking bugs per meter	Flowers per meter	Yield (Kg/ha)
	Racemes	Flowers				
1. TVx 3236	1.4	1.5	1.0	1.0	3.1	200
2. IT82E-32	1.7	1.7	1.0	1.0	2.8	195
3. KVx 165-14-1	1.5	1.2	1.0	1.1	3.6	213
4. IT84S-2246-4	1.9	1.4	1.0	1.0	3.6	191
5. IT84S-2231-15	1.6	1.8	1.1	1.1	3.3	92
6. KVx 30-G172-1-6K	1.9	1.5	1.0	1.1	2.0	205
7. IT81D-994	1.3	1.2	1.0	1.1	2.1	148
8. KN-1	2.1	1.2	1.0	1.0	2.7	126
9. Local 2/	2.3	1.7	1.0	1.1	3.0	345
10. Local 3/	3.2	2.7	1.1	1.0	2.7	148
Mean	1.9	1.6	1.0	1.0	2.9	186
LSD (5%)	0.62	0.35	NS	NS	NS	NS
C.V. (%)	33.17	22.16	-	-	-	-

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha) at floral bud formation and podding (30 to 35 and 45 to 55 DAP).

2/ Gorom Local (SUVITA-2)

3/ Pobe Local

Table 2. Effect of Minimum Insecticide protection [1/] on Insect Pests (Flower Thrips, Maruca Pod Borer, Pod Sucking Bugs) Flower Production and Grain Yields (Kg/ha) of Improved and Local Cowpea Varieties at Pobe, Burkina Faso, 1987.

Insecticide protection	Flower Thrips per 10		Maruca larvae per 10 flowers	Pod Sucking bugs per meter	Flowers per meter	Yield (Kg/ha)
	Racemes	Flowers				
Protected [1/]	1.6	1.2	1.0	1.0	3.0	209
Un-protected [2/]	2.2	2.0	1.1	1.0	2.8	164
Mean	1.9	1.6	1.0	1.0	2.9	186
L.S.D. (5%)	0.29	0.23	NS	NS	0.53	NS
C.V. (5%)	33.17	22.16	-	-	18.47	-

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha) at floral bud formation and podding (30 to 35 and 45 to 55 DAP).

2/ No spray applications.

Table 3. Flower Thrips, Maruca Pod Borer and Pod Sucking Bug Incidence, Flower Production and Grain Yields (Kg/ha) of 10 Improved and Local Cowpea Varieties with and without Minimum Insecticide Protection 1/ at Kamboinse, Burkina Faso, 1987.

Vaarieties	Flower Thrips per 10		Maruca larvae per 10 flowers	Pod Sucking Bugs per meter	Flowers per meter	Yield (Kg/ha)
	Racemes	Flowers				
1. TVx 3236	1.0	3.1	1.7	4.7	10.2	814
2. IT82E-32	1.5	4.0	1.6	3.6	7.5	608
3. KVx 165-14-1	1.3	4.4	2.0	3.4	8.3	923
4. IT84S-2246-4	1.1	3.0	1.6	2.5	20.0	760
5. IT84S-2231-15	1.5	3.6	1.7	9.9	18.3	538
6. KVx 30-G172-1-6K	1.1	4.6	1.7	2.0	1.3	353
7. KVx IT81D-994	2.9	4.3	1.0	0.1	3.1	206
8. KN-1	1.3	4.0	1.9	1.9	8.2	479
9. Local 2/	1.9	6.7	1.1	0.2	4.2	102
10. Local 3/	3.7	8.4	1.1	0.1	2.0	128
Mean	1.7	4.6	1.5	2.8	8.3	491
L.S.D. (5%)	0.62	1.90	0.36	5.09	3.63	NS
C.V. (%)	36.66	41.66	24.37	183.72	44.23	-

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha) at floral bud formation and podding (30 to 35 and 45 to 55 DAP).

2/ Kaokin Local

3/Kamboinse local (Rouge).

TVx 3236 but these were comparable to 0.5-0.6 T/ha by IT82E-32, IT84S-2231 and KN-1. Premature cessation of rains caused severe reduction in grain yields of local varieties --Koakin and Kamboinse Local. Only Flower Thrips infestation of cowpea flowers was significantly depressed by insecticide sprays (Table 4), which only modestly improved flowering. Nevertheless protection significantly increased grain production (0.6 and 0.4 T/ha respectively on sprayed and unsprayed crop).

The Farako-Bâ trial was planted on July 9, 1987. Initial crop establishment was good, but water-lodging severely impeded later development. Insect pest incidence was mild and similar among varieties except for Flower Thrips and Pod Sucking Bug infestations on flowers and pods respectively (Table 5). Flower production was low but significantly higher in IT84S-2231-15, IT84S-2246-4, KVx 165-14-1 and IT82E-32 compared to IT81D-994, KVx 30-G172-1-6K or Local kaya. Grain yields were poor (average 0.2 T/ha) and no marked differences emerged among varieties although IT84S-2231-15, IT84S-2246-4, KVx 165-14-1 yielded up to 0.3 to 0.4 T/ha. Minimum protection significantly suppressed Flower Thrips and Maruca larval densities on racemes and flowers (Table 6). Consequently flowering was markedly improved resulting in substantial grain yield increase (0.3 and 0.05 T/ha on protected and unprotected crop respectively).

