ANNUAL REPORT OF THE SUDAN COOPERATIVE SORGHUM AND MILLET CROP IMPROVEMENT PROGRAM

1981

REPORT No. 5

ICRISAT

International Crops Research Institute

For The Semi Arid Tropics

(Not For Publication)

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JANUARY 1982

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ACKNOWLEDGEMENTS

The ICRISAT/Sudan Cooperative Program expresses its appreciation to the Gezira Research Station, Wad Medani and Agricultural Research Corporation of the Sudan for their cooperation and full support.

Cooperation and assistance of the staff of Western Sudan Agricultural Research Project, Western Savanna Development Corporation, Jebel Marra Rural Development Project, Mechanized Farms Corporation, Sudan Gezira Board, and Mustafa Bashir Private Farm in conducting various trials and providing facilities is highly appreciated.

The continued financial and logistic support of United Nations Development Program is gratefully acknowledged.

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INTRODUCTION

Sorghum and pearl millet are the first and second most important cereal crops, respectively, of the Sudan. Most of the sorghum is grown in the central rainlands where the seasonal precipitation is unpredictable; whereas the bulk of the pearl millet in the country is grown in the Western Sudan where the rainfall is even less reliable. The national yield averages for both crops are low - 750 kg/ha for sorghum and 375 kg/ha for pearl millet. The ICRISAT/Sudan Cooperative Program for Sorghum and Pearl Millet Improvement was initiated in 1977 with the objective of developing improved genotypes of both crops that would give higher and stable yields under the diverse agroclimatic condition of the country.

Pearl Milet: In Sudan, 1981 was the fifth year of ICRISAT's millet breeding activities. During the last five years a large number of indigenous and exotic genotypes have been evaluated for their performance and usefulness. Now, we have a better idea about the type of material which is more adapted to different millet growing areas. The principal objectives of the pearl millet breeding program are to develop high yielding, widely adapted genotypes with acceptable agronomic and eating qualities, tolerance to drought, diseases and insects, and responsive to improved management practices necessary for higher and more stable yields under different agroclimatic conditions of the country.

The results of seven national yield evaluation trials which were carried out during 1979-1981 in Western Sudan under unirrigated condition, have shown that ICMS 7817 is a better yielding synthetic than the farmer's local variety Kordofani and released cultivar Ugandi.

In the dry season of 1980-81, 405 new variety crosses were made, seed of elite selections was multiplied for use in yield trials and 134 full-sibs were made in the intervariety population.

Sorghum: Considerable progress has been made in sorghum improvement in the Sudan since the advent of the ICRISAT/Sudan Cooperative Program in 1977. Valuable sorghum germplasm introduced from ICRISAT Centre and other sorghum

improvement programs elsewhere have been used to diversify the local Sudanese sorghum germplasm. Intercrosses between locals and adapted introductions are yielding progenies with the desired attributes. Correspondence between crop performance at ICRISAT Centre and Wad Medani has been very good that sorghum materials bred and selected at Hyderabad have shown excellent adaptation here at Wad Medani. After three years of testing, introduced genotypes with significant superiority over recommended local varieties have been identified. Entries M 90950 and M 626.1 which consistently outyielded Dabar under irrigation, appear the most promising varieties for the Gezira.

Progress and development made in establishing a hybrid sorghum improvement program for both the irrigated and rainfed situations have been very good. Experimental hybrids with consistently significant and higher yield than local varieties have been developed. Results of 1979, 1980, and 1981 yield evaluations clearly establish 3 experimental hybrids namely Tx 623A x Su.Cr.54.16/17, Tx 623A x Su.Cr.36.80/70 and Tx 623A x Karper 1597 as being clearly superior to local varieties both under irrigation and rain.

In close collaboration with national scientists at the Gezira Research Station, interdisciplinary cooperative research have been developed. Joint projects initiated on drought resistance, insect resistance, disease resistanc Striga resistance and agronomic studies have made good progress - and preliminary results from these projects are discussed in this report.

Table 1. Rainfall Distribution in Sorghum and Pearl Millet test Locations during the crop season of 1981 (mm)

Month	Wad Medani	Gadambalia	Agadi	El Obeid	Kadugli	Nyala	Nyertete
May	39.1	15.0	35.5	28.0	58.7	3.3	N.A
	(6)	(2)		(4)	(8)	(4)	
June	7.5	17.0	142.5	30.3	71.2	42.1	80.7
	(4)	(2)		(5)	(13)	(10)	(6)
July	63.5	145.0	129.5	112.0	223.7	158.3	363.2
	(12)	(6)		(21)	(19)	(16)	(7)
August	97.7	379.0	159.5	65.4	163.9	56.2	259.2
	(13)	(8)		(7)	(15)	(12)	(16)
September	87.2	128.0	90.0	46.0	121.3	29.5	72.0
	(8)	(6)		(9)	(17)	(7)	(6)
October	7.0	-	N.A	30.6	114.4	39.0	9.0
	(2)			(5)	(8)	(4)	(2)
Total	302.0	684.0	557.0	312.3	752.9	328.4	784.1
	(45)	(24)		(51)	(80)	(53)	(37)
Effective	255.4	557.0	379.0	254.0	512.4	N.A	665.1
Average (30 Years 1940-1970)	363.0	577.0	N.A	386.0	664.0	471.0	791.0*

Figures in parenthesis are number of rainy days.

* Long term average of 1958-80.

SECTION 1: RESULTS OF 1981 PEARL MILLET BREEDING EXPERIMENTS

Most of the pearl millet breeding work was carried out at the Gezira Agricultural Research Station, Wad Medani and the Kaba Farm, El Obeid . The major testing sites for the multilocation national yield evaluation trials were El Obeid and Kadugli in Northern Kordofan and Southern Kordofan, respectively and Nyertete and Zinsu in Northern Darfur and Southern Darfur, respectively. In addition, El Fula in Southern Kordofan was used for the first time this year. The Western Savanna Development Corporation, the Jebel Marra Project, the Western Sudan Agricultural Research Project, the Mechanised Farms Corporation and the IMTSOREIL cooperated in the pearl millet improvement program.

Agronomic Practices: At Wad Medani, the trials and breeding nurseries were planted in the first week of July. Spacing between rows and plants was 60 cm and 20 cm respectively, giving a plant population of 83000 per hectare. A basal dose of 40 kg nitrogen/hectare was applied at the time of planting and an equal amount was side-dressed after thinning and weeding. The soils of Wad Medani are heavy clay (black cotton soils) and the average rainfall is not sufficient to raise a successful breeding nursery of pearl millet. Therefore, the crop was irrigated as and when considered necessary.

At El Obeid and other testing sites in Western Sudan planting was started just after the first rain. Planting was done in hills 50 cm apart in rows spaced at 75 cm (26,666 hills/ha) and no irrigation was applied. At El Obeid, 40 kg nitrogen per hectare was applied in the form of urea, 3-7 days after the emergence of the crop. The urea was placed 7-15 cm away from the growing seedlings in 5-10 cm deep holes. No fertilizer was used at other testing sites.

Crop Stand: In general, germination and crop growth was good in all the experiments at Wad Medani. Initially, the germination and plant stand of most of the experiments was good at El Obeid. Unfortunately, the crop experienced 19 days dry period from July 26 to August 16, which resulted in drying of many seedlings in some parts of the fields.

At Kadugli, the experiment was planted on July 12. The field was flooded on July 18 due to heavy rain, resulting in the loss of the trial.

At Nyertete, planting was followed by a storm of over 60 mm, and a prolonged period of cool and cloudy weather resulted in poor germination. The trial was replanted on July 17. Again, planting was followed by 80 mm rain in one storm and the trial was virtually washed away.

Dr. M.A. Mahmoud, Senior Agronomist of the Mechanized Farms Corporation reported that at El Fula the initial plant stand was acceptable, but later on many seedlings died and among the remaining plants some grew normally and others showed different degrees of stunting. He attributed it to soil conditions and other unidentified factors.

Pests and Diseases Situation: At El Obeid, there was no disease problem except some incidences of smut and downy mildew. Damage due to Eublemma branchy gonia (locally known as Nafasha), grasshopper and birds was observed. Moderate infection of downy mildew and heavy incidence of rust was reported from Dimsu. The incidence of striga was negligible on the experimental farms.

Scoring and Experimental Details: The agronomic scores given in the report are based on a scale of 1-9, where 1 denotes the best and 9, the poorest. The details of the experiments e.g. locations, planting dates, number of entries, replications and plot size, are given in Appendix I. Since there is no national pearl millet breeder in Sudan, the entire millet improvement work for the country was continued to be attended to by the ICRISAT millet breeder.

The pearl millet breeding activities of 1981 are given below under the following headings:

1- National trials and nurseries
2- Regional trials and nurseries
3- International trials and nurseries.

I NATIONAL TRIALS AND NURSERIES

A. Indigenous Germplasm

As many as 386 samples of locally growing pearl millet were collected from Northern Kordofan, West of Jebel Marra Mountains and Eastern Sudan. Of these, 349 were collected by the anthropologists of INTSORMIL from the farmers' fields from within 50 km around El Obeid. The information with regard to origin, local name, seed colour, status (cultivated/wild) and prevalence of pests and diseases in the field were recorded for each sample at the time of collection. Mr. R.F. Croston, IBPGR Consultant, collected 27 samples from the farmers' fields and threshing floors in the west of Jebel Marra Mountains. From Gosh area (near Aroma) of eastern Sudan, Dr. Abdel Moneim El Ahmadi brought 10 samples. This material will be evaluated for different genetic and agronomic traits in the year 1982 for future use in the pearl millet improvement program.

B. Selections of Kharif 1980, Wad Medani (K-80)

The 173 lines which were selected in K-80, from the synthetics material, advanced segregating progenies and local collection of the national program; smut resistant nursery, Serere Composite-2 and Super Serere Composite progenies trials and uniform progeny nurseries of ICRISAT headquarters' material; nurseries of elite lines from Senegal and Nigeria and disease resistant nursery of Nigeria, were evaluated at Wad Medani and El Obeid. Data were recorded for days to 50 percent bloom, plant height (cm) head length (cm) and seed set. At Wad Medani, the following 10 entries were found phenotypically uniform and agronomically desirable. These entries have been retained for use in the synthetics and varietal crosses program and for testing in the initial yield evaluation trials of 1982. Plant selection was done in entries 1084, 1102, 1179, 1180 and 1188 which were found promising but segregating, for plant height, at El Obeid.

Table 2. List of selected entries from K-80 selections

SN	K-81 code	Pedigree	Days to 50 % bloom	Plant height (cm)
1	1012	Syn. 2-S1-11-2	60	155
2	1013	Syn. 2-S1-11-3	67	145
3	1016	787 EB - 137 - 1 - 1	70	190
4	1017	789 EB - 74 - 3	69	180
5	1055	(Gam 73 x Serere 2A-4)-4-2	69	135
6	1058	(KG22 x 700651)-4-1	56	150
7	1061	(B Senegal 9-15 x B616)-2-2	54	120
8	1084	79SC2 TC E127-2	65	160
9	1089	79 SC2 TC E230-2	67	195
10	1132	78 SC1 FS E104	64	180

C. Variety Crosses

The objectives of the intervariety crosses are to combine desirable characteristics of different parental lines and to create new genetic variation to broaden the genetic base of the breeding program. The major characteristics which are being contributed by the exotic germplasm are early maturity, semi dwarfness, synchronous tillering, good exertion of the head and, of course, high yield potential. Since 1977, over 1400 variety crosses have been made and the material which has been derived from these crosses has reached up to F5 generation stage. Selected F3, F4 and F5 progenies are being used in variety crosses, synthetics and population development programs.

1. New Crosses

In the off-season of 1981, 405 variety crosses were made. The parental lines were selected in the rainy season of 1980 from the working collection (high combining local and exotic genotypes), segregating progenies nursery, lines from Upper Volta, Senegal and Serere material, and uniform progeny nurseries of ICRISAT headquarters. F1's of all the crosses were evaluated in K-81. Among all the breeding nurseries which were planted during K-81 at

Table 3. List of Elite Variety Crosses - Wad Medani

SN	K81 code	Pedigree	Days to 50 % bloom	Plant height (cm)	Head Wt. kg/plot	Agron. score (1-9)
1	1202	F3(NEP 104-504 x 1351) x ACC 82-3-1	58	153	1.00	6
2	1206	F3(1682 x 1477) x ACC 82-3-1	58	170	1.45	5
3	1207	" x ACC 82-5-1	58	160	1.22	6
4	1214	F3(1682 x 1477-3-3) x ACC 82-5-1	58	150	1.20	6
5	1216	" x ICI 7556	56	155	1.35	6
6*	1219	F3(1682 x 1477-11-1) x ACC 82-3-1	56	140	1.20	5
7*	1221	" x ICI 7556	58	150	1.40	4
8	1239	F3(1561 x 1544-4-1) x SSC K79-914107	58	175	1.50	6
9	1243	F3(1561 x 1544-7-1) x ICI 7613-1	60	195	1.41	5
10*	1249	F3(1561 x 1544-7-2) x (WC x Old Jam Nagar-1-2-1 F324-11)	59	170	1 41	3
11	1250	F3(1561 x 1544-7-2) x ACC 82-3-1	58	200	1 27	5
12*	1251	" x ACC 82-5-1	59	180	1 60	3
13	1258	(F3 R75-994-9 x 75 TA 90004-18-8-1) x ACC 82-3-1	56	170	1.23	6
14	1270	(F3 R75-994-9 x 75 TA 90004-18-8-4) x ACC 82-5-1	56	155	1.65	5
15	1271	(F3 R75-994-9 x 75 TA 90004-18-8-4) x ACC 350-4-2	58	195	1.70	6
16	1286	(700651 x 23D2B-31-2 x F4 13061-1-7) x ACC 82-3-1	58	155	1.20	6
17	1304	F3(J1623 x 700544-13-4-2) x (3/4 EB x ICI 7556)	59	160	1.45	6
18*	1319	(3/4 ExB x J260-1) x 700557-14-10-5) x (J25-1 x 700797-12-1) x IVS 52-60)	60	170	1.35	4
19*	1332	(3/4 ExB x (J1188 x Cassady) - 12-3 x E53 x E54-1	56	140	1.42	5
20*	1339	(3/4 ExB x (J1188 x Cassady) - 12-5 x (J25-1 x 700797-12-1) IVS-S2-60	58	165	1.50	5
21	1343	F3(ExB 167-2 x J1798 x 700594-7-1-1) - 21-1 x (E16 x E17-1)	56	145	1.24	6

Table 3 Contd.

SN	K81 code	Pedigree	Days to 50 % bloom	Plant height (cm)	Head weight kg/plot	Agron. score (1-9)
22	1376	(NEI 218-17394 x NEI 18-17185-2) x FAU 497 x PAU 525-7) x E16 x E17-1)	58	165	1.30	6
23	1438	1547-12 x (687 x 789)-1 x (J25-1 x 700797-12-1) x IVS52-60	52	175	1.57	6
24	1443	1547-12 x 687 x 789-3) x E82-1-10	58	188	1.62	6
25	1488	ACC 123 x Serere 43	58	175	1.80	6
26*	1567	(E104-2 x ACC 82-7-1) x Serere 50	58	160	1.20	5
Mean			57.6	166.0	1.40	5.3

* Selected on visual observations also.

Wad Medani, as expected, F1's showed heterosis and were found most interesting. On the basis of agronomic score and head yield data, 281 crosses were selected for studying their F2 populations. Of these, 51 crosses that showed high heterosis will be studied in larger plots. Data on 26 crosses which yielded 1.2 kg or more of heads per plot are given in Table 3.

Sixteen F1 hybrids were selected to make nine synthetics. These have already been planted in the off-season nursery.

2. F2 Populations

We grew 217 F2 populations at Wad Medani and 42 at El Obeid. At maturity 405 single plants were selected from 50 F2 populations at Wad Medani while 34 were chosen from six F2 populations at El Obeid. These single plant selections will be advanced as F3 families in K-82. The following F2 populations produced desirable segregants in higher frequencies.

SN	K-81 code	Pedigree
1	K79-1	78 SC1 FS E104 x 78 SC1 FS E87
2	K79-3	78 SSC HS E171 x ICI 6010-2
3	K79-5	(700516 x Kordofani) x 5054B-4
4	K79-9	700516 x F3 B1-6-1
5	K79-12	700516 x 67B
6	K79-21	78 SC1 FS E104 x ACC 83-3-1
7	K79-28	(78 SC1 FS E104 x 1547-13) x (EB24-1 x C FS 148)
8	K79-38	67B x ACC 229-8-1
9	K79-41	(J1644 x 700490-3-1-1-4-1) x P2609-1
10	K79-47	78 SC1 FS 104 x 78 SC1 FS E16

3. F_3, F_4 and F_5 Progenies

As many as 245 F_3 progenies, 302 F_4 progenies and 43 F_5 progenies were evaluated at Wad Medani and El Obeid for plant and progeny selection. Seedling establishment and crop growth was good at both the locations. Local checks were planted after every 10 entries to compare the performance of progenies with the checks. Data were collected for days to 50 % bloom,

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F2 populations at serial numbers 7-9 were found promising at both the locations.

plant height (cm), head yield (/plot) and agronomic desirability of each entry.

At Wad Medani, 26 F3 progenies (Table 4) were selected for use in variety crosses and synthetics making. Of these, 23 will be used in exchange nursery and initial yield-evaluation trials. Individual plants were also selected from nine F3 families. Sixteen F4 families (Table 5) were bulked for use in the breeding program. Fourteen of the F4 bulk lines will be evaluated in IYET's of 1982. Single plant selection was done in three F4 progenies. In F5 progenies nursery, entry number 1836 (K78-552-12-4) was selected for breeding and trials on yield evaluation. Single plants were also selected from entry numbers 1828 (K78-541-10-2) and 1829 (K78-541-11-1).

Severe lodging was observed in several entries of the segregating progenies nurseries at El Obeid. This indicates that due care for lodging resistance should be taken at the time of selection of parents for crossing, and locally-collected genotypes and derivaties of local x exotic crosses should be used in the variety crosses with the exotic materials. However, 30 plants from eight F3 progenies, viz. 403, 404, 415, 419, 435, 457, 556 and 586, were selected. Their F4 families will be grown in rainy season of 1982. Seventeen plants were selected from F4 progeny numbers 762, 933, 967 and 1725. Also, entry number 1820 was selected from the F5 progenies nursery for future use.

As a whole, the F3, F4 and F5 progenies contributed greatly to our inter-variety crossing, synthetics and yield testing program. Ten synthetics will be made in the off-season nursery from entries selected from this material.

D. Populations Improvement

1. Intervariety Population

The second cycle of improvement of the intervariety population by using full-sib method of recurrent selection was carried out in 1981. One hundred and thirty-four full-sib progenies and two checks (Kordofani and Ugandi) were evaluated in a replicated trial at Wad Medani and El Obeid. Selfing was done at both the locations and elite plants from the promising full-sib progenies were selected at harvest. Data were recorded for days to 50 %

Table 4. List of Selected F3 Progenies - Wad Madani

SN	K 81 code	Pedigree	Days to 50 % bloom	Plant height (cm)	Head weight (kg/plot)	Agron. score (1-9)
1	401	F4(J 104 x 3/4 HK-4-8-1) x Dauro 228 P3-1	54	195	2.59	4
2	403	" -3	64	210	3.54	2
3	410	F4(MC 125 x Serere 33-2-2) x Dauro-228 P1-4	61	206	2.25	3
4	412	(P1B 228 x 3/4 S-68-21-4) x Dauro-248 P1-4	67	218	3.43	3
5	416	F4(MC 125 x SS 33-2-1) x Dauro-265-P6-1	69	210	2.00	2
6	432	F4(P1B 228 x 3/4 HK-113-3) x P2-3	66	170	1.03	3
7	435	F4(P1B 228 x 3/4 HK-113-4) x P1404-2 P3-1	63	212	3.04	1
8	436	F4(P1B 228 x 3/4 HK-113-21) x " P2613 4-1	69	150	1.37	3
9	437	-2	67	195	2.13	3
10	446	F4(P1B 228 x 3/4 HK-119-30) x P2 888 (P2)-1	68	180	0.72	3
11	447	" " -2	66	170	1.58	3
12	448	" " -3	66	170	1.41	3
13	449	" " -4	66	165	1.85	3
14	467	111B x GNS x 3/4 S96-3-1-5	74	165	1.83	3
15	474	(PAU 497 x PAU 525) x (ICI 7631 x E 34-1)	64	115	2.23	3
16	494	(NEB 218-17394-1 x NEB 18-17185-2 x (PAU 497 x PAU 525)-6	66	140	1.21	3
17	506	(NEB 218-17394-1 x E 35) x (PAU 497 x NEB 18-17185)-4	64	180	2.28	3
18	514	(ICI 7631-2 x NEB 18-17185-1) x (PAU 497 x NEB 18-17185-2)-1	69	157	2.49	4
19	516	" -3	57	155	2.30	5
20	517	" -4	61	162	2.12	4
21	519	" -6	59	155	2.17	4
22	550	(ICI 7631-2 x ICI 7627) x ICI 7688-4	68	185	2.33	4
23	605	(ACC 218-9 x ACC 218-2-5)	69	220	2.22	3
24	609	(1547-12 x WC 148)	67	185	2.55	2
25	625	1547-2 x (787 x WC148-1)	72	200	2.15	4
26	633	1947-2 x EB 24-1-3	71	215	2.16	3

Table 5. List of Selected F4 Progenies - Wad Medani

SN	K-81 code	Pedigree	Days to 50 % bloom	Plant height (cm)	Head weight kg/plot	Agron score (1-9)
1	708	K 78-48-8-2 (PAU 509 x 1287)	61	190	2.17	4
2	726	K 78-76-12-1 (700620-1 x 1287)	71	175	1.78	4
3	735	K 78-110-19-2 (NEI 18-17185-4 x 1336)	66	225	2.21	3
4	748	K 78-123-17-1 (NEI 104-5047 x 1351)	68	195	1.71	4
5	757	K 78-128-4-2 (1682 x 1477)	71	200	2.31	4
6	761	K 78-128-14-1 (1682 x 1477)	64	190	1.91	3
7	766	K 78-143-1-2 (1561 x 1544)	69	150	1.38	4
8	802	K 78-275-7-1 (ICI 7556 x NEI 67-17389-4)	72	155	1.34	3
9	907	K 78-585-27-1 ExB 167-2 x (J1798 x 700544-13-7-2)	67	165	1.71	4
10	917	K 78-586-21-1 ExB 167-2 x (J1798 x 700594-7-1-1)	72	175	1.51	3
11	919	K 78-586-29-1 ExB 167-2 x (J1798 x 700594-7-1-1)	70	210	1.51	3
12	936	K 78-589-9-1 (EB 167-2 x SD2 x ExB D1029-1-1)	68	200	2.67	4
13	942	K 78-617-15-1 (J25-1 x 700797-12-1) x IVS S2-60	74	190	1.80	4
14	967	(G73 x MC) BC1 (F3)-2	66	195	2.60	3
15	1717	(ICI 7631-2 x NEI 18-1785-2) x ICI 7627 x ICI 7608-1-9)	52	150	1.66	4
16	1726	1547-12 x (687 x 789-4)	52	120	1.17	4

Table 6. List of Elite full sibs of Intervariety Population - Wad Medani

SN	Entry number	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Head yield kg/ha	Agron. score (1-9)
1	1	57	175	362	4518	5.5
2	3	53	160	233	3401	4.5
3	11	59	195	410	5701	6.0
4	13	61	178	212	4351	5.5
5	19	63	195	225	4418	5.0
6	20	60	173	317	3751	6.0
7	24	57	160	253	3567	6.5
8	25	61	171	267	4268	5.0
9	26	63	168	172	3351	5.0
10	36	59	170	160	2134	5.0
11	49	61	193	308	5334	4.5
12	53	56	168	447	5384	6.0
13	54	59	169	258	2917	5.0
14	66	57	175	283	3267	5.5
15	72	57	178	265	3901	5.0
16	74	59	175	168	2267	5.0
17	82	59	170	160	3284	5.5
18	90	57	178	247	3634	6.0
19	102	63	179	237	3701	5.0
20	110	62	185	162	3234	5.0
21	112	61	185	177	3467	5.0
22	114	59	190	160	3117	4.0
23	115	56	160	230	5034	6.0
24	120	63	191	240	3567	4.0
Mean		59	177	248	3836	5.2
Range		53-63	160-195	160-447	2134-5701	4.0-6.5
Mean(136 entries)		58	171	218	3260	6.1
Range(136 ")		45-74	135-200	47-513	1334-5701	4.0-8.0
C.V. %		4.7	5.8	22.4	25.6	-
LSD (0.05)		5.3	19.9	97.0	165.2	-

Table 7. List of Elite full-sibs of Intervariety Population - El Obeid

SN	Entry number	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Head yield kg/ha	Agron. score
1	✓3	52	148	75	1106	5.5
2	38	62	133	132	1506	6.0
3	57	47	160	149	2826	5.0
4	62	63	130	69	1440	6.0
5	68	46	148	147	1867	7.0
6	70	48	140	183	1466	5.5
7	✓72	51	130	67	1360	6.0
8	✓74	51	165	101	2666	5.5
9	75	48	153	107	2079	5.5
10	80	56	153	75	1146	5.5
11	108	63	170	67	1213	6.0
12	✓115	53	138	107	1626	6.0
13	129	54	138	96	1613	6.0
Mean		53	147	106	1686	5.8
Range		46-63	130-170	67-183	1106-2826	5.0-7.0
Mean(136 entries)		57	138	78	1199	6.5
Range(136 ")		43-72	103-170	1-196	120-2826	5-7.5
C.V. %		14.0	10.4	58.1	60.7	-
LSD (0.05)		15.7	28.3	N.S.	N.S.	-

bloom, plant height (cm), head number ('000/ha), head yield (kg/ha) and agronomic desirability of each entry. The data of 24 selected progenies at Wad Medani and 13 selected progenies at El Obeid are presented in Tables 6 and 7, respectively, together with the mean of selected and all the 136 entries.

The average yield of selected entries at Wad Medani was 3836 kg/ha, which was 18 per cent higher than the mean of all the 136 entries. The mean head yield of 13 selected entries at El Obeid was 1686 kg/ha which was 41 per cent higher than the mean of all the 136 entries. The selfed seeds of selected full-sibs have been planted in the off-season nursery for recombination. Four experimental varieties are also being made on the basis of across locations and location-specific performance of the selected entries.

2. Bristled population

The third generation of random mating will be completed in the bristled population in the current off-season. C_0 bulk of this population will be planted at El Obeid in K-82 to make selections for resistance to lodging.

3. Bulk population

The bulk seed of 600 heads which were selected from the F2 populations grown at Wad Medani and El Obeid is the base material of this population. It is expected to have wide genetic variability. It will be grown at El Obeid for improvement by mass selection.

E. Yield Trials

The national testing program of pearl millet was started in Sudan in 1977 and has resulted in release of a cultivar called Ugandi (originally introduced as Serere Composite-2) on the basis of its performance in 1977-1979.

1. Pearl Millet National Trial-5 (PMNT-5)

Sixteen genotypes were selected for PMNT-5 on the basis of their performance in international trials and initial yield evaluation trials carried out in 1980 at El Obeid. Thirteen genotypes were of ICRISAT origin and three, namely, IV. C_1 bulk, Kordofani and Ugandi were included from the national program. The trial was planted at Wad Medani, El Obeid, Kadugli,

Dimsu and Nyertete. The trial failed at Kadugli and Nyertete due to unfavourable climatic conditions.

The trial was planted in lattice design with five replications. The data were analysed according to completely randomized block design. The results of the trial for Wad Medani, El Obeid and Dimsu are presented in Tables 8, 9 and 10, respectively.

Table 8 shows that at Wad Medani, the genotypes differed significantly for all the characters. Two entries, viz. IR/IB 7901 and ICMS 7817 yielded significantly more than recommended cultivated variety (Ugandi), and two others (SSC A79 and IVS 8206) were as good as Ugandi for grain yield. Mean grain yield of the trial was 1326 kg/ha and eight genotypes, including the two checks, produced more grains than the mean.

At El Obeid, the differences between genotypes for grain yield were non significant (Table 9). Mean grain yield of the trial was 381 kg/ha and 10 cultivars yielded more than the mean of the trial. Three entries, viz. SC1 H 78, ICMS 7819 and IVS 8206, out-yielded the best check (Ugandi). Other promising entries were SSC K78, ICMS 7703, IVS 7190 and ICMS 7817.

In IMMT-5 at Dimsu, ICMS 7819 was the only entry that gave significantly higher grain yield than Kordofani which was better of the two checks (Table 10) However, it must be noted that the coefficient of variation for grain yield was high. Downy mildew was observed on all the genotypes under test, except ICMS 7705. However, the per cent infection was high (more than 10 %) only on the two checks and ICMS 7703. The attack of rust was heavy on all the entries.

* Synthetic ICMS 7817 is under test in the IMMT since 1979. The results of its performance during the last three years are given in Table 11. In six out of the seven comparisons, ICMS 7817 was better than Kordofani. On an average, it yielded 22 per cent more than Kordofani and 14 per cent more than Ugandi. Demonstration trials, with ICMS 7817, using Kordofani and Ugandi as checks, are planned to be conducted on farmers' fields at several locations during the next crop season.

Table 8. Results of Pearl Millet National Trial-5 - Wad Medani, 1981

SN	Designation	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Grain yield kg/ha	Agron. score (1-9)
1	ICMS 7703	39	63	173	172	1142	5.2
2	ICMS 7705	57	60	168	159	1467	5.8
3	ICMS 7817	36	57	158	214	1859	6.4
4	ICMS 7819	46	65	182	140	750	.6
5	SSC A 79	48	62	163	185	1628	6.2
6	IVS F 77 (Imp.)	50	59	162	175	784	5.0
7	IVS A 78	46	63	168	121	858	5.8
8	IVS 7190	53	59	180	193	1315	6.4
9	IVS 8206	34	61	189	156	1498	6.0
10	SSC K 78	54	61	179	180	1209	4.6
11	WC C 75	35	59	167	150	1453	6.0
12	IR/IB 7901	46	60	180	203	2308	6.0
13	SC1 H 78	53	60	172	206	1421	6.2
14	IVS C1 Bulk	68	59	156	207	838	6.8
15	Kordofani (Check)	72	66	201	193	1202	5.8
16	Ugandi (Check)	55	57	188	205	1483	5.6
Mean		50	61	174	179	1326	5.7
Range		34-72	57-66	158-201	121-214	750-2308	4.6-6.8
CV %		18.2	3.3	6.4	15.7	19.4	-
LSD (0.05)		11.4	2.5	14.0	35.4	325.0	-

Table 9. Results of Pearl Millet National Trial-5 - El Obeid, 1981

SN	Designation	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Grain yield kg/ha	Agron. score (1-9)
1	ICMS 7703	9.7	65	169	34.4	405	6.4
2	ICMS 7705	10.0	64	165	52.8	393	6.3
3	ICMS 7817	12.8	57	153	67.6	396	6.6
4	ICMS 7819	14.0	63	175	50.4	420	5.6
5	SSC A 79	8.1	69	151	31.6	332	7.0
6	IVS I 77 (Imp.)	10.1	68	143	40.8	319	6.6
7	IVS A 78	9.7	67	165	42.5	377	6.2
8	IVS 7190	13.1	59	163	55.7	397	6.6
9	IVS 8206	5.7	66	169	26.8	420	6.6
10	SSC K 78	11.6	57	164	58.9	407	6.2
11	WC C 75	7.5	62	165	36.4	404	6.8
12	IR/IB 7901	12.3	65	156	45.2	283	7.0
13	SCI H 78	18.0	51	164	93.0	453	5.4
14	IVT C1 Bulk	11.9	60	137	47.3	307	6.8
15	Kordofani (Check)	23.2	65	156	62.4	368	6.4
16	Ugandi (Check)	19.7	56	163	69.2	408	6.6
Mean		12.3	62	160	50.9	381	6.4
Range		5.7-23.2	51-69	137-175	26.8-93.0	283-453	5.4-7.0
CV %		31.5	7.1	7.6	43.7	25.0	-
LSD (0.05)		5.1	5.5	15.3	28.0	NS	-

Table 10. Results of Pearl Millet National Trial-5 - Dimsu, 1981

Designation	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Grain yield kg/ha	Downy meldew %	Rust %
ICMS 7703	16.4	75	141	85.6	628	13.8	43.9
ICMS 7705	21.6	78	145	98.9	629	0.0	41.4
ICMS 7817	16.5	76	149	125.2	674	8.1	35.5
ICMS 7819	18.0	78	149	155.2	1274	8.9	31.1
ICC A 79	16.4	80	138	78.0	520	2.4	60.2
IVS 1 77 (Imp.)	17.2	81	132	87.8	599	2.3	46.5
IVS A 78	15.6	82	131	72.6	561	3.4	46.2
IVS 7190	14.0	78	140	67.8	552	8.6	66.7
IVS 8206	15.5	80	156	62.9	740	0.9	29.3
ICC K 78	17.1	74	160	95.8	644	2.3	62.5
ICC 75	16.5	78	136	107.2	837	7.3	37.1
ICR/IB 7901	17.3	80	152	89.4	698	2.3	43.1
IC1 H 78	19.7	76	134	103.2	680	2.0	56.8
IVS C1 Bulk	18.0	83	141	84.0	353	5.9	50.4
Serdofani (Check)	19.3	79	139	104.0	935	11.7	36.6
Ugandi (Check)	17.2	74	118	90.2	483	18.6	60.5
	17.3	78.3	141.3	94.2	675.4	6.2	46.7
	14.0-21.6	74-83	118-160	62.9-155.2	353-1274	0.0-18.6	29.3-66.7
	22.4	4.5	15.1	34.9	36.6	-	-
(0.05)	NS	2.4	NS	41.7	320.1	-	-

Table 11. Grain Yield Performance of ICMS 7817 Relative to Ugandi and Kordofani during 1979 - 1981

Year	Location	Grain Yield (kg/ha)		
		ICMS 7817	Ugandi	Kordofani
1979	Kaba	894	775	775
	Kadugli	1250	1417	1000
1980	Kaba	477	460	133
	Kadugli	619	418	377
	Dimsu	433	209	309
1981	Kaba	396	408	383
	Dimsu	674	483	933
Mean		678	596	557

2. Initial Yield Evaluation Trial-1 (IYET-1)

IYET-1 comprised 21 selections from the national program and ITV 8001 and ITV 8003 from Niger. Kordofani and Ugandi were used as checks. The trial was conducted at Wad Medani, El Obeid and Dimsu in simple lattice design with five replications. The data were analysed according to completely randomized block design.

At Wad Medani, no entry yielded more than either check (Table 12). At El Obeid, Kordofani gave the highest yield, (Table 13). At Dimsu, ITV 8001 ranked first for grain yield. However, it must be noted that the coefficient of variation was high for grain yield at El Obeid and Dimsu. Downy mildew and rust infected all the entries at Dimsu, the mean infection being 16.4 per cent and 52.4 per cent, respectively. Six entries were found less susceptible to downy mildew and had an infection below 10 per cent. All the genotypes tested were moderately to highly susceptible to the rust.

3. Initial Yield Evaluation Trial-2 (IYET-2)

Twenty-four genotypes which were found high yielding in the international synthetics trials, best population progenies trials and D_2 dwarf varieties trials in the year 1980 at El Obeid were evaluated against Ugandi. The trial was carried out at Wad Medani, El Obeid, Dimsu and El Fula.

A simple lattice design with five replications was used. Data were analysed according to completely randomized block design. The trial failed at El Fula due to adverse climatic and soil conditions. The results of the other locations are presented in Tables 15 to 17.

At Wad Medani, the differences between the genotypes were found significant for all the characters under study. Three entries, viz. Gam 73 K77, ICMS 7835 and IVS H78 yielded significantly more than the check-Ugandi. The mean grain yield of the trial was 1668 kg/ha and 12 entries yielded more than this.