In Cameroon the trial was conducted at the IRA Station in Maroua. Pest insect infestation was low (Table 7) and marked varietal differences were obtained in respect of Flower Thrips and Maruca larval incidence. Flower production was excellent and varied significantly among varieties. Grain yields were promising : IT82E-32, KN-1, TVx 3236, IT84S-2246-4 and KVx 165-2231-15, 0.8 to 1.0 T/ha compared to 0.5 to 0.7 T/ha by KVx 30-G172-1-6K, IT84S-2231-15, Vya Local and IT81D-994. Maroua Local, however, failed to produce any grain yield.

Table 4. Effect of Minimum insecticide Protection [1/] on insect Pests (Flower Thrips, Maruca Pod Borer, Pod Sucking Bug), Flower Production and Grain Yields (Kg/ha) of Improved and Local Cowpea Varieties at Kamboinse, Burkina Faso, 1987.

Insecticide protection	Flower Thrips per 10		Maruca larvae per 10 flowers	Pod Sucking bugs per meter	Flowers per meter	Yield (Kg/ha)
	Racemes	Flowers				
Protected [1/]	1.6	3.5	1.5	1.7	8.7	582
Un-protected [2/]	1.8	5.8	1.6	4.0	7.9	400
Mean	1.7	4.6	1.5	2.8	8.3	491
L.S.D. (5%)	NS	1.30	NS	NS	NS	123
C.V. (%)	-	41.66	-	-	-	74.37

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha) at floral bud formation and podding (30 to 35 and 45 and 55 DAP).

2/ No spray applications.

Table 5. Flower Thrips, Maruca Pod Borer and Pod Sucking Bug Incidence, Flower Production and Grain Yields (Kg/ha) of 10 Improved and Local Cowpea Varieties with and without Minimum insecticide Protection 1/ at Farako-Ba, Burkina Faso, 1987.

Vaarieties	Flower Thrips per 10		Maruca larvae per 10 flowers	Pod Sucking bugs per meter	Flowers per meter	Yield (Kg/ha)
	Racemes	Flowers				
1. TVx 3236	1.4	6.3	1.8	1.5	2.4	128
2. IT82E-32	1.6	6.3	1.9	1.3	3.3	162
3. KVx 165-14-1	1.6	7.6	1.8	1.3	3.4	292
4. IT84S-2246-4	1.9	4.7	2.1	1.4	3.6	320
5. IT84S-2231-15	1.9	4.8	1.7	1.4	4.3	436
6. KVx 30-G172-1-6K	1.7	4.7	2.0	1.3	1.7	76
7. IT81D-994	1.7	2.1	1.4	1.2	1.1	88
8. KN-1	1.7	6.5	1.6	1.3	2.2	152
9. Local 2/	1.8	2.8	1.2	1.2	2.0	72
10. Local 3/	2.1	7.1	1.4	1.2	2.3	104
Mean	1.8	5.3	1.7	1.3	2.6	183
LSD (5%)	NS	2.08	NS	0.17	0.59	NS
C.V. (%)	-	39.70	-	13.29	23.03	-

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./Ha) at floral bud formation and podding 30 to 35 and 45 to 55 DAP).

2/ Kaya Local

3/ Logofrousso Local

Table 6. Effect of Minimum Insecticide Protection 1/ on insect Pests (Flower Thrips, Maruca Pod Borer, Pod Sucking Bugs), Flower Production and Grain Yields (Kg/ha) of Improved and Local Cowpea Varieties at Farako-Bâ, Burkina Faso, 1987.

Insecticide protection	Flower Thrips per 10		Maruca larvae per 10 flowers	Pod Sucking bugs per meter	Flowers per meter	Yield (Kg/ha)
	Racemes	Flowers				
Protected 1/	1.5	4.1	1.4	1.3	3.0	317
Un-protected 2/	2.1	6.4	1.9	1.3	2.3	49
Mean	1.8	5.3	1.7	1.3	2.6	183
L.S.D. (5%)	0.42	0.33	0.19	NS	0.31	121
C.V. %)	37.94	39.70	37.88	-	23.03	149.98

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha) at floral bud formation and podding (30-35 and 45 to 55 DAP).

2/ No spray applications.

Table 7. Flower Thrips, Maruca Pod Borer and Pod Sucking Bug incidence, Flower Production and Grain Yields of 10 improved cowpea varieties with Minimum Insecticide Protection 1/ at Maroua, Cameroon, 1987.

Varieties	Flower Thrips per 10 2/		Maruca larvae per 10 flowers	Pod Sucking bugs per meter	Flowers per meter	Yield (Kg/ha)
	Racemes	Flowers				
TVx 3236	1.03	0.78	0.23	0.38	226.63	928
IT82E-32	1.65	2.58	0.58	0.00	98.88	941
KVx 165-14-1	0.85	1.00	0.75	0.20	203.38	780
IT84S-2246-4	0.38	0.63	0.38	0.13	239.88	850
IT84S-2231-15	0.78	2.63	1.13	0.25	34.75	556
KVx 30-G172-1-6K	0.73	0.58	0.53	0.13	110.13	718
IT81D-994	0.33	0.40	0.33	0.15	32.50	[illegible]
KN-1	1.15	1.13	1.13	0.20	102.63	
Local 2/	1.48	0.75	0.00	0.08	14.38	
Local 3/	0.58	0.25	0.13	0.00	6.75	
Mean	0.89	1.07	0.52	0.15	106.9	
L.S.D. (5%)	0.79	1.24	0.41	NS	86	
C.V. (%)	61.54	79.85	54.39	-		

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha)

2/ VYA

3/ Maroua 75

The Gambia trial was planted at the Yundum Station on July 29, 87, using 6 varieties (2 local, 4 improved). Flower Thrips infestation f flowers was moderate, while incidence of Maruca Pod Borer and Pod Sucking Bugs was mild (Table 8). Grain yields were moderate and differed significantly among varieties : KVx-14-1, TVx 3236 and IT84S-2246-4 yielded 0.7 to 0.8 T/ha while IT84S-2231-15 and the local varieties produced less than 0.4 T/ha.

The trial in Ghana was established at the Nyankpala Agricultural Research Station (CRI) on June 30, 1987. Insect pest densities were very low yet marked varietal differences emerged (Table 9). Flower production was good and varied significantly among varieties. Grain production was encouraging as IT82E-32, KN-1, Sumbriezie Local, KVx 165-14-1, IT84S-2246-4, TVx 3236 and IT82E-16 produced between 0.8 and 1.0 T/ha.

In Guinea Conakry, The trial was planted on July 27, 1987 at Kankan. Pest insect population levels were low with significant varietal differences (Table 10). Flower production was moderate and similar among entries. Despite three sprays of Parathion, grain yields were poor. The highest production (0.4 to 0.5 T/ha) was by IT84S-2246-4, KVx 165-14-1, KN-1 and a local variety.

The Niger trial was established at Maradi on June 27, 1987. Flower Thrips populations on cowpea racemes were low with mild varietal differences (Table 11). Grain yields were modest and differed significantly among cultivars. The best production (0.5 to 0.7 T/ha) was by locally adapted varieties, e.g. TN-5-78, TN88-86 and KVx 30-G172-1-6K, compared with 0.3 to 0.4 T/ha by TVx 3236, IT84S-2246 and KVx 165-14-1.

In Nigeria, the trial was sown on July 21, 1987 at Kano. Pest infestations were mild and comparable among entries (Table 12). Flower production was moderate with significant varietal differences. Yields were low and marked differences emerged among cultivars. Between 0.4 - 0.5 T/ha grain was produced by KVx 165-14-1, IT82E-36, IT84S-2246-4,

Table 8. Flower Thrips, Maruca Pod borer and Pod Sucking Bug incidence, and Grain Yields of 6 improved and local varieties with minimum insecticide protection 1/ at Yundum, The Gambia, 1987.

Varieties	Flower Thrips per 10		Maruca	Pod Sucking	Yield
	Racemes	Flowers	larvae per	Bugs per m.	(Kg/ha)
TVx 3236	1.47	10.80	0.35	0.20	767
KVx 165-14-1	0.07	29.77	2.62	0.27	805
IT84S-2246-4	0.25	12.32	0.35	0.07	755
IT84S 2232-15	0.07	9.72	0.22	0.07	288
Local 2/	1.60	8.52	0.65	0.27	395
Local 3/	0.0	6.17	0.40	0.32	142
Mean	0.57	12.88	0.76	0.20	525
L.S.D. (5%)	0.58	7.91	1.23	0.46	133
C.V. (%)	67.29	40.77	106.58	150.50	17.0

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha) at floral bud formation and podding (30 to 35 and 45 to 55 DAP).

2/ Soso Koima

3/ TN88-63

Table 9. Flower Thrips, Maruca Pod Borer and Pod Sucking Bug incidence, flower production and Grain Yields (Kg/ha) of 10 improved and local cowpea varieties with minimum insecticide protection [1] at Nyankpala, Ghana, 1987

Varieties	Flower Thrips per 10 [2]		Maruca larvae per 10 Flowers [3]	Pod Sucking bugs per meter [3]	Flowers per meter	Yield (Kg/ha)
	Racemes	Flowers				
TVx 3236	0.85	0.82	0.70	1.55	49.63	792
IT82E-32	0.85	1.39	0.77	1.50	45.00	940
KVx 165-14-1	0.82	1.25	0.70	1.63	38.25	859
IT845-2246-4	0.82	1.23	0.74	1.36	40.87	859
IT84S-2231-15	0.85	1.59	0.70	1.72	33.12	357
KVx 30-G172-1-6K	0.84	1.45	0.74	1.66	29.75	378
IT81D-994	0.83	1.09	0.88	1.47	32.37	626
KN-1	0.82	1.55	0.74	1.46	37.75	905
Local [3]	0.83	1.31	0.77	1.40	42.37	767
Local [4]	0.86	1.07	0.72	1.48	45.12	902
Mean	0.84	1.27	0.74	1.52	39.42	739
L.S.D. (5%)	0.06	0.47	0.16	0.30	5.30	273
C.V. (%)	5.44	25.41	15.29	13.69	39.42	25.39

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha) at floral bud formation and podding (30 to 35 and 45 to 55 DAP).