At El Obeid, 16 entries outyielded Ugandi. However, none of these yielded significantly more than the said check ($P = 0.05$), ICMS 7935 was the top ranking genotype which was followed by NELC 8156, NELC A 79, IVS H 77 and RFS 501-2 in decreasing order. Unfortunately, the coefficient of

12. Results of Pearl Millet Initial Yield Evaluation Trial-1 - Wad Medani, 981

Designation	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Grain yield kg/ha	Agron. score (1-9)
(WC x Old Jam Nagar-1-2-1) P 131-1	58	65	165	168	729	5.5
(3/4 EB x J260-17) 700557-14-10-5	45	62	150	190	1267	5.5
(J25-1 x 700797-12-1) IVS 82-60	62	66	182	194	1229	4.5
SSC E 82-1-2	51	66	178	148	494	6.5
SSC E 82-1-4	57	70	158	174	1219	6.0
SSC E 82-1-10	50	68	160	216	1002	6.5
Sen. Sel. ICI 6024-11	64	65	183	262	902	5.0
ACC 82-3-1	46	64	175	177	1708	5.0
ACC 82-5-1	52	69	170	145	1498	6.0
ACC 350-4-2	50	64	178	275	1710	6.5
Sen. Sel. ICI 6007	56	64	163	173	693	5.0
Sen.Sel. F4 63-2-9	42	63	150	267	1756	7.5
Syn. 4-51-8-2	52	66	148	148	1236	6.5
SUD 114	47	65	175	112	297	6.5
SC 922191	52	58	170	228	1598	6.0
SSC 914107	36	62	160	232	1081	7.0
ITV 8001	52	65	188	148	1722	5.5
ITV 8003	41	65	205	164	1477	6.0
ACC 5030	42	60	173	180	1860	6.0
ACC 5068	55	63	176	173	1907	7.0
ACC 5092	77	60	168	187	1057	6.5
ACC 5095	54	59	168	197	1382	6.5
IVI C1 Bulk	62	63	158	207	895	7.0
Kordofani (Check)	37	70	190	177	2414	5.5
Ugandi (Check)	55	60	178	185	2343	5.5
n	52	64	171	189	1339	6.0
ge	36-77	59-70	148-205	112-275	297-2414	4.5-7.5
%	20.7	4.1	5.5	22.0	20.9	-
(0.05)	NS	5.4	19.6	NS	364.8	-

Table 13. Results of Pearl Millet Initial Yield Evaluation Trial-1 - El Obeid, 1981

SN	Designation	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Grain yield kg/ha	Agron. score (1-9)
1	(WC x Old Jam Nagar-1-2-1) F 131-1	20.0	58	123	65.0	520	6.0
2	(3/4 EB x J260-17)-700557-14-10-5	17.0	66	109	52.0	264	7.2
3	(J25-1 x 700797-12-1) IVS-S2-60	19.0	66	139	37.4	328	6.8
4	SSC E 82-1-2	8.6	70	133	15.4	133	5.6
5	SSC E 82-1-4	13.8	69	120	24.8	248	7.0
6	SSC E 82-1-10	8.0	69	115	20.0	173	7.0
7	Sen.Sel. ICI 6024-11	17.6	69	139	34.2	300	6.4
8	ACC 82-3-1	17.6	60	127	52.8	352	6.8
9	ACC 82-5-1	22.2	68	148	49.8	403	6.4
10	ACC 350-4-2	20.2	60	142	73.4	368	6.8
11	Sen.Sel. ICI 6007	11.2	68	121	33.6	251	6.8
12	Sen.Sel. F4 63-2-9	17.8	67	110	53.0	187	7.5
13	Syn. 4-51-8-2	14.2	65	121	30.6	120	7.6
14	SUD 114	11.0	69	127	21.6	157	7.0
15	SC2 922191	13.4	63	122	63.8	384	6.6
16	SSC 914107	16.8	59	127	63.2	329	7.0
17	ITV 8001	20.2	60	151	59.4	581	6.2
18	ITV 8003	20.0	60	153	49.0	576	6.2
19	ACC 5030	20.2	61	141	62.6	515	6.4
20	ACC 5068	18.2	64	133	41.4	379	6.6
21	ACC 5092	18.4	60	136	50.2	380	7.0
22	ACC 5095	20.8	55	120	65.8	443	7.0
23	IVT C1 Bulk	16.8	58	133	52.8	277	7.2
24	Kordofani (Check)	22.2	64	146	70.4	611	6.0
25	Ugandi (chick)	18.4	63	141	55.8	440	6.6
Mean		16.9	62	131	47.9	349	6.7
Range		8.0-22.2	55-70	109-153	15.4-73.4	120-611	5.6-7.5
CV %		34.7	15.7	10.0	52.4	57.3	-
LSD (0.05)		7.3	12.3	16.5	31.3	250.0	-

ble 14. Results of Pearl Millet Initial Yield Evaluation Trial-1 - Dimsu, 981

Pedigree	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head count '000/ha	Grain yield kg/ha	Downy mildew %	Rust %
(WC x Old Jam Nagar-1-2-1) F 131-1	19.7	71	120	50.4	310	21.6	52.7
(3/4 EB x J260-17) 700557-14-10-5	16.0	69	147	78.4	217	3.3	60.0
(J25-1 x 700797-12-1) IVS S2-6	20.0	88	151	42.4	292	25.3	30.7
SSC E 82-1-2	12.0	86	134	21.1	80	4.4	46.7
SSC E 82-1-4	11.5	70	105	29.3	176	27.9	67.4
SSC E 82-1-10	16.0	77	116	52.2	97	2.3	26.7
Sen.Sel.ICI 6024-11	17.6	73	144	91.7	473	27.3	66.7
ACC 82-3-1	20.5	65	145	98.1	501	9.1	42.9
ACC 82-5-1	22.9	71	153	65.1	394	15.1	45.3
ACC 350-4-2	16.0	67	145	65.3	306	30.0	66.7
Sen.Sel. ICI 6007	18.7	70	145	52.5	222	10.0	58.6
Sen.Sel. F4 63-2-9	17.3	74	118	69.1	277	10.9	84.6
Syn. 4-51-8-2	14.1	81	121	22.1	69	13.2	60.0
SUD 114	17.6	79	140	35.2	101	16.7	40.9
SC 922191	17.1	66	129	70.9	333	15.6	53.1
SSC 914107	17.3	66	127	70.7	147	30.8	60.0
ITV 8001	22.4	64	149	135.5	594	16.7	36.9
ITV 8003	19.5	71	170	48.5	458	12.3	37.0
ACC 5030	19.7	71	138	57.3	321	5.4	58.1
ACC 5068	22.4	66	142	80.5	359	13.1	53.6
ACC 5092	22.7	65	146	71.2	172	3.5	52.9
ACC 5095	18.7	60	131	95.7	302	21.4	50.0
IVP C1 Bulk	17.6	73	129	56.0	230	12.1	47.0
Kordofani (Check)	18.4	77	162	76.8	466	40.6	53.6
Ugandi (Check)	21.3	64	143	80.0	385	21.3	57.5
ean	18	71	138	64	291	16	52
nge	11.5-22.9	60-88	105-170	21.1-135.5	69-594	2.3-40.6	26.7-84.6
%	29.4	12.9	15.3	44.7	52.2	-	-
D (0.05)	6.7	11.5	26.4	42.2	191.0		

Table 15. Results of Pearl Millet Initial Yield Evaluation Trial-2 - Wad Medani, 1981

SN	Designation	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Grain yield kg/ha	Agron. score (1-9)
1	ICMS 7704	57	59	179	179	1942	6.0
2	ICMS 7803	52	60	155	189	1727	6.0
3	ICMS 7835	56	58	167	200	3066	5.4
4	ICMS 7838	75	42	138	230	1910	5.8
5	ICMS 7905	71	54	153	241	1106	5.6
6	ICMS 7907	71	59	155	247	1667	5.4
7	ICMS 7910	61	57	159	227	1871	5.2
8	ICMS 7935	76	64	148	174	1358	4.6
9	ICMS 8016	77	60	165	238	1346	5.4
10	ICMS 8017	67	61	167	224	1459	4.8
11	ICMS 8025	56	58	170	172	1678	5.8
12	IVS I 77	56	59	166	200	1885	6.0
13	IVS H 78	64	57	167	195	2231	5.6
14	SC2 9211	67	51	154	220	1182	6.6
15	SC2 9176	56	59	139	176	1322	5.4
16	NELC A 79	46	61	159	146	1477	5.4
17	NELC 8156	47	59	170	150	1159	6.2
18	NC B 77	48	61	159	230	1896	5.6
19	NC 9046	52	67	175	192	1778	5.2
20	LC 7053	55	60	174	204	1734	5.2
21	Gam 73 K 77	71	58	132	223	3085	6.2
22	RFS 501-2	67	58	165	274	1068	5.8
23	IB 18-1	70	53	138	223	857	6.6
24	DIC I 7905	59	59	175	213	1302	5.2
25	Ugandi (Check)	69	57	178	222	1600	5.2
Mean		62	58	160	209	1668	5.7
Range		46-77	42-67	132-179	146-274	857-3085	4.6-6.6
C V %		17.0	6.2	7.2	23.1	24.7	-
LSD (0.05)		13.1	4.6	14.4	60.5	516.7	-

Table 16. Results of Pearl Millet Initial Yield Evaluation Trial-2 - El Obeid, 1981

N	Designation	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Grain yield kg/ha	Agr. score (1-9)
1	ICMS 7704	16.0	59	154	56.8	565	6.4
2	ICMS 7803	9.8	59	134	48.8	453	7.0
3	ICMS 7835	12.0	59	148	52.0	472	6.6
4	ICMS 7838	19.2	61	129	80.8	624	6.6
5	ICMS 7905	9.8	58	116	48.6	273	7.0
6	ICMS 7907	12.8	64	128	48.8	336	7.2
7	ICMS 7910	15.0	58	143	61.4	548	6.6
8	ICMS 7935	18.6	70	134	56.0	740	5.8
9	ICMS 8016	16.0	60	153	80.2	629	6.4
10	ICMS 8017	16.8	57	138	69.8	563	6.4
11	ICMS 8025	13.6	61	152	51.4	560	6.6
12	IVS I 77	16.0	62	147	60.6	669	6.4
13	IVS H 78	13.8	67	146	52.6	552	6.8
14	SC2 9211	15.0	55	136	69.6	493	7.2
15	SC2 9176	8.8	62	136	27.4	360	6.6
16	NELC A 79	12.6	61	147	68.2	687	6.4
17	NELC 8156	13.0	59	149	73.8	727	6.4
18	WC B 77	11.2	62	141	42.2	325	7.2
19	NC 9046	13.0	70	152	34.4	368	7.0
20	LC 7053	13.8	60	142	64.8	624	6.4
21	Gam 73 K 77	13.0	65	120	50.6	584	6.6
22	RFS 501-2	16.6	56	145	93.6	637	6.8
23	IB 18-1	19.4	53	138	88.6	568	6.8
24	DIC I 7905	13.0	59	142	68.2	600	7.0
25	Ugandi (Check)	21.6	55	139	72.6	536	6.4
Mean		14.4	60	140	60.8	540	6.7
Range		8.8-21.6	53-70	116-154	27.4-93.6	273-740	5.8-7.2
CV %		33.5	10.1	10.0	49.9	41.1	-
LSD (0.05)		6.1	7.5	17.9	NS	278.0	-

Table 17. Results of Pearl Millet Initial Yield Evaluation Trial-2 - Dimsu, 1981

SN	Designation	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Grain yield kg/ha	Downy mildew %	Rust %
1	ICMS 7704	21.3	74	148	108.8	666	10.0	17.5
2	ICMS 7803	20.8	65	134	108.3	410	5.1	15.4
3	ICMS 7835	19.2	64	153	82.9	522	12.5	22.2
4	ICMS 7838	21.3	71	127	79.5	452	10.0	25.3
5	ICMS 7905	20.5	65	131	144.6	478	5.2	7.8
6	ICMS 7907	19.2	62	131	91.2	468	13.9	19.4
7	ICMS 7910	17.1	63	152	105.3	457	6.3	7.8
8	ICMS 7935	18.9	66	124	81.1	606	15.5	15.5
9	ICMS 8016	21.6	72	145	96.5	449	22.2	18.5
10	ICMS 8017	19.2	65	127	99.5	561	13.9	22.2
11	ICMS 8025	20.5	73	150	77.3	385	11.7	13.0
12	IVS T 77	19.5	67	148	94.9	566	11.0	21.9
13	IVS H 78	20.8	65	156	141.1	554	16.8	19.2
14	SC2 9211	17.9	62	150	76.5	293	20.9	9.0
15	SC2 9176	20.0	68	138	46.1	183	18.7	17.3
16	NELC A 79	17.6	68	152	78.1	386	10.2	15.2
17	NELC 8156	15.7	67	156	66.7	357	15.3	22.0
18	WC B 77	19.2	67	148	111.5	582	9.7	33.3
19	NC 9046	15.2	72	141	61.6	403	3.3	8.5
20	LC 7053	19.5	71	138	95.2	498	8.2	20.5
21	Gam 73 K 77	21.1	72	123	116.8	532	10.1	38.0
22	RFS 501-2	13.1	72	130	84.5	385	16.3	30.6
23	IB 18-1	19.2	66	151	90.4	338	9.7	18.1
24	DIC T 7905	21.1	64	156	119.5	446	11.4	16.5
25	Ugandi (Check)	22.1	65	155	115.2	531	18.1	4.8
Mean		19.3	67.4	142.6	94.9	460.3	12.5	18.4
Range		13.1-22.1	62-74	123-156	46.1-144.6	183-666	2.3-22.2	7.8-38.0
CV %		25.6	10.5	12.3	42.6	40.0	-	-
LSD (0.05)		6.1	NS	21.9	50.7	235.0	-	-

variation for grain yield was very high (41.1 %).

At Dimsu, seven entries outyielded Ugandi, the check; but none yielded significantly more than it. Moreover, it must be noted that the coefficient of variation was very high (40 %). All the entries were infected by downy mildew and rust diseases but seven entries had low incidence (below 10 %) of downy mildew, while five genotypes had low incidence of rust.

II REGIONAL TRIALS AND NURSERIES

A Exchange Nursery

We received from Dr. B.B. Singh 17 accessions of Niger origin (14 new selections and three varieties, viz. CIVT, Ex Bornu and Souna III) and six lines of Senegal origin. Dr. S.C. Gupta contributed 15 lines from Senegal, of which six were common to the ones sent by Dr. Singh. All the entries of the exchange nursery were planted at Wad Medani and El Obeid in an observation nursery. Each entry was planted in 2 rows x 5 m plots.

In general, Niger lines were tall and long headed. ITV 8103 appeared high yielding and has been selected for use in the national program. Senegalese entries were relatively late and showed segregation for plant height. However, three entries, viz. IBV 7815, IBV 8103 and IBV 8107, were selected for future use.

We sent out seed of 19 entries to Nigeria, Niger, Senegal, Upper Volta and Mali for their use in the exchange nursery.

B. 1981 West African Disease Resistant Elite Varieties Trial (WADREV-81)

The trial comprised 15 entries and a susceptible check. Since disease pressure is usually not sufficient at Wad Medani/El Obeid to screen the genotypes against the pearl millet diseases, the entries were grown in observation rows to assess their agronomic desirability.

The entry IMIS 8020 was found uniform and agronomically acceptable for future use in the program.

C. Pearl Millet African Regional Trial-1981 (PMART-81)

The objective of PMART-81 was to evaluate the performance of promising genotypes identified in various breeding programs in Africa at different African locations. Fourteen genotypes were tested in this trial against Kordofani, a local check. IBV 8001, IBV 8004 and Souna III were contributed by Senegal; ITV 8001, ITV 8004 and CIVT II by Niger; EBKSC-80 and TGBSC-80

y Upper Volta and Ex Bornu, Nigerian Composite and Kano IDC by Nigeria. ordofani was grown at two spacings - (i) at 75 cm x 50 cm, as other entr s, nd (ii) at 1m x 1m, as grown by farmers of the area.

The results of the trial are presented in Table 18. Kordofani, the ocal check, ranked first. It yielded 473 kg/ha i.e. 24 per cent higher t an he mean of the trial. However, the differences between the entries were ot ignificant ($\alpha = 0.05$).

Table 18. Results of Pearl Millet African Regional Trial - El Obeid, 1981

SN	Designation	Plant count '000/ha	Days to 50 % bloom	Plant height (cm)	Head number '000/ha	Grain yield kg/ha	Agron. score (1-9)
1	IBV 8001	12.7	59	188	32.8	383	6.5
2	IBV 8004	15.2	53	180	33.0	452	6.3
3	Souna III	11.8	54	200	35.0	380	5.5
4	ITV 8001	19.5	59	211	24.8	354	6.3
5	ITV 8002	20.5	59	206	19.0	320	5.5
6	ITV 8004	19.7	56	198	39.2	427	6.0
7	CIVT II	16.5	61	208	14.8	320	6.0
8	EBKS C80	15.8	56	189	39.7	375	6.5
9	TGBS C80	13.7	53	180	49.7	375	6.5
0	Ex Bornu	18.0	58	196	26.8	372	6.5
1	Nigerian Composite	17.3	56	208	44.5	355	6.5
2	Kano MDC	15.2	59	149	45.0	377	6.[illegible]
3	IVS A 78	19.2	55	176	53.0	420	6.[illegible]
4	ICMS 7704	17.7	51	176	42.0	382	6.0
5	Farmers Local Kordofani(75 cm x 50 cm)	12.8	57	183	66.0	473	6.8
6	Farmers Local Kordofani(1m x 1m)	10.8	50	153	37.8	341	6.0
Mean		16.0	56	188	37.7	382	6.2
Range		10.8-20.5	50-61	149-211	14.8-66.0	320-473	5.5-6.8
CV %		22.3	8.8	9.6	34.5	21.7	-
LSD (0.05)		5.1	7.0	25.6	18.8	NS	-

III INTERNATIONAL TRIALS AND NURSERIES

Introductions from ICRISAT centre continue to provide us the elite genotypes. The best entries of the international trials are included in the national initial yield evaluation trials and advance yield trials. The elite selections from the breeding nurseries of the centre forms a part of our working collection and are used for variety crosses, synthetics and population improvement programs.

For the 1981 crop season, we received three yield trials and six breeding nurseries from ICRISAT centre. The yield trials, viz. IMMT-7, elite varieties trial and experimental varieties trial were planted at El Obeid. Due to adverse growing conditions which prevailed in some parts of the fields, the plant stand of the centre's trials was not adequate. Also, the crop growth was unsatisfactory. Therefore, the data are not presented in this report. Of the six breeding nurseries, variety crosses (F1) Multilocation, F1 crosses involving African x African parents and BC1 (F1) were planted at Wad Medani; SMF2 at Wad Medani and El Obeid; and 1981 UNII, and F3 progenies nursery at El Obeid. The results are discussed in the following pages.

A. Variety Crosses F1 (Multilocation)

Twenty F1 crosses were planted in unreplicated observation rows. In general, the performance of the crosses was average to poor. However, the selfed heads from ten crosses (Table 19) have been selected for growing their F2 population in 1982.

Table 19. List of selected entries from variety crosses F1 (Multilocation)

Cross No.	Pedigree	Days to 50 % bloom	Plant height (cm)	Agron. score (1-9)
3	IVS 5454 Tall x (Serere 39 x B816-2-4-2)	63	218	6
4	(Serere 39 x B816-2-4-2) x (E298-2-1-8 Tall)	58	190	6
5	(MC125 x Serere 33-1) x (Serere 39 x B816-2-4-2)	66	200	5
9	IVS 5454 Tall x (SC1(S)4-18 x Saria-Syn. 40-4)	56	195	6
11	(KG22 x 700651-4-1) x IVS 5454 Tall	54	165	6
12	IVS 7190 x (KG22 x 700651-4-1)	56	165	6
13	(B282 x J888-27-14-1) x (SC1(S)4-18 x Saria Syn.40-5)	62	170	6
14	(J104 x ¾ HK-11-10-1) x (TB228 x ¾ HK-119-17)	56	150	5
16	(TB228 x ¾ HK-119-17) x IVS 5454 Tall	56	155	6
19	(B.Senegal-9-5 x B816-1) x (B282 x J888-27-9-4)	58	165	6

B. F1 Crosses Involving African x African Parents

Parents involved in the 139 crosses of this group were from Upper Volta, Senegal, Niger, Nigeria and Uganda. Togo Short from Upper Volta was used as one of the parents in most of the crosses. In general, this material was not found promising. The pedigree and agronomic data of 17 crosses which were selected for growing their F2 populations are given in Table 20.

Table 20. List of selected F1 crosses involving African x African parents

Cross No.	Pedigree	Days to 50 % bloom	Plant height (cm)	Head yield (kg/plot)
25	Souna 48 x Togo Short-7	58	188	1.16
33	Souna 11 x Togo Short-15	58	240	1.05
40	Siria Korola Souna V x Togo Short-37	59	185	1.61
44	Togo Short-7 x Sanio-37	66	205	1.10
47	Togo Short-7 x Sanio-40	60	230	1.01
50	Togo Short-7 x Sanio-46	63	205	1.13
51	Togo Short-23 x "	56	210	1.09
52	Togo Short-30 x "	66	240	1.08
54	Togo Short-7 x Sanio 49	63	155	1.11
57	Togo Short-16 x Sanio 52	65	210	1.29
62	Togo Short-5 x Sanio 64	62	210	1.13
66	Togo Short-4 x Sanio 65	62	215	1.01
74	Sanio 33 x Togo Short-7	60	180	1.03
77	Sanio 38 x Togo Short-11	60	235	1.01
78	Sanio 55 x Togo Short-11	63	185	1.18
84	Sanio 40 x Togo Short-16	61	225	1.20
125	Barbe x INNG-3	62	215	1.05

C. BC1 (F1)

Thirteen entries of BC1 (F1) were received and planted in observation rows. The parents involved in these crosses were Indian/African inbreds and Niger land races. None of the crosses was found agronomically acceptable for future usage in the program.

D. SMF2 Populations

Twenty-six F2 populations which were derived from the source material project at ICRISAT headquarters were planted at El Obeid and Wad Medani for plant selection. Each population involved a bristled parent. Fifty single

selfed plants from nine F2 populations were selected at Wad Medani and 19 plants from four populations were chosen at El Obeid for growing F3 progenies in 1982. The crosses P1B228 x P339 and P242 x ¾ HK performed well at both the locations.

E. F3 Progenies

Twenty-eight F3 progenies which were derived at ICRISAT headquarters from the crosses of Serere 10LB and Indian/West African lines were grown at El Obeid. Single plant selection was done in three progenies to grow their F4 progenies in 1982. These are:

K 81 Code:	Pedigree:
4	(¾ HK x Serere 10LB-38-1)
6	(B 282 x Serere 10LB-38-1)
28	(ICSN 282-4-1-1 x Serere 10LB-38-1)

F. 1981 Uniform Progeny Nursery II (UPN-II)

The objective of the 1981 UPN-II was to select the elite single plants and progenies from the newly generated contrasting lines of diverse parentage derived at ICRISAT headquarters.

Of the 20 progenies of this nursery, entry No. 9 (23 DBE-20 x Serere 10LB-89-1) was found promising and was selected for future usage in the national program.

G. INTSORMIL's Material

Dr. Stegmeier of Kansas State University sent us via Dr. D. Rosenow, Texas A & M, USA the seed of 20 F1 hybrids along with their parents, four fertility restorer bulk male lines and six populations, viz. Serere 3A, P1 185642, HM 559, world collection composite, FR-RM (3) and Senegal Bulk Cross. Of these six populations, Serere 3A and P1 185642 were made from the bulk seed of 22 S1 and 32 S1 selections, respectively, in cycle 2. The remaining populations were random mated and mass-selection was done at Kansas.

All the F1 hybrids and their parents were evaluated at Wad Medani. In general, the hybrids were early, dwarf and unadapted, having small to medium heads. Nine were found fertile, six showed male sterility and remaining five were segregating for fertility. The parents of hybrids consisted of 20 fertility restorer inbred male lines and two male sterile lines along with their maintainers. Selfing was done in all the inbreds to maintain them. Entry 80-4371, which had small and compact heads, will be grown in eastern Sudan to see its performance. The male sterile line 79-2007 was found agronomically better than 79-2038 but its A line flowered one week earlier than the B line. However, the seed of both the male sterile lines was maintained by hand pollination.

Four fertility restorer bulk male lines and six populations were planted both at Wad Medani and El Obeid. The restorer bulk male lines were not found adapted. At El Obeid, Senegal Bulk Cross Population performed better than the remaining populations and at Wad Medani HMT 559 appeared promising. Both the populations will be evaluated in 1982.

IV 1981-82 OFF-SEASON NURSERY ACTIVITIES

The first planting of the off-season nursery was done on October 6, 1981. The material comprised 17 F1 hybrids and 36 segregating progenies (F3, F4 & F5) which performed well during K-81. The objective is to develop 9 synthetics from F1 crosses and 10 synthetics by crossing selected segregating progenies.

Forty-nine elite selections of K-81 along with the good combining local materials were planted on November 1, 1981. The objectives are to increase the seed of selected lines by sibbing for testing them in the initial yield evaluation trials of 1982, and to cross them with the good combiners.

Selections made from the intervariety population full-sib progenies trial at Wad Medani (24) and El Obeid (13) have also been planted. The objective is to make four experimental varieties by crossing of elite full-sib progenies and to make full-sibs for test in 1982.

Nineteen experimental varieties and synthetics which were found high yielding in the national trials of 1981 were planted on December 15, 1981 to increase their seed by sibbing. This material will be retested in the national trials of 1982.

On December 28, 1981 and January 13, 1982, the seed of 11 genotypes, viz. CIVT-[illegible], Souna III, WC (C_1), SSC (C0), IVS (C3), MC (C4), Ex Bornu, Nigerian Composite (C_1), Kordofani, Fakiabyad and Ugandi, was planted to make a full diallel cross to study their combining ability.

The bristled population was grown in an isolation plot to complete the third generation of random mating.

V SUMMARY

1. Synthetic ICMS 7817, which has been under test since 1979, on an average, yielded 24 and 14 per cent more grains than the Kordofani and Ugandi, respectively. This synthetic will be tested in larger plots at different locations in Kordofan and Darfur regions through the regional departments of agriculture.

2. In the pearl millet national trial, the following seven entries were found promising and have been selected for retesting in 1982: ICMS 7817, ICMS 7819, IR/IB 7901, SSC A79, SC1 H79, SSC K78 and IVS 8206.

3. Two pearl millet initial yield evaluation trials were carried out this year. Two entries of PMIT I (ITV 8001 and ITV 8003) performed well at Dimsu and El Obeid and 11 entries of PMIT 2 (ICMS 7838, ICMS 7704, ICMS 7835, ICMS 7935, Gam 73 K77, IVS H78, NBLC 8156, NBLC A79, RCM 501-2, MC B77 and IVS P77) were found to have some promise at one or more locations. These entries have been chosen for inclusion in the 1982 national trials.

4. The 600 segregating progenies (F3, F4 and F5) were evaluated this year and 23 F3 progenies, 14 F4 progenies and one F5 progeny have been selected on the basis of plant and yield contributing characters to include in the initial yield evaluation trials and for use in the breeding program.

5. Ten entries of K-80 selections have been selected for inclusion in IYMT's and working collection.

6. Selections were made in F1 crosses and segregating progenies nursery for the development of synthetics. Nine synthetics from selected F1 crosses and 10 synthetics from the elite entries of segregating progenies are being made in the current off-season.

7. Seventeen promising full-sibs of intervariety population have been selected to make four experimental varieties.

8. Local germplasm collection was enriched by 386 accessions which were obtained from Northern Kordofan, Northern Darfur and eastern Sudan. The new germplasm will be evaluated at El Obeid and will also be grown at Wad Medani for its maintenance.

9. Bristled population has been planted in the off-season nursery to complete third random mating generation. This population will be grown at El Obeid in 1982 to screen for lodging resistance. Later resistant selections will be used for recombination and its improvement.

10. Eleven genotypes, viz. CIVT II, Souna III, WC (C_1), SSC (C_0), IVS,(C_3), MC (C_4), Ex Bornu, Nigerian composite (C_1), Ugandi, Kordofani and Fakiabyad have been selected to cross in a diallel fashion to study their combining ability and to generate new breeding material. The derived lines will be used to develop synthetics. The crosses will be made during the current off-season and the F_1's and parents will be evaluated in a multilocation replicated trial in the year 1983.

11. One entry each from 1981 exchange nursery and WADREV-81, namely, ITV 8103 and IMPS 8020, respectively has been selected to include in the initial yield evaluation trials.

12. Among the ICRISAT Centre's new crosses and segregating breeding materials, F2 populations were found most interesting and 69 single plants have been selected to grow their F3 progenies in K-1982.

From the different breeding nurseries which were evaluated during this year, 48 lines have been chosen for the 1982 exchange nursery.

SORGHUM IMPROVEMENT

SECTION 2: RESULTS OF 1981 SORGHUM IMPROVEMENT RESEARCH

Sorghum research activities during the 1981 crop season were carried out at five locations - Wad Medani (Gezira Province), Gadambalia (Kassala Province), Agadi (Blue Nile Province), El Obeid (Northern Kordofan Province), and Kadugli (Southern Kordofan Province). These stations very well represent the environments of the major sorghum growing zones in the northern two-thirds of the country. In Southern Sudan 2 sets of sorghum nurseries were sent for trial at Wau (Bahr El Ghazal Province) and Yei (Eastern Equatoria Province) but no follow up could be made because of poor communication.

Wad Medani (WM): The farm at Gezira Research Station (GRS), represents the irrigated sorghum growing conditions. GRS is the centre of all our operations; all of our crossing and most early generation advancing and evaluations are done here. Planting at this station was done starting on July 1st, at optimum planting dates. A spacing of 60cm between rows and 15cm between plants within rows were used in most of the trials and nurseries providing a desired plant population of approx. 110,000 plants/ha. Nitrogen fertilization was applied at the rate of 80 kg N/ha in split applications - a basal dose of 40 kg/ha applied at planting and the balance side-dressed at boot formation. The growing condition at WM this season was very good. Seedling emergence and establishment were excellent resulting in good plant stand at maturity. There was no major disease or insects with significant damage. A heavy infestation of Heliothis that threatened the nursery at grain filling was eradicated after only one spray of Sumicidin (20 % E.C.) at the rate of 300ml product per feddan. Red mite infestation was also observed. It seemed to prefer SC-108 related materials; P-954062, P-954063 and SPV-138 were the most susceptible. There was some shortage of irrigation water in mid-August due to the unusual dry spell at the time, but only the breeding nurseries were stressed.

Gadambalia (GD): At an average annual rainfall of about 500 mm, GD represents the low rainfall, heavy soil situation of the mechanized sorghum farming zones. Virtually all trials and nurseries conducted at WM under irrigation were also grown out for evaluation under rains at GD. (The plots at GD were generously allotted to us by the owner of the farm, Mr Mustafa Bashir). Early rains signalling time of planting were late-coming this

season. Planting was thus done on July 22 and 23-later than normal. Plant population of approx. 67,000 plants/ha was desired at a spacing of 75cm between rows and 20cm within rows. No fertilization was used. Rainfall during the season was higher than long time average but the distribution was poor. Some 75 % (379 mm) of the the total effective seasonal precipitation (557 mm) was received during the month of August. Crop emergence and stand establishment were excellent in most of the nurseries at GD. As the rains stopped in mid-September drought stress late in the season was apparent. Weeds particularly Johnson grass and various wild x cultivated sorghum intercrosses were heavy. No major insect or disease was prevalent. Some long smut was seen on some introductions and charcoal rot was apparent on stressed plants at late season.

El Obeid (OBD): Mean annual rainfall over 30 years is less than 400 mm; and with its light soil OBD represents most of the sorghum/millet growing zones of Western Sudan. Our 1981 sorghum nurseries were planted beginning on July 7 with the onset of early rains. Spacing of 75cm between rows and 20cm between plants within rows resulting in expected plant population of approx 67,000 plants/ha was adopted. No fertilizer was applied to the nursery. Initially there was enough moisture for seedling emergence, but 3 weeks of dry spell (July 28 to August 16) resulted in severe moisture stress. In addition to the moisture stress there seems to be significant soil variability in the plots at Kaba farm resulting in very erratic plant stand, highly reduced plant stature and poor crop performance. As a result no meaningful data could be collected or reported from our 1981 sorghum nurseries at El Obeid.

Agadi (AGD): Annual rainfall at Agadi runs about 600-750 mm. This station represents the relatively heavy precipitation in the central clay plains. Our trials were conducted on the Agadi State Farm of the Mechanized Farming Corporation. Planting was done on July 10 and 11. Plant population of 110,000 plants/ha (spacing, 60cm x 15cm) was adopted. No fertilization was used. Rainfall at the station was normal. Crop emergence and plant establishment were good. Weeds including Striga were severe. The station gets virtually inaccessible during the rainy

season and that caused some logistic problems. No major disease or insect pests were observed; Striga was serious, however.

Kadugli KDG): With its long term mean annual rainfall of about 750 mm, KDG represents the heavy rainfall and heavy soil situation in the Southern fringe of the Central Clay Plains. The station is located in the sorghum growing area around the Nuba Mountains. Our sorghum trials at Kadugli were carried out in cooperation with the Western Sudan Agricultural Research Development Project. Planting was unfortunately delayed till the 10th of August. Yet there was enough rain to develop a good crop, as the rainfall distribution was satisfactory. No fertilizer was applied to the nursery at Kadugli. Plant population adapted was high (110,000 plants/ha) for the management level provided. Diseases and pest were severe. Leaf diseases particularly Helminthosporium was heavy in our nursery. Surveys on farmers fields around the station showed heavy incidences of Cercospora, Colletotrichum and different kinds of smuts. Striga was the most severe in our nursery. The heavy infestation of Striga resulted in poor crop expression, though initial seedling emergence and stand establishment were good.

Visual scores in various trials and nurseries documented in here are ratings on a scale of 1-5 where 1 denotes the best and 5 the poorest. A (+) sign next to a given score implies the rating is better than the assigned score but slightly less than the next best. Appendix II gives the details of all experiments carried out in all our test locations - list of trials, sources of material, number of entries, number of replications, design used, plot size, and locations of testing are all provided.

I. VARIETAL IMPROVEMENT PROGRAM

A. Breeding Nurseries

At the end of every season selections are made from various trials and nurseries for use in our crossing program. A great deal of variability has been generated in the last few seasons by crossing elite introductions with popular local cultivars as well as by intercrossing among elite introductions. Emphasis is on improving the grain quality and yield potential of the locals and incorporation of the adaptation and moisture use economy of the locals on to the introductions. Breeding materials at various stages are now available in the program and they are being evaluated both under irrigated and rainfed conditions. Evaluation of these progenies during this past season indicated that promising lines with the desired attributes are being developed. Some of the progenies have already been included as pollinator parents in our hybrid improvement program with good success. Few others will soon be included in multi-locational variety testing yield trials.

Below is a brief account of our activities on breeding nurseries during 1981. Discussion will focus on crossing efforts and objectives and multilocational testing and evaluation of early generation breeding material.

1. Crossing Block - 1981

The list of materials utilized in our 1981 crossing program, block combinations desired, and the objectives of each crossing block is briefly outlined as follows:

Block-I: Group A x Group B

Objective: To combine mechanisms of early-season and late-season drought tolerance.

A. Pre-flowering Drought Tolerant Yellow Endosperm Selections: (100 Lines)

1/4	7/56	14/94	18/66	21/95
1/5	7/83	14/98	19/7	22/22
1/6	8/57	15/100	19/22	22/35
1/17	8/93	16/22	19/40	22/39
1/29	9/18	16/32	19/42	22/45
1/47	9/53	16/44	19/47	22/48
1/91	9/56	16/80	19/57	22/51
2/5	10/28	17/23	19/59	23/60
2/60	10/49	17/45	19/65	23/71
3/87	10/61	18/8	19/70	23/78
4/70	10/72	18/17	19/95	23/94
4/100	10/76	18/22	20/3	24/2
5/18	10/80	18/26	20/33	24/3
5/48	11/40	18/29	20/6	24/18
5/58	11/51	18/30	20/100	24/71
6/6	12/28	18/32	21/18	24/96
6/9	13/41	18/34	21/32	25/13
6/27	14/44	18/37	21/63	25/41
7/34	14/84	18/40	21/67	25/51
7/52	14/91	18/44	21/74	25/81

B. Post-flowering Drought Tolerant Local Sorghums

1. Ajebsido
2. Mugud
3. Safra
4. Wad Fehal
5. Mayo

Block-II: Group C x Group D

Objective: To improve the yield potential and/or grain quality attributes of local sorghums.

C. Elite Introductions - Top 7 Yielders in 1980 Elite Varieties Yield Trial.

1. M 62637
2. M 63594
3. M 62708
4. P-954063
5. M 36329
6. M 62641
7. M 62456

D. Popular Local Varieties.

1. Dabar
2. Tetron
3. Safra
4. Wad Fehal
5. Mugud
6. Mayo
7. Ajebsido

Block-III: Group E x Group F

Objective: To develop vigorous varieties (with or without fertility restoration) combining good adaptation and other agronomic attributes.

E. Elite B-Lines.

1. Tx 623B
2. P-954066B
3. CK-74B
4. IS-1006B
5. IS-10398B

F. Elite Local R-Lines.

1. Su.Cr. 54 : 18/17
2. Su.Cr. 36 : 80/70
3. Su.Cr. 65 : 30/27
4. Su.Cr. 54 : 16/15
5. Su.Cr. 36 : 81/71

In spite of staggered plantings we could only make some 50 % of the desired crosses because of poor nicking. Early planting of the local photosensitive parents resulted in delays in flowering. The F_1's from the 1981 summer crossing block are already planted in the current off-season 1981/82, and F_2 seeds will be harvested for planting at Wad Medani and Gadambalia in the main crop season of 1982.

2. F_2 Populations

A total of 178 F_2 populations resulting from Crossing Block 1980 and some intercrosses of Indian Sorghum Preliminary Varieties (received from Dr. N.G.P. Rao, ICRISAT in June 1980) were planted for evaluation and selection both under irrigated (Wad Medani) and rainfed (Gadambalia) locations. The source and background information of both of these groups of F2 material could be found in Annual Report 1980.

At Wad Medani, planting was done in early July in plots of 5 rows of 12m long and 60cm apart while at Gadambalia the nursery was planted in 5 rows each 5m long and 75cm wide in late July. At both locations plants were thinned out to 25cm apart to facilitate good individual plant development. Individual plant selections were made at maturity in some selected F2 families and the results are given in Table 21. At Wad Medani 373 F2 plants were selected whereas at Gadambalia only 98 F2 plants were advanced. There were fewer selections made from the F2 nursery at Gadambalia as it was damaged just before harvest by a herd of cattle belonging to a nomadic tribe. Resulting F3 progenies will be evaluated next season at the respective locations they were selected from.

3. F_3 Progeny Rows

From 20 F2 populations of intercrosses among elite Indian sorghum types with B and R fertility reactions sent to us by Dr. N.G.P. Rao, ICRISAT in July 1980, individual plant selections were made during the same season in thirteen F2 families. The selections were advanced for evaluation as F3 progeny rows in summer 1981.

Table 21. List of Crosses and Number of Selections made in F2 Populations Evaluated at Wad Medani and Gadambalia - summer, 1981.