2/ Square Root Transformation.

3/ IT82E-16

4/ Sumbrizie

Table 10. Flower Thrips, Maruca Pod Borer and Pod Sucking Bug uncidence, Flower production and Grains Yields (Kg/ha) of 10 improved and local cowpea varieties with minimum insecticide protection 1/ at Kankan, Guinea Conakry, 1987.

Varieties	Flowers Thrips per 10 2/		Maruca larvae per 10 flowers	Pod Sucking bugs per meter 2/	Flowers per meter 2/	Yield (Kg/ha)
	Racemes	Flowers				
TVx 3236	1.34	1.31	0.90	1.14	10.40	215
IT82E-32	1.38	1.60	1.14	1.12	8.25	254
KVx 165-14-1	0.85	1.79	0.80	1.69	10.85	395
IT84S-2246-4	0.82	1.37	1.10	1.52	8.05	514
IT84S-2231-15	0.78	1.26	1.03	1.19	9.20	210
KVx 30-G172-1-6K	1.12	1.58	1.04	1.26	8.50	128
IT81D-994	0.82	1.77	0.94	1.10	9.97	173
KN-1	0.94	1.42	0.98	1.26	8.77	366
Local 1/	0.95	1.17	0.81	0.70	9.70	464
Local 2/	1.14	1.91	0.90	1.31	10.07	241
Mean	1.01	1.52	0.96	1.23	9.37	296
L.S.D. (5%)	0.65	0.95	0.33	0.96	3.14	140
C.V. (%)	44.28	43.29	23.70	53.87	23.11	32.58

1/ Three sprays of Parathion

2/ Square Root Transformation.

1/ Not specified

2/ Soso Kankan

Table 11. Flower Thrips incidence and Grain Yields (Kg/ha) of 10 Improved and Local Cowpea Varieties with Minimum Insecticide Protection 1/ at maradi, niger, 1987.

Varieties	Flower Thrips per 10 Racemes	Yield (Kg/ha)
1. KVx 3236	1.90	364
2. IT82E-32	0.82	229
3. KVx 165-14-1	0.77	345
4. IT84S-2246-4	2.02	358
5. IT84S-2231-15	1.27	182
6. KVx 30-G172-1-6K	1.0	486
7. IT81D-994	0.92	1
8. KN-1	1.15	294
9. Local 2/	1.55	694
10. Local 3/	0.77	498
Mean	1.02	345.0
L.S.D. (5%)	1.09	171.02
C.V. (%)	74.06	34.12

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha) a floral bud formation and podding (30 to 35 and 45 to 55 DAP).

2/ TNS-78

3/ TN88-63

Table 12. Flower Thrips, Maruca Pod Borer and Pod Sucking Bug Incidence, Flower Production and Grain yields (Kg/ha) of 10 improved and Local Cowpea Varieties with Minimum Insecticide Protection 1/ at Kano, Nigeria.

Varieties	Flower Thrips 10 Racemes	Flower Thrips 10 Flowers	Maruca larvae 10 Flowers	Pod Sucking Bugs per m	Flowers per m.	Yield (Kg/ha)
TVx 3236	0.32	1.75	0.0	0.0	8.15	361
IT82E-32	0.32	4.75	0.25	0.0	12.20	468
KVx 165-14-1	0.20	3.50	0.37	0.0	13.22	512
IT84S-2246-4	0.32	2.12	0.0	0.25	15.20	456
IT84S-2231-15	0.82	4.12	1.20	1.50	11.15	425
KVx 30-G172-1-6K	0.12	1.0	1.0	0.25	1.02	445
IT81D-994	0.35	2.0	1.37	0.0	5.12	1
KN-1	0.15	1.87	0.37	0.0	3.95	374
Local 1/	0.20	2.0	0.25	0.0	9.40	370
Local 2/	0.65	2.62	0.12	0.0	5.52	325
Mean	0.34	2.37	0.29	0.15	8.49	373
L.S.D. (5%)	NS	2.45	NS		4.67	102
C.V. (%)	-	71.09	-		37.88	18.78

1/ Two sprays of Deltamethrin + Dimethoate (12.5 + 400g a.i./ha) at floral bud formation and podding (30-35 and 45-55 DAP).

2/ Dan-Ilan

3/ SVC1-48

KVx 30-G172-1-6K and IT84S-2231-15, TVx 3236, KN-1, while the local cultivars yielded 0.3-04 T/ha with minimal protection.