Cross	No. of F2 Plants Selected	
	Wad Medani	Gadambalia
S-104 x Karper 669	2	0
S-107 x Karper 775	7	0
S-107 x Karper 551	4	4
S-107 x R-7725	0	3
S-110 x Karper 775	4	0
S-110 x R-7108	9	0
S-138 x Karper 551	8	8
S-65 x Karper 789	3	0
S-141 x Karper 665	5	0
S-141 x Karper 551	4	0
S-29 x Karper 665	7	0
S-55 x Karper 551	4	0
S-55 x Karper 665	7	0
S-142 x Karper 1281	9	0
R-8683 x Karper 665	10	0
R-8683 x Karper 789	14	0
R-8683 x Karper 1281	17	0
R-8737 x Karper 789	15	0
R-15 x Karper 669	4	0
R-8102 x Karper 1281	9	0
R-7725 x Karper 789	10	6
R-7108 x Karper 775	0	8
R-7108 x Karper 669	0	5
SPV 141 x SPV 102	6	7
SPV 141 x SPV 232	6	0
SPV 141 x SPV 265	4	0
SPV 126 x SPV 104	0	4
SPV 126 x SPV 221	4	0
SPV 104 x SPV 221	5	3
SPV 104 x SPV 232	3	0

Table 21 Contd.

Cross	No. of F2 Plants Selected	
	Wad Medani	Gadambalia
SPV 104 x SPVS 291	4	0
SPV 104 x 469-1	3	0
SPV 232 x SPV 104	6	0
SPV 232 x SPV 141	0	0
SPV 232 x SPV 221	0	5
469 x SPV 102	5	4
469 x SPV 104	5	4
469 x SPV 265	5	4
SPV 102 x M 35-1	3	5
SPV 221 x SPV 102	7	3
SPV 221 x SPV 104	10	0
SPV 221 x SPV 126	7	0
SPV 221 x SPV 291	11	0
SPV 232 x SPV 265	3	0
SPV 291 x SPV 104	5	4
SPV 291 x SPV 232	3	0
YE 55 x Safra	3	0
YE 55 x Dabar 1/1/1/1	3	0
YE 55 x M 66118	4	0
YE 55 x A 9057	4	0
YE 90 x A 9057	3	0
P-898012 x R-8102	12	0
YE 55 x Su.Cr. 34 : 6	8	0
Karper 660 x Su.Cr. 60 : 6	7	0
YE 293 x Su.Cr. 62 : 12/18	6	0
P-898012 x Kambal 18	7	5
Tetron x M 62466	2	4
Mugud x R-7581	0	3
Mugud x R-8102	4	0
M 66118 x Su.Cr. 35 : 20	2	0
M 62637 x Su.Cr. 62 : 12/18	10	0
M 62609 x Su.Cr. 62 : 12/18	5	0

Table 21 Cont.

Cross	No. of F2 Plants Selected	
	Wad Medani	Gadambalia
M 62456 x Su.Cr. 43 : 43/78	0	3
Su.Cr. 35 : 20 x Tetron	4	0
Su.Cr. 54 : 16 x Su.Cr. 43 : 43	5	5
Su.Cr. 36 : 44 x SRN 4882-B	4	0
Safra x M 62465	6	0
Luwiayaha x M 63594	5	0
Norkhow x Karper 970	4	0
Bende x Karper 756	8	5
Total	373	98

A total of 112 F3 progenies were planted in July 1981 both at Wad Medani and Gadambalia. At both locations an appropriate local check (Dabar at WM; Safra at GD) was planted after every nine F3 headrows making visual comparison possible both with the neighboring local check and among F3 progeny rows. Both nurseries emerged and developed very well without any major problem. Data on days to 50 % flowering, plant height and agronomic score were collected at both sites. However, the nursery at GD was unfortunately damaged by animals just before harvest and, therefore, no selection could be done. At maturity visual selection on the basis of general agronomic desirability and grain quality was done in the nursery grown at WM. The results, as presented in Table 22, indicated that 33 good F3 lines generated 56 derived lines to be evaluated as F4 progenies in summer 1982.

4. F_4 Progeny Rows

A multilocational evaluation of early generation breeding material was initiated in summer 1980 when a large number of F3 progeny rows derived from intercrosses of locals and elite introductions were evaluated at four locations in the Sudan - namely Wad Medani, Gadambalia, Agadi, and El Obeid (Annual Report 1980). Since these stations represent different sorghum growing zones of the country with different growing conditions, the objective was to evaluate and select materials originating from the same background population for possible specific adaptation. It was also hoped that by eventually pooling elite derivatives and evaluating them across locations, it might be possible to identify genotypes with broad adaptation.

During summer 1980 a total of 1698 F3 progeny rows were evaluated and varying number of selections were made at each test locations. As per original plans, each group of selections was to be reevaluated as F4 progeny rows at the respective location they originated from. However, the 1980 growing season at some locations, particularly Gadambalia and El Obeid, was less favorable and meaningful selections might not have been made. Hence all selections from the four locations were pooled together for reevaluation as F4 progeny rows.

Table 22. List of Crosses and Number of F3 Progenies Evaluated and Selected with Corresponding Sister-lines Derived - Wad Medani, 1981

Cross	F3 Progenies		F4 Sister-lines
	Evaluated	Selected	Derived
SPV-290 x SPV-140	8	6	9
SPV-290 x SPV-296B	18	7	11
SPV-290 x 2219B	4	0	0
CSV-5 x SPV-104	13	4	5
CSV-5 x 296B	40	0	0
CSV-5 x 2219B	4	0	0
CSV-5 x 2077B	17	5	14
SPV-104 x SPV-232	16	6	11
SPV-104 x 2077B	6	2	3
SPV-232 x 296B	6	2	2
SPV-232 x 2219B	6	1	1
232B x 2219B	4	0	0
232B x 2077B	3	0	0
Total	112	33	56

The 1981 F4 nursery consisted of 1270 progeny rows and was planted at optimum planting dates in four locations - Wad Medani, Gadambalia, El Obeid, and Agadi. At all the locations an appropriate local check was planted after every nine F4 progeny rows. Data on days to flowering, plant height and visual agronomic score were collected. At maturity visual selection was made at each location mainly on the basis of agronomic desirability and grain quality and on disease, insect and drought tolerance as relevant.

Table 23 summarizes the number of F4 progeny rows evaluated and selections made from them at each of the test locations.

Table 23. No. of F4 Family Rows Evaluated and Selected at four Test Locations During Summer 1981

Location	F4 Family Rows		F5 Lines
	Evaluated	Selected	Derived
Wad Medani	1270	134	273
Gadambalia	1270	74	109
Agadi	1270	90	106
El Obeid	1270	45	49

At Wad Medani the growing season was favorable as there was no major disease, insect or pest attack on the nursery. However at mid-season, just prior to headings there was shortage of irrigation water; as a result some degree of drought was experienced. Nevertheless the selections made at maturity looked very promising combining good crop expression and grain quality. A total of 273 lines were derived from 134 F4 families selected at Wad Medani.

The F4 nursery at Gadambalia developed very well without any major problem. The selections made at the location appeared well adapted with crop expression in par with the local check, Safra. Seventy four F4 families were advanced resulting in 109 derived lines.

There were some problems at the other two locations - Agadi and El Obeid. At El Obeid severe drought badly affected the nursery. At Agadi the crop emerged and established very well; but delayed thinning coupled with heavy weeds including Striga resulted in poor crop expression. Yet at Agadi 90 F4 progenies with a total of 106 derived lines were selected while at El Obeid 45 F4 families generated 49 derived lines. All these derived selections will be evaluated as F5 progeny lines during summer 1982 at the respective locations they were selected from.

5. F_5 Progeny Rows

As discussed in Annual Report 1980, a set of F2 plant selections from the 1979 F2 populations evaluated at Wad Medani was planted during the off-season 1979/80 for the purpose of advancing a generation. Each F3 entry was bulk harvested and advanced without any deliberate selection. The resulting F4 bulk rows were planted and selections were made in summer 1980.

During summer 1981, some 400 progeny rows of these F3 bulk derived F5 rows were grown out for selection at Wad Medani in single rows of 5m long. A local variety, Dabar, was planted after every nine F5 rows. Data on days to flowering, plant height and visual score on agronomic acceptability were recorded; and at maturity visual selection in comparison with the local variety was made. Table 24 presents the list of selected F5 rows with their pedigree, agronomic data, and number of lines derived. Twenty nine F5 families were identified as being elite with a total of 58 F6 lines derived from them. These will be yield tested for real superiority over the local check variety during the coming 1982 crop season.

B. Local Sorghum Germplasm

1. Evaluation of 1980 Local Collection

A total of 83 local sorghum cultivars were collected from farmers' fields during the crop season of 1980. Of these 77 entries were collected from around Abyei, southern Kordofan Province (Annual Report 1980).

able 24. List of F5 Progeny Rows With Their Agronomic Data and Number of Lines Derived - Wad Medani, 1980

Pedigree	Days to 50 % Flow.	Plant height (cm)	Agron. score (1-5)	No. of sister lines selected
((By x P4) x SPV 35)-2-bk-1	72	130	3+	1
(A1567 x E35-1)-2-bk-1	87	170	3+	3
(926 x SPV 13)-1-bk-1	80	130	3+	1
(926 x SPV 13)-3-bk-1	63	150	3+	1
(Su.Cr.65/21 x E35-1)-1-bk-1	85	270	3+	3
(Su.Cr.65/21 x A1567)-7-bk-1	85	140	2+	2
(Su.Cr.36:81/71 x A1700)-1-bk-1	85	200	2	1
(Su.Cr.51:22/28 x Karper 775)-2-bk-2	82	210	3+	1
(Su.Cr.51:22/28 x Karper 775)-5-bk-2	76	210	3+	2
(Su.Cr.65:8/8 x CSV_1)-3-bk-2	83	200	3+	1
(Su.Cr.67:98/68 x E35-1)-1-bk-1	83	260	3+	3
(Su.Cr.67:98/68 x E35-1)-5-bk-1	83	220	3	1
(Su.Cr.67:98/68 x 7047)-4-bk-2	83	180	3	2
(ALAD 6287 x Karper 775)-3-bk-3	82	270	3+	2
(ALAD 6319 x Karper 669)-8-bk-1	82	190	3+	2
(ALAD 6319 x Karper 669)-8-bk-2	81	150	3+	2
(Karper 775 x A 1581)-3-bk-1	82	130	2+	2
(Karper 775 x A 1581)-10-bk-2	81	130	2	1
(Karper 775 x A 1581)-2-bk-1	84	160	2	2
(Karper 1281 x Serere Sel.)-1-bk-2	81	190	2	4
(CSV_1 x 513)-7-bk-1	75	180	2	1
(CSV_1 x 940)-8-bk-1	83	220	3	1
(CSV_1 x A 1567)-3-bk-1	84	170	2+	3
(A1720 x 501)-3-bk-1	85	210	3+	2
(A1581 x 7047)-1-bk-2	83	240	2	5
(A1581 x 7047)-2-bk-1	73	150	1	2
(Su.Cr.54:18/17 x ALAD 6089)-1-bk-1	86	250	2	4
(Su.Cr.65:30/27 x ALAD 6354)-7-bk-1	84	240	3+	2
(A 6189 x 828 Diallal)-9-bk-1	85	190	3+	1

During the crop season of 1981, two sets of these new collections were grown out for evaluation and characterization at Wad Medani (irrigated) and Gadambalia (rainfed), in a single row plot observation nursery. Only one planting date was used at each location, but there was difference of two weeks in planting dates of the nursery at the two locations - Wad Medani (July 9) and Gadambalia (July 23).

There was not much difference in both maturity and height between the two plantings. In general maturity ranged between the early types that flowered in about 75 days to the late ones flowering in about 103 days; and some highly photosensitive types continued vegetatively without heading. There was a narrower range in plant height (170 cm - 300 cm) among the collection, with most of it skewed to the tall height group of over 2 meters. The entries in this collection, though from a high rainfall area in Southern Kordofan, showed good adaptation at both locations of evaluation.

There was a great deal of variability in the collection for most of the characters observed including maturity, photoperiod sensitivity, plant type, head type, pericarp color, presence or absence of testa, kernel hardness, presence or absence of awns and glume coverage. More significantly, pericarp colors ranging from white with and without testa to different shades of brown, purple, yellow and black pericarp were noted.

These observations on the collections were documented with assigned local accession numbers and kept separately for the record. In addition to a set of panicle branches and seed samples to be maintained at Wad Medani, a set has recently been sent to Genetic Resources Unit at ICRISAT for inclusion into the World Collection of Sorghum.

2. New Local Collection

In cooperation with other development projects in the country, several local sorghum cultivars were collected from 3 provinces in the Western Region of the Sudan during the 1981 crop season. The area of collection, number of samples collected, and the names of the cooperating organization involved in the collection are listed below:

Cooperating Organization	Area of Collection	Number Collected
1. IBPGR/ARC	Jebel Marra, Darfur Province	33
2. Jebel Marra Project	" " " "	63
3. INTSORMIL - Sudan	El Obeid area, N. Kordofan	87
4. W.Sudan Agr.Res. Project	Kadugli	7
Total		190

All of the above 190 collections were obtained as a result of organized germplasm collection expeditions and as such are accompanied with good set of collectors notes and some useful information.

Dr. Roger Crosten, Consultant botanist with IBPGR and Dr. Abdalla El Ahmadi, wheat breeder, ARC, collected the first group of collection from the Jebel Marra area; whereas the second group of accession from the same area was made by Jim Harvey and associates with the Jebel Marra Rural Devept. Project. INTSORMIL anthropologists, Dr. E. Reeves and T. Frankenberger and their Sudanese colleagues Ibrahim Zurgan and Mohammed Fideil made the collection in villages within 50 km radius around the city of El Obeid, N. Kordofan province. In a trip organized by WSARP, we collected 7 commonly grown local types around Kadugli in the Nuba Mountains.

Next season, these new collections will be grown out for characterization and hopefully some of the obvious duplication will be sorted out. As usual after such an evaluation, we will assign our local accession numbers to them; and a set of samples will be sent to Genetic Resources Unit at ICRISAT Centre for "safe-keeping".

C. Multilocational Variety Trials and Nurseries

Promising lines selected from the local breeding program, ICRISAT international nurseries, and other sources of introductions were put together in two types of multilocational variety trials. The first group, the 1981 Elite Sorghum Varieties Yield Trial (ESVYT), consisted of the most elite sorghum varieties available to us in the program for

evaluation along with two popular local varieties, Dabar and Safra. The second group, the 1981 Selected Sorghum Varieties Preliminary Yield Trial (SSVPYT) includes "second-string" entries from similar source as in ESVYT for initial multilocation yield evaluation. It is intended that as low yielding entries are dropped from ESVYT, they will be replaced by the promising ones from SSVPYT; thus multiseasonal data will be accumulated before a variety is forwarded for recommendation.

1. 1981 Elite Sorghum Varieties Yield Trial (ESVYT)

Twenty two elite varieties, one Indian commercial hybrid (CSH-6) and two locally popular food-grain varieties (Dabar and Safra) were included in our 1981 ESVYT. The trial was carried out at 5 locations - namely Wad Medani, Gadambalia, Agadi, El Obeid and Kadugli. A randomized complete block design with 4 replications of 4 rows of 5m long each was adopted for each test location. The spacing between rows and between plants within rows was different from location to location. At Wad Medani, Agadi and Kadugli a spacing of 60cm between rows and 15cm within rows was adopted resulting in approximately 110,000 plants/ha; whereas at El Obeid and Gadambalia, plant densities of about 67000 plants/ha was the desired plant population at a spacing of 75cm between rows and 20cm within rows. At all the locations seeds were drilled into furrows and plants were later thinned to desired densities about two weeks after emergence. No fertilizer was applied at all the locations except at Wad Medani where urea was applied at the rate of 80 kg N/ha.

Data on days to flowering, plant height, plant stand, head yield, grain yield, 100 seed weight, and visual agronomic scores were collected. In addition visual scores on diseases and pest attack were noted when relevant.

Tables 25 through 28 summarize the results of 1981 ESVYT at 4 test locations - Wad Medani, Gadambalia, Agadi and Kadugli respectively. No meaningful data could be collected at El Obeid as the severe drought resulted in erratic plant stand and poor crop establishment.

able 25. Results of Elite Sorghum Varieties Yield Trial - Wad Medani, 1981

Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt(g)	Agron. score (1-5)	Rank
954063	66	171	67	4676	3256	2.51	2.2	25
62641*	67	192	80	5803	4654	2.84	2.5	10
6329	74	218	122	6471	5093	2.66	3.0	8
63594	70	190	89	5322	4008	1.97	2.5	20
62637*	72	228	89	6658	5364	2.32	1.8	4
62708	70	235	82	5865	4050	2.65	3.0	19
36332	80	242	94	5823	4529	2.05	3.8	11
3054	77	158	112	6449	5051	1.80	2.8+	9
954062*	65	162	73	5155	3443	2.70	2.0	23
90344*	86	255	92	6867	5698	2.55	2.2+	3
90362*	82	208	75	6388	5238	2.67	1.5+	6
90396*	83	218	82	6430	5322	2.39	1.8+	5
90950*	75	198	91	7431	5887	2.06	1.0	2
3187	77	240	101	5469	4278	1.84	2.5	16
6557	66	182	63	4988	3382	2.06	2.2+	24
3940	71	207	82	6074	4425	2.14	3.2	14
3539	76	185	75	5197	4008	1.90	2.8	21
3631	68	180	112	6680	4467	1.64	3.2	12
3607*	74	142	112	6847	5155	1.64	2.2+	7
66145	77	192	79	5552	4320	1.99	2.5	15
ICr.54:18/17	70	175	97	5405	4069	2.18	4.0	18
ICr.35:5*	79	220	110	7034	5990	2.11	2.0	1
bar	83	212	95	5302	4445	2.52	3.0	13
fra	98	360	82	4654	3777	4.35	4.0	22
H-6	58	150	89	5887	4091	1.74	2.5	17
an	75	205	90	5937	4560	2.29	2.6	-
SD	1.2	8.7	6.5	708.5	556.4	-	-	-
CV %	2.3	6	30.3	16.7	17.3	-	-	-

* Promising Entries

Table 26. Results of Elite Sorghum Varieties Yield Trial - Gadambalia, 1981

ntry No.	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
1	P-954063	68	147	100	2509	1862	3.0	6
2	M-62641*	61	160	100	2597	1954	3.0	4
3	M-36329	73	150	110	2509	1820	3.0	8
4	M-63594	72	141	92	2522	1808	3.0	9
5	M-62637	78	162	88	2280	1624	3.0	18
6	M-62708	74	162	70	2154	1428	3.0	19
7	M-36332	85	137	88	1449	952	4.0	24
8	A-3054	81	121	84	1662	1140	4.0	23
9	P-954062*	70	142	110	2568	2062	3.0	3
10	M-90344	87	130	54	885	610	4.0	25
11	M-90362	88	125	84	2333	1774	3.0	10
12	M-90396	77	145	110	2138	1657	3.0	12
13	M-90950	81	132	94	2204	1482	4.0	18
14	A-3187	81	132	112	1912	1323	4.0	21
15	A-6557	69	142	104	2492	1570	3.0	16
16	A-39940	80	147	100	2338	1591	4.0	15
17	A-3559	82	147	90	1883	1173	4.0	22
18	A-3631	79	134	100	2188	1490	4.0	17
19	A-3607	73	120	110	2480	1741	3.0	11
20	M-66145	84	139	90	2196	1344	3.0	20
21	Su.Cr.54: 18/17	73	137	110	2943	2075	3.0	2
22	Su.Cr.35: 5	72	136	122	2179	1624	3.0	14
23	Dabar 1/1/1/1	82	132	118	2551	1891	3.0	5
24	Safra	83	222	84	2384	1824	3.0	7
25	CSH-6	63	147	80	3123	2305	3.0	1
	Mean	77	144	96	2259	1605	3.3	-
	$\bar{Sd}$	4.7	8.3	7.9	440.9	330.6	-	-
	CV %	8.6	8.2	23.2	27.6	28.1	-	-

* Appeared Promising

Table 27. Results of Elite Sorghum Varieties Yield Trial - Agadi, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
1	P-154063	72	163	48	2191	1628	3.3	15
2	M-62641*	74	165	60	2421	1878	3.0	5
3	M-36329	82	140	58	2087	1586	4.3	16
4	M-63594	93	148	56	1920	1440	4.3	19
5	M-62637	90	160	52	1448	1064	4.0	25
6	M-62708	90	175	47	2024	1570	3.5	17
7	M-36332	92	170	53	1941	1336	3.8	22
8	A-3054	90	120	61	2267	1674	3.8	13
9	P-954062	72	160	42	1712	1210	3.3	23
10	M-90344	92	153	54	2467	1858	3.5	6
11	M-90362	87	133	50	2238	1733	4.0	11
12	M-90396	87	148	54	2296	1753	3.8	10
13	M-90950	85	148	58	1983	1440	4.3	20
14	A-3187	83	148	48	2568	1983	3.8	4
15	A-6557	79	148	44	1941	1440	4.5	21
16	A-3940*	78	150	46	2902	2296	3.3	1
17	A-3539	91	138	48	2234	1670	3.5	14
18	A-3631	80	150	53	2129	1553	4.8	18
19	A-3607	85	115	59	2421	1795	3.8	8
20	M-66145*	88	133	58	2797	2067	3.3	3
21	Su.Cr.54:18/17	80	128	52	2726	2100	4.0	2
22	Su.Cr.35:5	79	143	49	2213	1753	3.3	9
23	Dabar 1/1/1/1	83	138	50	2484	1858	4.0	7
24	Safra	90	235	41	1699	1210	4.3	24
25	CSH-6	73	153	33	2392	1712	3.3	12
	Mean	84	150	51	2220	1664	3.8	-
	Sd	3.1	9.7	4.2	30.1	32.1	-	-
	CV %	5.3	9.1	17.8	30.1	32.1	-	-

* Appeared Promising

Table 28. Results of Elite Sorghum Varieties Yield Trial - Kadugli, 1981

Entry No.	Pedigree	Days to 50 % Flow.	Plant height (cm)	Grain yield (kg/ha)	Striga score (1-5)	Leaf blight score (1-5)	Agron. score (1-5)
1	P-954063	70	99	586	5.0	3.0	5.0
2	M-62641	71	111	507	3.0	2.0	3.0
3	M-36329	76	95	220	5.0	3.0	5.0
4	M-63594	77	103	590	5.0	2.0	4.0
5	M-62637	81	84	273	5.0	2.0	5.0
6	M-62708	80	87	559	4.0	2.0	4.0
7	M-36332	86	87	102	5.0	4.0	5.0
8	A-3054	80	88	165	5.0	3.0	5.0
9	P-954062	65	95	599	5.0	3.0	3.0
10	M-90344	80	85	430	5.0	2.0	4.0
11	M-90362	75	92	747	3.0	3.0	4.0
12	M-90396	75	99	457	5.0	3.0	4.0
13	M-90950	93	65	41	5.0	3.0	5.0
14	A-3187	93	57	60	5.0	2.0	5.0
15	A-6557	79	96	340	5.0	3.0	4.0
16	A-3940	76	90	372	5.0	2.0	4.0
17	A-3539	82	116	44	4.0	2.0	4.0
18	A-3631	77	94	209	5.0	3.0	5.0
19	A-3607	80	89	339	5.0	3.0	4.0
20	M-66145	78	117	399	2.0	3.0	3.0
21	Su.Cr.54:18/17	70	112	610	4.0	3.0	3.0
22	Su.Cr.35:5	64	104	727	3.0	3.0	2.0
23	Dabar 1/1/1/1	73	96	541	4.0	2.0	3.0
24	Safra *	64	150	802	2.0	3.0	2.0
25	CSH-6	63	109	509	4.0	3.0	3.0
	Mean	76	97	409	4.0	2.7	4.0
	Sd	2.9	11.3	207.2	-	-	-
	CV %	5.5	16.5	69.0	-	-	-

* Showed tolerance to Striga at Kadugli.

Wad Medani: The 1981 ESVYT at Wad Medani established and developed very well with no major problem as could be seen from the relatively low coefficient of variability (Table 25). The overall mean grain yield at Wad Medani was more than two fold of that recorded at any of the other stations. Entry No. 22 had the highest grain yield (5990 kg/ha) recorded; however this entry has chalky white pericarp with dark sub-coat. Based on grain yield, grain quality and general agronomic acceptability, entry numbers, 2, 5, 9, 10, 11, 12 and 13 (Table 25) were the most promising.

Gadambalia: Table 26 shows the result of 1981 ESVYT at Gadambalia. Seedling emergence and stand establishment were very good. However late planting (July 23) due to delayed onset of rains and some logistic problems, the total crop expression was reduced. The total effective rainfall recorded (557 mm) was higher than normal, but the distribution was very poor as about 75 % of the precipitation was received only during the month of August and rains stopped around mid-September. The overall mean grain yield was 1605 kg/ha (Table 26). CSH-6 gave the highest yield (2305 kg/ha) followed by Su.Cr. 54: 18/17 (2075 kg/ha) and P-954062 (2062 kg/ha).

Agadi: Table 27 provides the data of ESVYT at Agadi. The nursery emerged and established well but plant stature and total crop expression was reduced due to poor nursery management. The station was inaccessible by road during the season because of the heavy rains and this coupled with poor local arrangements resulted in lower than expected yields. Thinning was delayed and weeds including Striga were severe. The highest yielding entry was A-3940 with grain yield of 2296 kg/ha; but it was not significantly superior to the other entries.

Kadugli: The nursery at Kadugli had several problems. It was planted later than the optimum planting date. It was severely infested with Striga which was mainly responsible for reduced plant stature and poor yield. Leaf diseases particularly leaf blight (Helminthosporium turcicum Pass) was also fairly heavy. The variety Safra from East-Central Sudan looked the most tolerant to Striga in this trial at Kadugli, Western Sudan. Other entries, M-90362, M-66145, M-62641 and Su.Cr.35:5 also showed tolerance to Striga (Table 28).

Table 29 gives the combined mean grain yield data of 1981 ESVYT. Data from Kadugli was not included in the mean as it was uncharacteristically too low because of the severe Striga infestation.

2. 1981 Selected Sorghum Varieties Preliminary Yield Trial (SSVPYT)

This nursery consisted of 60 entries from various sources put together in a preliminary yield evaluation trial. A randomized complete block design with 2 replications in plots of 3 rows, 5m long each was used. Plant populations desired and all other details regarding cultural practices were the same as in 1981 ESVYT discussed above. The trials were also conducted in the same 5 locations as in ESVYT and similar set of data were also collected. The results from SSVPYT - 1981 are presented in Tables 30 through 34.

At Wad Medani where the growing conditions was the most favorable, the mean grain yield of all entries in this nursery was 4145 kg/ha. Several entries yielded significantly higher than the local check, Dabar. But entry No. 10, 11, 17, 21, 48 and 50, (Table 30) appeared the most promising overall.

Table 31 presents the results of SSVYT-1981 at Gadambalia. Twelve entries yielded higher than the local check variety, Safra; however, the differences were not statistically significant. Nevertheless entries No. 6, 48, and 53 looked promising on the basis of grain yield, grain quality and agronomic adaptation score.

Table 32 provides data on the results of SSVPYT-1981 at Agadi. Poor plant stand and heavy weeds resulted in low overall yield. Statistical analysis also indicated that data on grain yield was not significantly different among entries. In addition percent coefficient of variability was very high. As such meaningful comparison among entries could not be made. On visual agronomic acceptability, however, entries No. 3, 8, 38, 44 and 53 looked better adapted than the others.

Table 29. Mean Grain Yield (kg/ha) of Elite Sorghum Varieties Yield Trial at irrigated (Wad Medani) and rainfed (Gadambalia and Agadi) locations

Pedigree	Wad Medani	Gadambalia	Agadi	Mean
Su.Cr.35:5	5990 (1)**	1624 (14)	1753 (9)	3122 (1)
M-90950	5887 (2)	1482 (18)	1440 (20)	2936 (2)
M-90362	5238 (6)	1774 (10)	1733 (11)	2915 ( )
M-90396	5322 (5)	1657 (12)	1753 (10)	2911 ( )
A-3607	5155 (7)	1741 (11)	1795 (8)	2897 ( )
M-36329	5093 (8)	1820 (8)	1586 (16)	2833 ( )
M-62641	4654 (10)	1954 (4)	1878 (5)	2829 ( )
A-3940	4425 (14)	1591 (15)	2296 (1)	2771 ( )
Su.Cr.54:18/17	4069 (18)	2075 (2)	2100 (2)	2748 ( )
Dabar 1/1/1/1	4445 (13)	1891 (5)	1858 (7)	2731 (10)
M-90344	5698 (3)	0610 (25)	1858 (6)	2722 ( )
CSH-6	4091 (17)	2305 ( )	1712 (12)	2703 ( )
M-62637	5364 (4)	1624 (13)	1064 (25)	2684 ( )
A-3539	4008 (21)	1173 (22)	1670 (14)	2632 (14)
A-3054	5051 (9)	1140 (23)	1674 (13)	2622 (15)
M-66145	4320 (15)	1344 (20)	2067 (3)	2577 (16)
A-3187	4278 (16)	1323 (21)	1983 (4)	2528 (17)
A-3631	4467 (12)	1490 (17)	1553 (18)	2503 (18)
M-63594	4008 (20)	1808 (9)	1440 (19)	2419 (19)
M-62708	4050 (19)	1428 (19)	1570 (17)	2349 (20)
M-36332	4529 (11)	0952 (24)	1336 (22)	2272 (21)
Safra	3777 (22)	1824 (7)	1210 (24)	2270 (22)
P-954063	3256 (25)	1862 (6)	1628 (15)	2249 (23)
P-954062	3443 (23)	2062 (3)	1210 (23)	2238 (24)
A-6557	3382 (24)	1570 (16)	1440 (21)	2131 (25)
Mean	4560	1605	1664	2624
$\bar{Sd}$	556.7	330.6	NS	-
CV %	17.3	28.1	32.1	-

** Figures in parenthesis are ranks in grain yield

able 30. Results of Selected Sorghum Varieties Preliminary Yield Trial - Wad Medani, 1981

ry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt(g)	Agron. score (1-5)	Rank
	M-90110	74	160	112	5994	4412	2.28	3.0	23
2	M-90386	-	-	-	-	-	-	-	-
3	M-903660	86	190	62	5494	4412	2.98	3.0	24
4	M-90901	79	230	60	4828	3663	2.07	2.0+	44
5	M-90318	77	185	74	5578	4412	1.90	3.0+	25
6	M-91044	77	150	95	5161	3829	2.32	2.5	41
7	M-90253	77	240	98	5994	4828	2.31	2.5	11
8	M-90894	87	200	74	5907	4578	2.95	3.5	18
9	M-90384	73	255	97	5244	4245	2.44	3.5	28
0	M-90404*	75	230	77	5744	4828	3.06	2.0	12
1	M-90874*	88	150	72	5910	4828	2.09	2.0	13
2	M-90362	86	180	77	6243	4745	3.05	2.5+	14
3	M-90929	87	200	71	6327	5161	2.66	3.5	5
4	A-3732	71	230	100	5417	3996	2.45	3.0	34
5	A-6352	79	190	112	7242	5161	1.93	2.5+	6
6	A-6425	69	215	76	4578	3663	2.23	3.0	45
7	A-3699*	76	230	91	7159	5328	2.04	3.0+	4
8	A-6392	80	195	86	5910	4745	1.96	3.0	15
9	A-4041	80	255	80	6576	5078	2.10	3.5	9
0	A-6398	76	205	100	5328	4079	1.83	3.0+	33
1	A-3647*	86	250	74	6993	5827	2.48	3.5	1
2	A-4028	83	260	71	4911	3996	2.07	3.5	35
3	A-3844	80	285	106	5578	4329	2.65	3.5	26
4	A-2902	83	280	85	5827	4578	2.73	3.0	19
5	A-2509	87	195	82	7242	5411	1.72	3.0	3
6	A6370	78	195	71	5078	4162	2.00	2.5	31
7	A-3922	75	230	73	4995	3996	2.44	3.0	36
8	A-2612	75	225	79	5244	3996	1.85	3.5	37
9	M-62473	76	195	85	4578	3247	2.16	3.0	51
0	M-62477	81	185	82	7242	4912	2.26	2.0+	10
1	77C8771	75	140	68	4662	3496	2.37	3.0+	50
2	77C8766	78	130	74	4911	3663	2.50	3.0	46
3	A - 3872	77	175	41	4079	3247	3.18	3.0	52

Table 30 Cont.

ntry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt(g)	Agron. score (1-5)	Rank
4	A-3507	78	200	67	5578	3912	2.77	3.0	39
5	M-62618	76	245	88	5161	3746	1.92	3.5	43
6	M-62705	71	255	86	4995	3912	3.11	3.5	40
7	A-9520	74	240	64	3330	2414	2.51	3.5	57
8	A-3642	73	175	59	5328	3663	1.88	4.5	47
9	A-5648	78	185	56	4245	3246	1.99	3.5	53
0	A-3626	73	175	118	6410	4495	1.93	3.0+	20
1	A-5969	82	210	97	5328	3579	1.94	4.5	48
2	A-3513	73	200	124	5744	3996	1.95	4.0	38
3	A-3622	69	175	97	5994	4245	2.46	4.0	29
4	A-1157-1	80	160	21	2331	1831	2.21	4.5	59
5	A-1750	76	125	79	5910	4329	2.17	3.0+	27
6	A-3566	74	140	51	4079	2913	2.17	3.0+	54
7	M-64080	74	250	67	5744	4495	2.56	3.0	21
8	CSV_1-1*	71	180	104	6743	5143	3.04	3.0	7
9	P-702031-1	78	225	71	5577	4662	3.00	3.5	16
0	P-750005-1	76	190	98	7242	5494	3.06	2.5	2
1	P-850518-1	68	225	67	2997	1998	2.57	4.0	58
2	P-851045-1	69	150	65	3746	2664	1.38	3.0	56
3	P-967083-1	84	270	79	5328	4495	3.14	3.0	22
4	P-967079-1	86	300	79	5994	5161	1.69	4.0	8
5	A-3625	76	180	76	4245	2830	1.54	3.0	55
6	M-66320	81	210	92	5744	4662	2.57	3.5	17
7	M-62456	71	130	86	5078	3829	2.20	4.0	42
8	M-35598	80	195	86	5328	4162	2.67	3.0+	32
9	P-967059-1	73	200	70	4995	3579	3.54	3.5	49
0	Local(Dabar)/ 1/1/1/1	84	235	100	5328	4245	2.80	4.0	30
	Mean	78	206	81	5432	4145	2.34	3.2	-
	$\bar{Sd}$	2.2	14.9	5.7	501.0	373.7	-	-	-
	CV %	2.9	7.2	21.3	18.4	28.6	-	-	-

* Appeared Promising

31. Results of Selected Sorghum Varieties Preliminary Yield Trial - Gadambalia, 1981

Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
M-90110	70	127	106	2314	1582	3.0	20
M-90386	-	-	-	-	-	-	-
M-90360	88	130	54	2398	1815	3.0	14
M-90901	89	132	34	999	616	5.0	55
M-90318	98	120	64	1648	1082	4.0	45
M-91044*	84	115	84	3114	2131	3.0	5
M-90254	86	160	76	2081	1332	4.0	32
M-90894	94	125	92	2031	1532	3.0	24
M-90384	88	142	108	3213	2115	3.0	6
M-90404	80	145	108	2281	1515	3.0	25
M-90874	90	107	42	866	533	5.0	58
M-90362	86	120	94	2148	1548	3.0	23
M-90929	93	125	90	1532	1232	4.0	37
A-3732	72	157	110	3330	649	3.0	53
A-6352	84	112	86	1598	982	4.0	47
A-6425	70	157	122	2081	1449	4.0	29
A-3699	76	152	104	2131	1482	4.0	26
A-3692	81	167	72	2464	1349	3.0	31
A-4041	82	140	114	2930	2081	3.0	7
A-6398	84	140	86	2897	1797	3.0	18
A-3647	90	145	110	2564	1632	3.0	19
A-4028	80	155	60	1397	949	4.0	48
A-3844	83	185	92	1332	866	4.0	49
A-2902	85	157	114	1382	716	4.0	52
A-2509	86	135	58	1066	583	3.0	56
A-6370	82	130	120	1865	1116	4.0	43
A-3922	83	135	142	2198	1149	4.0	42
A-2612	86	155	58	949	616	4.0	54
A-62473	87	135	108	2964	2015	3.0	8
M-62477	80	125	68	1765	1049	4.0	46
77C8771	79	105	108	2081	1182	3.0	38
77C8766	84	110	86	1881	1265	4.0	35

Table 31 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
33	A-3872	70	140	66	2597	1898	3.0	10
34	A-3507	83	150	102	3613	2547	3.0	3
35	M-62618	76	175	82	2597	1482	4.0	27
36	M-62705	77	175	98	3447	2381	3.0	4
37	A-9520	77	165	98	2298	1832	5.0	12
38	A-36420	84	115	60	2048	1265	4.0	36
39	A-5648	70	157	96	2431	1565	3.0	22
40	A-3626	85	132	116	1898	1166	4.0	41
41	A-5969	87	137	90	1931	1182	3.0	39
42	A-3513	77	127	76	1965	1282	4.0	33
43	A-3622	79	132	80	2448	1582	3.0	21
44	A-1157-1	86	120	30	932	566	4.0	57
45	A-1750	88	102	64	1232	733	4.0	51
46	A3566	82	120	60	2264	1998	3.0	9
47	M-64080	80	175	88	2564	1832	4.0	11
48	CSV_1-1*	76	140	96	4096	2847	3.0	1
49	P-702031-1	-	-	-	-	-	-	-
50	P-750005-1	77	135	60	2148	1382	3.0	30
51	P-850518-1	77	152	68	1648	1082	3.0	44
52	P-851045-1	75	115	80	1632	1132	4.0	40
53	P-967083-1*	77	177	100	3746	2831	3.0	2
54	P-967079-1	83	180	88	1732	1282	4.0	34
55	A-3625	86	120	80	1832	833	4.0	50
56	M-66320	73	150	72	2148	1465	3.0	28
57	M-62456	78	170	90	2664	1798	3.0	15
58	M-35598	72	152	72	2498	1765	3.0	17
59	P-967059-1	72	135	70	2481	1782	3.0	16
60	Safra	83	137	110	2348	1831	3.0	13
	Mean	82	140	86	2185	1435	3.5	-
	$S\bar{d}$	4.9	12.3	4.8	NS	566.1	-	-
	CV %	5.9	8.7	22.2	40.9	38.6	-	-