Across trial locations, seed production was low (0.2 to 0.3 T/ha) at Kankan (Guinea), Pobe and Farako-Bâ (Burkina Faso) ; moderate (0.4 to 0.5 T/ha) at Maradi (Niger) and Kano -Nigeria) ; and promising (0.6 to 0.7 T/ha in Kamboinse (Burkina), Maroua (Cameroon) and Nyankpala (Ghana) (Table 13). Under minimum insecticide protection, IT84S-2246-4 (Aphid, Bruchid, Flower Thrips resistant) yielded over 0.5 T grain per hectare across various locations, while KN-1, IT82E-32, KVx 30-G172-1-6K and local varieties produced between 0.3 and 0.5 T/ha. An average grain yield of 0.3 T/ha across test sites by IT81D-994 (Bruchid resistant, late maturing) was attributed in part, to low plant densities caused by poor germination.

These results show that judicious use of insecticide (minimum protection) effectively complimented moderate levels of pest insect resistance, particularly in adapted cowpea varieties in assuring a grain yield of 0.5 T/ha.

Table 13. Grain yields (kg/ha) of 10 improved and local cowpea varieties under minimum insecticide protection[1/] in 9 Semi-Arid locations of West and Central Africa, 1987.

Varieties	Farako-Bâ Burkina	Kamboinse Burkina	Pobe Burkina	Maroua Cameroon	Nyankpala Ghana	Kankan[2/] Guinea	Yundum Gambia	Maradi Niger	Kano Nigeria	Variety Means
IT84S-2246-4	608	1083	224	850	859	514	755	358	456	634
KVx 165-14-1	544	1037	271	780	859	395	805	345	512	616
KVx 3236	66	873	248	928	732	215	767	365	361	506
KN-1	272	614	140	939	905	366	-	294	374	488
IT82E-32	262	532	199	941	940	354	-	229	468	478
Local-1	144	162	412	630	767	464	395	694	370	449
IT84S-2231-15	624	733	76	556	357	210	288	182	425	383
KVx-30-G172-1-6K	128	220	234	718	378	128	-	486	445	342
Local-2	208	191	129	0	902	241	142	498	325	293
IT81D-994	176	377	184	475	626	173	-	1	1	252
Mean	303	582	212	682	739	296	525	345	373	444
LSD (5%)	N.S	556	122	244	273	140	133	171	102	172
C.V. (%)	-	66	40	25	25	33	17	34	19	40

1/ Two sprays of dimethoate + deltamethrin (400 + 12.5 g a.i./ha) at flower bud formation and podding - 30 to 35 and 45 to 55 days after planting respectively using knapsack sprayer.

2/ Three sprays of Parathion.

1988 REGIONAL COWPEA TRIALS

1988 REGIONAL COWPEA TRIALS

1. Cowpea Breeding

In addition to Striga and Drought Resistant trials, Bruchid, Aphid and virus nurseries were sent to RENACO member countries upon request.

1.1. Regional Bruchid Nursery

The nursery contained 16 entries including two susceptible checks (KN-1 and a local cultivar). Six sets were sent to five countries: Ghana (1), Mauritania (2), Benin (1), Togo (1) and Burkina Faso (1). The plot size was a 4 row with a distance between and within the rows of 0.50m and 0.20m, respectively. Though NARCs had the option of sowing only one replication, they replicated four times in a randomized complete block design. Cowpea plants were sprayed with insecticide at least twice, during the cropping season. Harvested seeds were subjected to a bruchid biological test in the laboratory. At the time of this write-up, feedback had been received from Burkina Faso, Togo and Benin. Bruchid biological test was done in Burkina Faso and Togo, using different methods. In Burkina, seeds were infested with bruchid eggs, and only ten seeds with four hatched eggs were retained 7 days after infestation (DAI) for the experiment. Whereas in Togo, each box of ten seeds was infested with 2 pairs of newly emerged bruchid insects and number of eggs was counted 5 DAI.

In spite of differences in the methodology, all KVx lines exhibited high level of resistance to bruchids in Burkina Faso and Togo (Table 1). The same was true, to some extent, for line IT84S-275-9. Unfortunately, with the exception of KVx 30-G467-5-10K, all the bruchid resistant lines yielded far below average at all tested sites (Table 1). Both checks, KN-1 and the local cultivar, were highly susceptible to bruchids. Their yields were either outstanding or above average.

1.2. Regional Aphid Resistant Nursery

The nursery contained 13 promising entries, three susceptible checks (KN-1, TVx 3236 and a local check) included for comparison. Seven sets of

Table 1 : Seed yield and Bruchids biological test of cultivars in three locations in West Africa in 1988.

Cultivars	Kamboinse (Burkina Faso)			Ativeme (Togo)			Ndali (Benin)
	Seed yield (T/ha)	Bruchids Bio-test		Seed	Bruchid bio-test		Seed
		Total hatched eggs 7 DAI	Adults insects 50 DAI	Seed yield (T/ha)	Eggs on seed 5 DAI	Adult insects 50 DAI	yield (T/ha)
IT81D-1137	1.05	160	4	1.86	18	8	1.07
IT84D-449	1.08	160	81	1.92	9	1	1.03
IT84E-460	0.90	160	73	2.43	14	3	1.10
IT84S-275-9	0.84	160	4	1.83	1	0	0.61
IT84S-2246-4	1.06	140	5	1.96	18	10	1.09
IT85F-2205	1.01	160	6	1.42	12	7	0.70
IT86D-472	0.88	160	39	1.98	16	13	0.88
IT86D-534	0.97	160	78	1.75	42	13	1.07
IT86D-641	0.97	160	80	1.58	0	0	1.05
KVx 30-G246-2-5K	1.11	160	0	1.49	0	0	0.88
KVx 30-G183-3-5K	1.20	160	2	1.70	0	0	0.96
KVx 30-G467-5-10K	1.25	160	0	1.83	9	1	1.17
KVx 30-G172-1-6K	1.27	160	0	1.54	13	0	0.85
KN-1	1.08	160	84	1.66	15	22 *	1.72
Local check	1.25	160	89	1.97	23	37 *	1.55
Mean	1.06			1.79			1.05
LSD (5 %)	NS			0.48			0.29
CV (%)	32			19			28

* Second generation Bruchids emerged for these cultivars.

the nursery were sent to six countries, namely, Cape Verde (1), Ghana (1), Mauritania (2), Benin/INA (1), Togo (1) and Burkina Faso (1). The plot size was a 4 row with a distance between and within the rows of 0.50m and 0.20m, respectively. Though NARCs had the option of planting only one replication, they replicated four times in a randomized complete block design.

With the exception of Cape Verde, two insecticide sprays were made against insect pests at flower bud formation and pod stage, respectively. Aphid infestation test in Burkina Faso was only done in the laboratory. Infestation of Aphids in the field was observed during the vegetative stage in Cape Verde and after the first harvest in Benin. No Aphid infestation was noticed in Togo. Observations were recorded on plant stand, flowering, maturity, disease and other insect pest infestment as well as on seed yield. At the time of this write-up, feedback had been received from Cape Verde, Benin, Togo and Burkina Faso only. The most interesting observation made was that IT83S-742-2, I84S-2246-2, IT85D-3577, IT86D-1038 and KVx 146-27-4 showed good resistance to Aphid in the field in Cape Verde and Burkina Faso in the laboratory tests (Table 2). Of the entries, only IT83S-742-2 maintained a good yield in the four countries in which the experiment was conducted.

1.3 Regional virus resistant nursery

The nursery contained 14 promising entries; two susceptible checks, namely, Ife Brown and a Local cultivar, included for comparison. Four sets of the nursery were sent to three countries as follows: Benin (1), Togo (2) and Burkina Faso (1). The plot size was a 4 row with a distance between and within the rows of 0.50m and 0.20m, respectively. It was not replicated. Cowpea plants were sprayed twice with insecticide against insect pests as described in the previous experiment.

The most encouraging observation of the nursery was that entries IT85F-2687, IT84D-448 and IT83S-872 showed a good level of virus resistance and gave a satisfactory seed yield at all tested sites (Table 3).

1.4 Regional Cowpea Drought Resistant Trial

The trial contained 20 entries including checks. Four sets were sent to two countries: Benin (1) and Mauritania (3). The plot size was a 4 row

Table 2 : Seed yield and aphid infestation of cultivars in several locations of West Africa in 1988.

Cultivars	Kamboinse (Burkina Faso)		Ndali (Benin)		Serrago (Cap Vert)		Ativeme (Togo)
	Seed yield (t/ha)	Aphids infes-tation 20 DAI§ (1-5)	Seed yield (t/ha)	Aphids infes-tation& (1-5)	Seed yield (t/ha)	Aphids infes-tation&	Seed yield (t/ha)
IT83S-720-2	0.80	3.6	1.94	1.50	1.61	3.50	1.91
IT83S-742-2	0.94	1.0	1.21	1.50	2.16	1.25	1.96
IT84S-2246-2	0.75	1.0	2.08	1.75	2.63	1.50	2.06
IT85D-3577	0.66	1.6	1.34	1.00	2.21	1.75	2.04
IT85F-867	1.03	4.8	0.90	1.50	0.76	5.00	2.09
IT86D-901	0.53	1.4	1.23	1.00	2.55	2.00	1.91
IT86D-1033	0.61	3.6	1.01	1.00	0.74	5.00	2.70
IT86D-1038	0.82	1.8	1.16	1.00	3.29	1.00	1.54
IT86D-1057	0.85	1.6	1.31	1.00	1.51	3.75	2.10
KVx 145-27-6	0.87	1.6	1.18	1.75	2.26	2.25	1.69
KVx 145-27-4	0.76	1.8	1.60	1.00	1.98	1.75	1.26
KVx 146-44-1	1.25	2.0	1.72	2.50	1.56	2.75	1.67
KVx 165-14-1	0.72	1.6	1.57	1.00	2.21	2.25	2.47
TVx 3236	0.93	3.8	1.56	1.00	0.30	5.00	1.44
KN-1	0.88	4.2	1.59	1.00	0.52	4.75	2.35
Local check	0.67	3.2	1.71	1.00	1.99	4.25	1.29
Mean	0.82	-	1.44	-	1.77	-	1.87
LSD (5 %)	0.40	-	0.37	-	0.42	-	0.69
CV (%)	34	-	26	-	17	-	27

§ The aphid infestation test was done in the laboratory.