* Appeared Promising

Table 32. Results of Selected Sorghum Varieties Preliminary Yield Trial - Agadi, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
1	M-90110	84	125	58	2414	1665	3.0	19
2	M-90386	-	-	-	-	-	-	-
3	M-90360*	85	130	45	3080	2414	2.0	4
4	M-90901	94	140	41	2081	1415	3.5	29
5	M-90318	93	125	67	1998	1332	3.0	34
6	M-91044	91	150	67	2248	1665	3.5	19
7	M-90253	93	145	44	1915	1415	3.5	30
8	M-90894*	88	165	61	3247	2580	3.0	3
9	M-90384	87	170	39	1498	0999	3.0	48
10	M-90404	87	125	48	2164	1748	3.0	17
11	M-90874	89	115	48	2031	1498	3.0	26
12	M-90362	92	140	48	2497	1915	3.0	12
13	M-90929	94	165	45	1665	1249	3.0	41
14	A-3732	78	125	32	1082	0666	4.0	57
15	A-6352	85	140	55	1332	1082	4.0	45
16	A-6425	79	150	50	2764	2081	4.0	8
17	A-3699	90	165	64	2331	1748	3.5	18
18	A-6392	92	130	55	3247	2414	3.0	5
19	A-4041	88	160	45	2031	1332	3.0	35
20	A-6398	91	130	36	1332	0782	4.0	56
21	A-3647	91	150	47	1748	1299	4.0	40
22	A-4028	98	150	59	1498	0916	4.0	50
23	A-3844	93	170	42	1915	1249	3.5	42
24	A-2902	95	175	52	1415	0916	3.0	51
25	A-2509	89	145	62	1415	0832	4.0	55
26	A-6370	97	125	48	1249	0916	3.5	52
27	A-3922	81	160	58	2914	2082	3.0	6
28	A-2612	96	150	33	1082	0666	4.0	58
29	M-62473	94	140	36	1748	1249	3.0	43
30	M-62477	91	120	32	2248	1582	5.0	22
31	77CS771	88	105	36	1948	1415	3.0	31
32	77CS766	82	115	39	2164	1582	3.0	23

Table 32 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
33	A-3872	86	120	24	1865	1332	3.0	36
34	A-3507	85	145	36	2214	1532	3.0	25
35	A-62618	86	185	39	1915	1365	3.5	32
36	M-62705	83	165	36	2664	1998	2.5	10
37	A-9520	81	185	44	2348	1831	2.5	13
38	A-3642*	85	165	56	2830	2081	2.5	7
39	A-5648	83	165	41	2164	1498	3.0	28
40	A-3626	83	115	50	2830	1998	3.0	9
41	A-5969	89	135	41	1848	1332	3.5	37
42	A-3513	85	130	44	1415	0916	3.5	53
43	A-3622	85	130	41	2248	1581	3.0	24
44	Gadam El Hamam	80	120	55	3663	2830	3.0	1
45	A-1750	88	105	38	1199	0849	4.0	54
46	A-3566	91	115	26	1498	1082	5.0	46
47	M-64080	87	175	38	2581	1915	3.0	11
48	CSV_1-1	78	125	36	2164	1498	3.5	27
49	A-702031	87	115	20	0583	0333	4.5	59
50	P-750005	81	125	33	1665	1248	3.5	44
51	P-850518-1	85	150	45	1831	1332	3.0	38
52	P-851045-1	86	110	32	1415	0999	4.0	49
53	P-967083-1*	91	160	32	3540	2647	3.0	2
54	P-967079-1	92	180	33	2248	1748	3.5	16
55	A-3625	92	135	35	2031	1365	4.0	33
56	M-66320	82	135	55	2114	1831	3.0	14
57	M-62456	78	165	45	2331	1748	3.0	15
58	M-35598	80	135	27	1998	1665	3.0	21
59	P-967059	91	120	55	1498	1082	3.0	47
60	Dabar	88	135	67	2331	1332	3.0	39
	Mean	88	142	44	2057	1486	3.3	-
	$S\bar{d}$	5.4	18.1	3.9	NS	NS	-	-
	CV %	6.4	12.8	23.7	37.7	43.2	-	-

* Appeared Promising

Table 33. Results of Selected Sorghum Varieties Preliminary Yield Trial - Kadugli, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Grain yield (kg/ha)	Striga score (1-5)	Leaf blight score (1-5)	Agron. score (1-5)
1	M-90110	72	87	734	4.0	3.0	3.0
2	M-90386	-	-	-	-	-	-
3	M-90360	71	87	1262	4.0	2.0	3.0
4	M-90901	-	48	75	5.0	2.0	5.0
5	M-90318	83	84	371	4.0	3.0	3.0
6	M-91044	77	47	42	5.0	2.0	5.0
7	M-90253	74	102	443	5.0	2.0	4.0
8	M-90894	70	101	1152	4.0	2.0	3.0
9	M-90384	79	119	204	5.0	2.0	4.0
10	M-90404	68	89	997	4.0	2.0	4.0
11	M-90874	76	77	266	5.0	2.0	4.0
12	M-90362	75	94	634	4.0	2.0	2.0
13	M-90929	81	100	529	5.0	3.0	3.0
14	A-3732	68	97	579	5.0	3.0	4.0
15	A-6352	73	99	411	5.0	3.0	4.0
16	A-6425	73	114	474	5.0	2.0	4.0
17	A-3699	68	119	989	3.0	3.0	3.0
18	A-6392	79	88	356	5.0	2.0	4.0
19	A-4041	75	102	248	5.0	2.0	5.0
20	A-6398	72	102	466	5.0	2.0	4.0
21	A-3647	76	95	571	5.0	3.0	4.0
22	A-4028	82	91	356	4.0	3.0	4.0
23	A-3844	78	99	352	5.0	2.0	5.0
24	A-2902	82	110	333	5.0	2.0	4.0
25	A-2509	80	72	341	2.0	2.0	4.0
26	A-6370	78	116	753	1.0	2.0	4.0
27	A-3922	77	97	426	1.0	2.0	3.0
28	A-2612	81	84	128	5.0	3.0	5.0
29	M-62473	79	101	318	4.0	2.0	4.0
30	M-62477	77	88	225	5.0	3.0	4.0
31	77CS771	72	80	246	2.0	3.0	3.0
32	77CS776	74	79	401	4.0	3.0	3.0

Table 33 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Grain yield (kg/ha)	Striga score (1-5)	Leaf blight score (1-5)	Agron. score (1-5)
33	A-3872	77	95	817	3.0	2.0	4.0
34	A-3507	79	98	430	5.0	2.0	4.0
35	M-62618	75	140	478	5.0	2.0	5.0
36	M-62705	73	125	787	4.0	3.0	4.0
37	A-9520	83	94	421	5.0	3.0	4.0
38	A-3642	76	85	400	5.0	2.0	4.0
39	A-5648	66	108	966	4.0	2.0	3.0
40	A-3626	78	80	308	3.0	3.0	4.0
41	A-5969	81	87	193	5.0	2.0	5.0
42	A-3513	82	96	310	5.0	3.0	3.0
43	A-3622	74	100	663	2.0	3.0	4.0
44	Local	64	97	891	3.0	2.0	2.0
45	A-1750	-	38	123	5.0	3.0	5.0
46	A-3566	79	79	185	5.0	3.0	4.0
47	M-64080	77	139	919	4.0	2.0	5.0
48	CSV_1-1	76	92	717	5.0	2.0	5.0
49	P-702031-1	90	85	40	5.0	3.0	5.0
50	P-750005-1	82	99	425	5.0	3.0	5.0
51	P-850518-1	73	112	373	5.0	3.0	5.0
52	P-851045-1	77	61	193	5.0	3.0	5.0
53	P-967083-1**	71	144	1467	2.0	2.0	2.0+
54	A-967079-1	83	87	400	4.0	3.0	4.0
55	M-3625	79	82	423	5.0	3.0	5.0
56	M-66320	79	97	273	5.0	2.0	5.0
57	M-62456	69	108	749	4.0	3.0	4.0
58	P-35598	71	125	932	5.0	2.0	4.0
59	P-967059-1	78	102	713	3.0	2.0	3.0+
60	Dabar 1/1/1/1	71	79	261	5.0	2.0	5.0
	Mean	76	95	501	4.3	2.4	4.0
	$\bar{Sd}$	NS	15.1	130	-	-	-
	CV %	7.4	15.9	53.1	-	-	-

** Most Resistant to Striga and good evident grain quality.

Table 34. Mean Grain Yield (kg/ha) of Top Fifteen Entries in 1981 Selected Sorghum Varieties Preliminary Yield Trial under irrigated and rainfed conditions

Pedigree	Wad Medani	Gadambalia	Agadi	Kadugli*	Mean
P-967083-1	4495 (22)**	2831 (2)	2647 (2)	1467	3324 (1)
CSV_1-1	5161 (7)	2847 (1)	1498 (27)	717	3169 (2)
A-3647	5827 (1)	1632 (19)	1299 (40)	571	2919 (3)
M-90894	4578 (18)	1532 (24)	2580 (3)	1152	2897 (4)
A-3699	5328 (4)	1482 (26)	1748 (18)	989	2852 (5)
A-6392	4745 (15)	1349 (31)	2414 (5)	356	2836 (6)
A-4041	5078 (9)	2081 (7)	1332 (35)	248	2830 (7)
M-90360	4412 (24)	1815 (14)	2414 (4)	1262	2880 (8)
M-62705	3912 (40)	2381 (4)	1998 (10)	787	2764 (9)
M-64080	4495 (21)	1832 (11)	1915 (11)	919	2745 (10)
M-90362	4745 (14)	1548 (23)	1915 (12)	634	2736 (11)
P-967079-1	5161 (8)	1282 (34)	1748 (16)	400	2730 (12)
P-750005-1	5494 (2)	1382 (30)	1248 (44)	425	2708 (13)
M-90404	4828 (12)	1515 (25)	1748 (17)	997	2697 (14)
A-3507	3912 (39)	2547 (3)	1532 (25)	430	2664 (15)
⋮	⋮	⋮	⋮	⋮	⋮
Mean	4145	1435	1486	501	?
$\bar{Sd}$	373.7	566.1	NS	130	-
CV %	28.6	38.6	43.2	53.1	-

* Data from Kadugli (column 5) not included in the mean - (Too low yield due to severe Striga infestation).

** Figures in parenthesis are ranks in grain yield.

At Kadugli seedling emergence and stand establishment were good in spite of late planting and the ensuing heavy rains in mid August. However, due to heavy Striga infestation the total crop productivity was highly reduced. The overall mean grain yield recorded was a mere 501 kg/ha (Table 33). The most significant information obtained from this trial at Kadugli was the identification of P-967083-1 as a probable Striga-resistant variety. We found that in both replications of this trial there were significantly less number of Striga plants on this entry, while plots on both sides of P-967083-1 were heavily infested with Striga. Other entries that showed tolerance included M-90894, M-90362, P-967059-1 and M-90360.

Table 14 presents overall mean grain yield of the highest yielding entries in SSVFYT-1981. Ironically, the highest overall yielder was P.967083-1, the same entry identified as possessing good level of Striga tolerance. Some of these high yielding entries in SSVFYT-1981 (Table 34) will be upgraded for inclusion into ESVYT in a multilocation yield trial planned for 1982.

3. Head Selections from 1980 Trials and Nurseries

From all introduced trials and nurseries carried out during 1980 crop season, elite entries were selected either for preliminary yield testing or as pollinator parents in the hybrid program. In addition head selections were made in otherwise poor entries for further observation during 1981 season.

A total of 186 head selections from 1980 trials and nurseries were grown out in observation nurseries at 5 locations - Wad Medani, Gadambalia, Agadi, Kadugli and El Obeid. Single row observation plots of 5m long each were used for each entry at all locations. Agronomic data were collected as usual and selections were made at maturity at all locations. The following is a list of entries selected in this nursery from various locations, either for hybrid program as pollinator parent (PP) or for variety trial testing (Var):

Pedigree	Selection		Location
	TP	Var	
A-3739-2	X		WM
A-3739-4	X		WM
A-3649-1		X	WM, KDG
A-894-1-1	X		WM
A-6535-2	X		WM
A-755-1-1		X	WM
A-6359-3		X	GO
A-6387-1		X	KDG
A-6559-4		X	KDG
A-3699-3		X	KDG
M-90874-1		X	WM, AGD
M-90883-1		X	WM
M-90885-1	X		WM
M-90393-1		X	GD, AGD
M-90900-1		X	GD

D. Introduced Variety Trials and Nurseries

In addition to diverse sources of sorghum germplasm that we continue to carefully introduce to the program from several cooperators around the world, we obtain advanced breeding lines from ICRISAT Centre as package trials and nurseries. So far, this has been extremely useful to our program as many of these accession have been identified as excellent parental materials in both our varietal and hybrid improvement programs. Some lines have also been identified as high yielding and significantly superior to local varieties.

The following is a report on the results of International Variety Trials and Nurseries introduced this past season from ICRISAT Centre for evaluation in the Sudan.

1. ICRISAT Sorghum Variety Trial (ICSVT-1981)

ICSVT-1981 consisted of 24 experimental entries with one local check variety to be supplied by us. We received 2 sets of this nursery for trial both under irrigation (at Wad Medani) and under rain (at Gadambalia). A randomized complete block design with 2 replications was used. Plot size at both locations was 4 rows of each 5m long. Plant populations of 110,000 plants/ha (60cm between rows and 15cm within rows) and 66,000 plants/ha (75cm between rows and 20cm within rows) were used at Wad Medani and Gadambalia, respectively. It must be noted that different randomization was used for the 2 locations. The results of ICSVT-1981 are presented in Tables 35 and 36.

At Wad Medani the nursery emerged and established very well without any major problem. Crop expression in this nursery was tremendous as the growing environment was near optimal. Table 35 shows that the overall location mean for grain yield was high, 4956 kg/ha, with no significant statistical difference among entries. On the basis of visual agronomic score, however, entries No. 14, 15, 18, 19, and 25 (Table 35) looked promising.

Table 36 shows the results of ICSVT-1981 at Gadambalia. The highest yielding entry in this trial was the local variety Safra with a mean grain yield of 2948 kg/ha. Other entries that appeared promising on the basis of yield, grain quality and agronomic acceptability score include entries No. 12, 18, and 21 (Table 36).

Based on their overal performance at both locations entries M-36136, M-39335, SPV-138, M-36178, M-36107, A-6250, and A-6102 were selected for inclusion in ESVYT for 1982.

2. Sorghum Elite Progeny Observation Nursery - SEPON - 1981

An observation nursery of SEPON-81 consisting of 46 advanced breeding lines from the ICRISAT Mould resistant breeding program, one Indian commercial hybrid, CSH-6, and one local check variety, was sent to us for evaluation in the Sudan. Since enough seed was available for two locations, the nursery was planted at both irrigated (Wad Medani) and rainfed (Gadambalia) locations. Observation nurseries of 2 rows of 5m long each were planted at both Wad Medani and Gadambalia.

Table 35. Results of ICRISAT Sorghum Variety Trial - Wad Medani, 1981

ntry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed (wt(g)	Agron. score (1-5)	Rank
1	M-36121	73	235	92	5511	4383	3.27	3.5	20
2	A-6102	69	205	87	4342	3423	2.22	3.0	25
3	A-6001	70	180	117	7306	5552	1.71	2.5+	5
4	M-36163	79	215	92	7682	6179	2.47	3.0+	2
5	A-6033	72	210	92	6721	5010	1.90	2.5	14
6	A-6306	74	230	115	5594	4550	2.22	4.0	19
7	M-39281	73	230	98	6554	5218	2.34	4.5	10
8	M-36056	76	230	87	6930	5427	2.14	3.0+	7
9	A-6026	71	225	97	5427	3757	2.06	4.5	22
10	A-6286	76	235	93	6429	5177	2.61	3.0	11
11	M-36154	76	235	98	5928	5010	2.43	3.0	13
12	A-6092	73	230	92	4676	3632	1.72	3.5	24
13	Dabar 1/1/1/1	81	200	84	6304	4843	2.64	3.5	17
14	M-36136*	78	215	78	6972	5886	2.68	3.0+	4
15	M-39335*	71	185	87	7097	5469	1.97	1.5+	6
16	A-6019	74	245	92	6638	5051	1.94	3.0	12
17	SPV-138	67	195	83	5093	3674	2.72	2.0	23
18	M-36178*	73	205	82	6346	4968	2.49	1.5+	15
19	M-36107*	73	215	79	6429	5260	2.02	2.0+	8
20	M-36007	69	190	88	5427	4091	2.91	2.5+	21
21	A-6064	71	220	86	6387	4926	2.17	2.5+	16
22	A-6106	73	230	87	5803	4550	2.56	3.0	18
23	M-36528	76	235	156	7556	6053	2.32	3.5	3
24	M-36095	80	205	83	6304	5260	3.25	2.0	9
25	A-6250*	76	245	79	8099	6554	2.53	2.5+	1
	Mean	74	218	93	6302.	4956	2.37	2.9	-
	Sd	1.3	11.8	10.2	NS	NS	-	-	-
	CV %	1.8	5.4	16.6	16.5	17.4	-	-	-

* Appeared Promising

Table 36. Results of ICRISAT Sorghum Varieties Trial - Gadambalia, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
1	M-36163	89	155	24	676	551	4.0	25
2	M-36136	85	142	76	2472	1653	3.0	11
3	A-6092	70	165	106	3223	2213	3.0	3
4	A-6064	80	147	102	3115	2073	4.0	6
5	M-39281	83	165	90	1687	1060	4.0	22
6	A-6250	82	145	82	2029	1236	4.0	18
7	M-36121	70	177	96	3073	2204	3.0	4
8	M-36178	87	130	60	1921	1361	3.0	16
9	A-6026	82	140	88	2488	1645	4.0	12
10	A-6019	86	147	62	2054	1044	4.0	23
11	A-6001	82	140	80	1946	1294	4.0	17
12	SPV-138*	76	152	96	3028	2071	3.0	7
13	M-36528	88	160	106	2964	1837	3.0	9
14	M-36007	85	140	92	2806	1986	3.0	8
15	M-36095	82	145	76	2413	1637	3.0	13
16	Safra (Local)	80	250	44	3874	2948	3.0	1
17	A-6106	80	150	78	1971	1177	4.0	19
18	A-6102*	71	167	110	3298	2221	3.0	2
19	A-6306	81	175	116	2647	1837	4.0	10
20	M-36056	87	175	100	2280	1470	4.0	15
21	M-39335*	82	155	100	3415	2113	3.0	5
22	A-6033	83	135	72	2096	1152	4.0	20
23	M-36154	88	165	72	1695	1069	5.0	21
24	A-6286	88	140	56	969	593	4.0	24
25	M-36107	75	135	58	2580	1511	4.0	14
	Mean	82	156	82	2429	1598	3.6	-
	Sd	5.3	9.1	9.3	584.5	409.2	-	-
	CV %	6.4	5.9	22.6	34.1	25.5	-	-

* Appeared Promising

Tables 37 and 38 present the results of SEEON-81 at Wad Medani and Gadambalia respectively. At Wad Medani seedling emergence, plant stand and crop expression in this nursery were very good. No major disease, insect or pest problem was observed in this nursery. The results on SEEON-81 at Gadambalia are presented in Table 38. Most of the SEEON-81 entries did poorly at Gadambalia perhaps because of poor distribution of rainfall (Table 1). Based on the results at both locations, however, entries No. 9, 12, 16, 17, 22, 26, 33, 43 (Table 37) have been selected for inclusion directly to the 1982 ESVYT. It is noteworthy that entries No. 9, 16, 17 and 26 found as promising in SEEON-81 were also identified as being elite in ICRISAT Variety Trial - discussed above. In addition entries No. 2, 4, 7, 10, 14, 21, 25, 28 (Table 37) have also been selected as pollinator parents for our hybrid crossing program.