& Naturally occurring field infestation.

Table 3 : Regional virus resistant nursery conducted at Kamboinse, Burkina Faso ; Broukou and Ativeme, Togo ; and Ndali, Benin, in 1988.

Cultivars	Kamboinse (Burkina Faso)		Broukou (Togo)		Ativeme (Togo)		Ndali (Benin)	
	Seed yield (t/ha)	Virus (%)	Seed yield (t/ha)	Virus (1-5)	Seed yield (t/ha)	AbCMV (1-5)	Seed yield (t/ha)	Yellow Mos.V. (1-5)
IT84S-2135	0.82	2	0.59	1	1.06	1	2.13	1
IT85F-2805	0.63	2	0.56	1	0.71	1	1.36	1
IT85F-867-5	0.56	2	0.81	1	1.84	1	1.42	1
IT85F-2687	0.98	0	0.67	1	1.45	1	2.31	1
IT85F-1380	0.43	4	0.69	1	1.61	1	1.38	1
IT85F-3139	0.41	4	0.72	1	1.20	1	0.98	1
IT84D-448	0.91	1	0.67	1	1.45	1	1.93	1
IT84D-449	0.44	0	0.62	1	1.50	2	2.25	1
IT83S-872	1.05	2	1.01	1	1.95	1	2.45	1
IT81D-1137	0.68	7	0.94	1	1.95	1	1.07	3
IT83S-818	0.67	0	0.52	1	1.22	1	0.96	1
IT82E-16	0.23	0	0.86	1	1.55	1	2.60	1
If Brown	0.46	0	1.06	4	1.87	2	1.05	1
IT82D-889	0.17	0	0.54	1	1.42	1	1.02	1
IT83D-442	0.43	0	0.56	1	1.34	1	0.71	1
Local check	0.79	0	0.79	2	0.91	1	1.41	1
Mean	0.60	-	0.73	-	1.44	-	1.56	-

with a distance between and within the rows of 0.75m and 0.20m, respectively. The experimental design was a randomized complete block with four replications. Observations were recorded on plant stand, flowering, maturity, disease and insect pest infestations and yield. At the time of this write-up, feedback had been received from Benin only. The most promising entries were KVx 65-114 and KVx 60-K26-2 (Table 4). Thus, unlike KVx 30-305-36 and others, KVx 60-K26-2 confirmed its good performace as observed in 1987.

2. COWPEA AGRONOMY

2.1. Maize-Cowpea Relay-Cropping

In 1988, only Burkina Faso requested for a maize-cowpea relay-cropping trial. The experiment tested the effect of maize and cowpea culitivars, particulary of different maturity groups and row spacings on the performance of both crops in a relay-cropping system. Two maize cultivars -(1) A86P16DR (90 days to maturity with short plant stature) and (2) EV8422SR (100-105 days to maturity with tall plant stature) -and two cowpea cultivars- (1) KVx 396-4 (daylength insensitive) and (2) Local Tiankura (daylength sensitive) - were used. The row spacings consisted of 0.75 x 0.20m and 1.00 x 0.25m for maize and 0.75 x 0.20m and 1.00 x 0.20m for cowpea. Maize was sown at the on-set of the crop season, whereas cowpea was sown four weeks after maize. Maize plants were fertilized with NPK at sowing and N, one month after sowing as a side dressing. Cowpea plants were sprayed with insecticide twice. The experimental design was a factorial combination of two maize cultivars, three cowpea treatments and two row-spacings in randomized complete blocks. There was no cowpea pure-stand treatment.

Both maize cultivars gave similar yields and row spacings had no significant effect on maize yield (Table 5). With regards to cowpea cultivars, KVx 396-4 significantly out-yielded the local cultivar at all treatments. Row-spacgings had no effect on yield of the local cowpea cultivar, but tended to increase yield of KVx 396-4. The late and tall maize cultivar, EV8422SR, tended to depress the yield of both cowpea cultivars.

From these and the 1987 results and those of Farako-Bâ, Burkina Faso, since 1981 to 1985, it can be concluded that:

(1) Maize-cowpea relay-cropping is an appropriate production technology for the northern Guinea savanna;

Table 4 : Seed yield of cowpea cultivars at Ndali, Benin in 1988.

Cultivars	Seed Yield (t/ha)
KVx 30-305-3G	0.26
KVx 60-K26-2	0.56
KVx 60-P04-1	0.36
KVx 61-1	0.51
KVx 65-114	0.61
KVx 183-1	0.36
KVx 249-P37-30	0.36
KVx 250-K27-18	0.19
KVx 257-K21-3	0.26
KVx 268-K03-3	0.38
KVx 256-K17-11	0.28
IT83S-343-5	0.50
IT81D-994	0.38
IT82D-699	0.20
IT84S-2246-4	0.39
IT84S-2137	0.08
IT83S-340-5	0.35
TN88-63	0.38 A
SUVITA-2	0.44 A
Local	0.40 A
Mean	0.35
LSD (5 %)	0.23
CV (%)	48

Table 5 : Seed yield of maize and cowpea as affected by row-spacings and cultivars in relay-cropping system at Tiankoura/Diebougou, Burkina Faso in 1988.

Cowpea Cultivars	Maize cultivar			
	A86 P 16 DR		EV 8422 SR	
	(0.75m x 0.25m)	(1.00m x 0.25m)	(0.75m x 0.25m)	(1.00m x 0.25m)
	T/ha			
1) Maize seed yield :				
KVx 396-4	2.31	3.02	1.93	2.22
Local	2.36	2.65	2.65	2.48
Maize pure stand	2.88	2.45	2.96	2.77
LSD (5 %)	NS			
CV (%)	31			
	T/ha			
2) Cowpea seed yield :				
KVx 396-4	0.30	0.37	0.29	0.34
Local	0.21	0.22	0.20	0.20
Maize pure stand	0	0	0	0
LSD (5%)	0.07			
CV (%)	27			

(2) Row-spacings can be increased from 0.75 x 0.25m to 1.00 x 0.25m with no detrimental effect on maize yield, but with a yield gain for relay-cropped cowpea.

(3) Late and tall maize cultivars, though high yielding they may be, tend to depress the seed yield of relay cowpea. At any rate, even when they are chosen judiciously, must be combined with 1.00 x 0.25m row-spacing; this is crucial in preventing severe cowpea yield losses in relay-cropping system.

(4) High yielding, disease resistant daylength sensitive cowpea (that flower in mid-September) cultivars are better adapted than others.

2.2. Sorghum-Cowpea Intercropping

In 1988, a sorghum-cowpea intercropping trial was sent upon request to Ghana (1), Benin (1) and Burkina Faso (1). The objective consisted of testing three cowpea cultivars: TVx 3236, KN-1 and a local cultivar under two insecticide treatments: no insecticide application and two sprays: one at flower bud formation and the other at the on-set of pod filling to control flower thrips and pod sucking bugs. TVx 3236 and KN-1 are daylength-neutral cultivars, the first is moderately resistant to flower thrips whilst the second is only susceptible. The Sorghum cultivar, Framida, was sown early in the crop season whereas cowpea was sown two weeks later. The spacings used were 1.25 x 025m for sorghum and 1.25 x 0.20m for cowpea. Sorghum plants were fertilized with NPK at sowing and N one month after sowing. The experimental design was a randomized complete block with four replications. At the time of this write-up, feedback had been received from Burkina Faso only.

Sorghum seed yield reduced significantly only with the local cultivar in the intercrop treatment that was not sprayed with insecticide and TVx 3236 in the intercrop treatment sprayed with insecticide (Table 6).

Under intercropped treatment: (1) seed yield of cowpea had significantly reduced as compared to pure-stand treatment, regardless to insecticide spray regimes; (2) there was no significant difference between insecticide sprayed and no spray treatments, although the former tended to outyield the latter; (3) KN-1 and TVx 3236 yielded similarly and both of them significantly

Table 6 : Sorghum and cowpea seed yield as affected by insecticide sprayings and intercropping at Oronkwa/Diebougou, Burkina Faso in 1988.

Treatments	Seed yield		LER§
	Sorghum£	Cowpea£	
a) No insecticide spraying			
1) Intercrop treatment			
TVx 3236	2.20	0.28	1.34
KN-1	2.25	0.39	1.56
Local	1.72	0.14	0.91
2) Pure-crop treatement			
Sorghum (Framida)	2.61	0	1.00
TVx 3236	0	0.64	(1.00)
KN-1	0	1.05	(1.00)
Local	0	0.56	1.00
b) Insecticide spraying§			
1) Intercrop treatments			
TVx 3236	1.64	0.36	1.02
KN-1	2.20	0.46	1.33
Local	2.07	0.16	0.96
2) Pure-crop treatments			
TVx 3236	0	1.23	(1.00)
Local	0	0.93	1.00
LSD (5%)	0.69	0.15	-
CV (%)	31	26	-

§ LER = Land equivalent ration was computed using the yield of the pure stand of local cowpea cultivar under each spraying regime.

higher than the local cultivar under both insecticide spray regimes (Table 6). However, the difference between TVx 3236 and the local cultivar was not significant in no insecticide treatments.

Under pure-stand treatment: (1) insecticide spray significantly increased yield of cowpea as compared to the no spray; (2) KN-1 significantly outyielded TVx 3236 and the local cultivars in no insecticide spray treatment, while the latter cultivars did not differ significantly from one another; and (3) TVx 3236 significantly outyielded the local cultivar in insecticide sprayed treatment (KN-1 was not tested under these treatments).

There was a marked advantage in intercropping cowpea: TVx 3236 and KN-1, with sorghum particularly under no insecticide application regimes. KN-1 appeared more suitable for intercropping with sorghum than TVx 3236. The results agree with those of a similar experiment at the same location in 1987, except when insecticide was not applied and to some extent, those of Maroua, Cameroon, in 1987.

It appears, therefore, that where insect pest pressure is not very great, improved cowpea cultivars including those with flower thrip susceptibility, can be advantageously intercropped with sorghum.

1988-11

1987 AND 1988 REGIONAL COWPEA TRIALS (RENACO)

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