3. International Sorghum Preliminary Yield Trial-1 (ISPYT-1)

1981-ISPYT-I consisted of 25 entries including a hybrid check, CSH-6, and a local variety - all to be grown out as an observation nursery. Two sets of this nursery were received from ICRISAT Centre for trial at Wad Medani and Gadambalia, Two-row plots of 5m long each were used at both locations. Row and plant spacings were as in other trials at both locations.

Tables 39 and 40 provide the data for ISPYT-I at Wad Medani and Gadambalia, respectively. Entry A-6250 was the highest yielder and the most outstanding at Wad Medani (Table 39). Interestingly this entry was also included in the 1981 ICRISAT Sorghum Variety Trial and was again the highest yielder in that trial at Wad Medani (Table 35). At Gadambalia the highest yielding entry was the local check variety, Safra, and none of the entries in ISPYT-I came even close (Table 40).

Table 37. Results of Sorghum Elite Progeny Observation Nursery - Wad Medani, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt(g)	Agron. score (1-5)	Rank
1	M-36001	68	130	94	3590	2171	2.55	4.0	48
2	M-36031	72	150	66	5344	3924	1.90	3.0	31
3	M-36113	79	140	44	4258	2839	2.43	4.0	44
4	M-36172	72	150	100	5845	4425	2.72	2.0	19
5	M-36208	76	110	115	4509	3256	2.02	3.0	39
6	M-36213	75	170	76	4926	3924	2.44	3.0	32
7	M-36232	80	180	86	4429	3340	2.37	3.0	38
8	M-36248	72	230	89	5093	4008	2.43	4.0	28
9	M-36136*	79	220	74	6847	5093	3.03	2.0	11
10	M-36091	79	170	67	4509	3841	2.28	2.0	33
11	M-36170	81	220	106	4258	3173	2.72	4.0	41
12	M-36190*	77	220	88	6680	5511	2.24	3.0	5
13	M-36056	76	240	74	5928	4759	2.64	3.0	16
14	M-36158	72	160	88	5344	4175	2.32	3.0	24
15	M-36229	72	210	82	6847	5427	1.95	3.0	6
16	M-39335*	72	200	95	6429	4926	2.78	2.0	13
17	M-36107	72	200	95	5344	4342	2.76	2.0	20
18	M-36411	75	200	88	5511	4342	2.27	4.0	21
19	M-36272	72	230	95	4592	3173	1.95	4.0	42
20	M-36007	66	190	110	5177	3841	1.98	3.0	34
21	M-36131	68	210	104	6262	4592	3.15	2.0	18
22	M-36095*	79	200	92	6429	5177	3.07	2.0+	10
23	M-36374	79	190	80	5010	3757	2.80	3.0	36
24	M-36037	72	230	95	5928	4342	2.39	4.0	22
25	M-36182	72	200	73	4843	4008	2.48	2.0	29
26	M-36178*	72	200	80	6346	5260	2.32	2.0+	8
27	M-36183	72	190	77	6346	5010	2.34	2.0	12
28	M-36200	70	170	73	6012	4676	2.38	2.0+	17
29	M-36197	76	240	62	6513	5260	2.30	5.0	7

Table 37 Cont.

ry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt(g)	Agron. score (1-5)	Rank
	M-36081	72	160	68	5761	4091	2.83	3.0	27
	M-36263	77	190	97	7406	5678	2.49	4.0	4
	M-36157*	76	200	95	7515	5845	2.53	3.0	2
	M-36161*	81	210	85	6930	5678	2.69	2.0	3
	M-36216	67	180	56	3507	2588	2.44	3.0	46
	M-36221*	80	240	112	7515	6262	2.20	3.0	1
	M-36266	72	230	70	5093	4342	2.50	3.0	23
	M-36428	72	190	89	4843	3674	2.43	4.0	37
	M-36429	76	190	79	3757	3173	2.32	5.0	43
	M-36453	79	240	91	3507	2672	2.13	5.0	45
	M-36528	77	230	111	5845	4926	2.59	4.0	14
	M-36406	80	220	112	4008	3256	2.26	5.0	40
	M-36435	84	250	85	5845	4843	2.61	5.0	15
	M-36463*	77	230	114	6429	5260	2.17	3.0+	9
	M-39281	72	220	85	5177	4175	2.03	5.0	25
	M-36168	76	210	70	5010	3841	3.03	5.0	35
	M-36121	72	200	101	5010	4175	2.43	4.0	26
	CSH-6	58	130	79	3340	2171	2.83	3.0	47
	Dabar 1/1/1/1	81	160	95	4843	4008	2.70	4.0	30
	Mean	75	196	87	5427	4234	2.46	3.2	-

Table 38. Results of Sorghum Elite Progeny Observation Nursery - Gadambalia, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Head yield (kg/ha)	Agron. score (1-5)	Rank
1	M-36001	65	130	3891	3.0+	7
2	M-36031	70	130	3674	3.0	10
3	M-36113	71	120	3006	3.0+	23
4	M-36172	72	130	1971	4.0	42
5	M36208	70	100	1670	4.0	44
6	M-36213	72	140	4609	4.0	2
7	M-36232	83	140	2505	4.0	36
8	M-36248	84	170	3240	4.0	16
9	M-36136	84	140	2422	4.0	37
10	M-36091	84	160	2355	3.0	36
11	M-36170	94	140	2021	4.0	41
12	M-36190	95	140	2271	4.0	40
13	M-36056	83	170	3056	4.0	21
14	M-36158	84	120	3323	3.0	13
15	M-36229	83	170	2572	4.0	35
16	M-39335	81	140	1553	3.0	45
17	M-36107	71	150	2839	4.0	28
18	M-36411	83	140	3190	4.0	17
19	M-36272	84	130	2605	4.0	34
20	M-36007	70	140	2789	3.0	29
21	M-36131	84	130	2639	4.0	33
22	M-36095	89	130	2856	3.0+	27
23	M-36374	84	140	3056	3.0+	20
24	M-36037*	70	180	4342	3.0+	3
25	M-36182	87	140	2739	4.0	30
26	M-36178	88	140	3039	4.0	22
27	M-36183	87	140	2923	3.0	26
28	M-36200	84	130	3874	3.0+	8
29	M-36197	89	170	3090	4.0	19
30	M-36081*	84	140	4008	3.0	5
31	M-36163	89	160	3273	4.0	14
32	M-36157	94	160	1369	5.0	47

Table 38 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Head yield (kg/ha)	Agron. score (1-5)	Rank
33	M-36161	89	140	1804	4.0	43
34	M-36216	70	170	2739	3.0	31
35	M-36221	96	140	1403	5.0	46
36	M-36266	84	170	3707	3.0	9
37	M-36428	70	150	3591	4.0	12
38	M-36429	71	170	2973	4.0	25
39	M-36453	84	170	2989	3.0	24
40	M-36528	88	150	2288	4.0	39
41	M-36406	87	150	1252	5.0	48
42	M-36435	87	180	2672	4.0	32
43	M-36463	89	170	3257	3.0	15
44	M-39281	84	180	3624	5.0	11
45	M-36168	70	180	3173	3.0+	18
46	M-36121*	65	170	4309	2.0	4
47	CSH-6	65	140	3908	4.0	6
48	Safra(Local)	82	230	7415	2.0	1
	Mean	81	150	2997	3.6	1

* Appeared promising

le 39. Results of International Sorghum Preliminary Yield Trial-1 - Wad Medani, 1981

Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt(g)	Agron. score (1-5)	Rank
A 6033	72	160	38	4843	3674	1.87	3.0	12
A 6266	77	150	61	3173	2004	2.56	3.0	25
A 6299	75	160	70	7598	5928	2.38	3.0	2
A 6103/6102	72	170	65	3924	2672	1.91	4.0	21
A 6118*	72	180	92	5761	3340	2.07	3.0+	15
A 7053	70	200	104	3757	2672	2.30	4.0	22
A 6170	72	220	76	4425	3256	1.64	4.0	16
A 3574	68	130	97	4509	3089	1.58	4.0	18
A 6001	72	160	77	4342	2922	1.54	3.0	19
A 6306	77	220	88	4425	3590	2.04	4.0	13
A 7001	68	210	86	5093	3841	2.24	3.0	10
A 6141	70	180	92	5678	4258	2.09	3.0	6
Dabar 1/1/1/1	80	180	45	4676	3507	2.82	3.0	14
A 6207	68	200	100	4008	2755	1.87	3.0+	20
A 6291	80	180	79	5427	4008	2.52	5.0	8
A 6149	68	190	50	3256	2254	1.92	4.0	24
A 6092	74	200	88	5177	3674	1.96	3.0	11
CSH-6	60	160	61	3841	2505	2.08	5.0	23
A 6175	76	220	104	5344	4843	2.31	3.0	3
A 6151	72	230	95	5344	4258	2.26	3.0	5
A 6154*	75	200	47	5260	3924	2.19	2.0	9
A 6252	78	200	38	5511	4342	2.64	3.0	4
A 6201	67	160	56	5928	3173	2.12	3.0	17
A 6259	70	170	64	5928	4091	1.93	3.0	7
A 6250*	75	190	74	7598	6012	2.64	3.0	1
Mean	75	185	74	4993	3623	2.14	3.5	-

* Appeared Promising

Table 40. Results of International Sorghum Preliminary Yield Trial -I Gadambalia, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Head yield (kg/ha)	Agron. score (1-5)	Rank
1	A-6141	71	150	3257	3.0	11
2	A-6092	69	160	3674	4.0	8
3	A-6207	70	170	3240	4.0	12
4	A-6151	82	180	4192	4.0	2
5	A-6266	70	160	4025	4.0	5
6	A-6118	82	140	1971	5.0	24
7	A-6291	81	130	2138	4.0	23
8	A-6033	82	150	2756	4.0	17
9	A-7053	83	170	4092	4.0	4
10	A-6299	70	150	2340	3.0	19
11	A-7701	68	160	3891	3.0	7
12	A-6175	84	160	2338	5.0	20
13	A-6250	84	150	2221	5.0	21
14	A-6306	84	170	1570	5.0	25
15	A-6001	84	150	3105	5.0	13
16	A-6149	68	160	2171	5.0	22
17	A-6103/6102	65	170	2822	4.0	16
18	A-6170	68	150	2655	5.0	18
19	A-3574	70	130	2989	4.0	15
20	A-6201	70	160	3925	5.0	6
21	A-6259	79	180	3056	5.0	14
22	A-6252	84	170	3607	5.0	9
23	CSH-6	66	130	4175	3.0	3
24	A-6154	84	130	3407	4.0	10
25	Safra (Local)	82	260	6747	2.0	1
	Mean	82	160	3215	4.2	-

4. International Sorghum Preliminary Yield Trial-2 (ISPYT-2)

This trial consisted of 24 advanced generation lines from ICRISAT breeding populations and their crosses with other elite material. All other details were the same as in ISPYT-I discussed above. Two sets of this nursery were received for evaluation under irrigated (Wad Medani) and rainfed (Gadambalia) conditions.

Tables 41 and 42 provide data from ISPYT-II at Wad Medani and Gadambalia, respectively. Entries A-6298, A-7045, and A-6269 looked good at Wad Medani on the basis of grain yield and agronomic acceptability. CSH-6 and Safra (local) looked better than all other entries at Gadambalia.

In general most entries in both ISPYT-I and ISPYT-II looked unadapted to the short growing season at Gadambalia. Should the rainfall be a little more distributed (less rain in August and some in late September and early October), many of the entries may have fared better.

Table 41. Results of International Sorghum Preliminary Yield Trial-II - Wad Medani, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt(g)	Agron. score (1-5)	Rank
	A 6178	80	190	59	4425	3507	2.37	3.0	24
	A 6121	72	200	82	6429	4843	2.21	3.0	13
	A 6180	79	200	91	5845	4759	2.53	3.0	14
	A 6241	78	230	83	7348	5928	2.44	4.0	7
	Dabar 1/1/1/1	80	180	59	5260	4425	2.74	4.0	18
	A 7003	75	190	74	6012	4592	1.70	2.0	15
	A 6243	76	240	73	7682	6346	2.63	3.0	3
	A 7031	67	210	65	4592	3256	2.35	3.0	26
	A 6142	75	200	77	6680	5260	2.68	3.0	10
	A 6267	79	250	65	5761	4509	2.40	3.0	15
	A 6351	75	190	64	5344	3841	1.86	4.0	23
	A 6088	76	130	95	5761	4091	2.14	3.0	20
	A 6213	77	190	85	8061	6346	1.80	3.0	2
	A 6344	78	220	71	5010	4008	2.18	3.0	21
	A 3263	79	220	41	5928	4592	2.26	3.0	14
*	A 6269	77	190	71	7348	5427	2.14	2.0	9
	A 6228	81	250	76	8183	6012	2.43	3.0	6
	A 6106	72	230	39	4676	3340	2.64	3.0	25
	CSH-5	72	220	68	7765	5511	2.13	2.0	8
*	A 7045	75	220	68	7849	6262	2.70	2.0	4
	CSH-6	62	170	74	5093	3841	2.15	3.0	22
	A 6275	77	230	80	9018	6179	2.69	3.0	5
	A 6145	75	200	55	4342	3256	2.67	3.0	27
	A 6258	77	190	59	6573	5177	2.09	4.0	11
	A 3666	79	200	71	5511	4342	1.94	4.0	19
	A 6307	85	220	67	6429	5093	2.36	4.0	12
*	A 6298	79	200	85	7932	6596	2.24	3.0	1
	Mean	76	206	70	6326	4864	2.31	3.1	-

* Appeared Promising

Table 42. Results of International Sorghum Preliminary Yield Trial-II - Gadambalia, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Head yield (kg/ha)	Agron. score (1-5)	Rank
1	Safra(Local)	82	230	3591	3.0	5
2	A-6351	84	150	2438	4.0	16
3	A-6258	83	160	3457	3.0	6
4	A-3263	89	140	2505	4.0	15
5	A-3263	89	180	2655	4.0	13
6	A-6088	88	110	3958	4.0	3
7	CSH-6	65	150	4175	3.0	1
8	A-6307	89	140	2355	5.0	17
9	A-3666	82	170	2806	4.0	11
10	CSH-5	81	150	3106	4.0	8
11	A-6106	83	140	1353	5.0	26
12	A-6243	86	150	1369	4.0	25
13	A-6269	84	140	2171	4.0	19
14	A-6275	83	180	3607	4.0	4
15	A-6344	82	160	1787	4.0	21
16	A-6142	79	150	3190	4.0	7
17	A-6145	81	160	2355	5.0	18
18	A-6298	89	160	1620	5.0	23
19	A-6267	84	170	2973	5.0	10
20	A-7003	84	120	1754	5.0	22
21	A-6180	85	130	2138	5.0	20
22	A-6241	87	170	1570	5.0	24
23	A-6228	87	140	1069	5.0	27
24	A-6178	78	190	2756	4.0	12
25	A-6121	79	170	3023	5.0	9
26	A-7045	83	150	2522	4.0	14
27	A-7031*	67	170	4025	3.0	2
	Mean	83	157	2605	4.2	-

II HYBRID IMPROVEMENT PROGRAM

Our hybrid sorghum improvement program is developing to our fullest satisfaction. We have trained our staff with the technical routines of handling a very large size of nurseries on the synthesis and evaluation of experimental hybrids, selections, maintenance and evaluation of parental lines from various sources materials, and the overall concept of hybrid improvement vis-a-vis varietal improvement program. With the back up support of the sorghum improvement program at ICRISAT Centre and in cooperation with sorghum programs elsewhere, we have accumulated an array of diverse male sterile (A & B) lines which we continue to evaluate both for seed production potential and combining ability with diverse pollinator lines. We have also put together a very large pool of pollinator lines which have been evaluated and characterized in locations with good potential for hybrid production.

The varietal and hybrid improvement programs are also well integrated and balanced both with regard to logistic arrangements and material flow. A group of elite F4 selections from our local varietal improvement breeding nurseries resulted in elite experimental hybrids when test-crossed with established female lines. I believe that more and more hybrid parental lines will be generated from our local breeding efforts in the future. As the hybrid program is expanded we find that the bulk of our off-season activities better be concentrated on synthesis of new experimental hybrids and regeneration of promising hybrids for multilocational reevaluation. The crossing block for our varietal improvement program is carried on during the main season and F_1's from it grown out during the off-season.

Our hybrid sorghum improvement program entails the following activities: parental lines evaluation and maintenance, synthesis and evaluation of experimental hybrids, and evaluation of introduced hybrids - and will be discussed below in the same order.

A. Parental Lines Evaluation and Maintenance

1. New A & B Lines Accession

A growing number of A & B lines from diverse sources is being accumulated in the program. Our introduction of new A & B lines during this past year is summarized as follows:

Source	No.of Pairs Introduced
ICRISAT Drought Tolerance Breeding Program	6
ICRISAT Mould Resistance " "	17
INTSORMIL (via Texas A & M)	6
Total	29

The above new introductions were evaluated for agronomic adaptation and seed yield potential this past season (sec. II-A-3 below). An A-line test-cross involving all these new A & B lines is already underway during the current off-season (1981/82) for combining ability testing in summer 1982.

2. R-Line Pool

As new selections are made from various introductions and progenies from our local breeding program, they are immediately utilized in synthesis of new experimental hybrids using established set of female lines as testers. At the same time they are also grown out for closer observation and characterization.

A set of over 500 pollinator lines that have been used in production of experimental hybrids during the last 3 seasons were grown out at Wad Medani this past season. These have now been fully characterized and the completed data on their agronomic and potential as hybrid parents will be documented and kept for future reference. The pool of pollinator lines available to us is growing every season and evaluation and mainteance will of course continue but not necessarily every season. At the end of this past season 200 new pollinator lines have been selected and their R-line test cross using established A-lines (Tx 623A, 296A, and 2077A) is underway during the current off-season (1981/82) nursery. The number and source of newly selected pollinator lines is as follows:

Source	No. selected
F5 (Sudanese x Exotic) selections	162
1981 - SEPON	8
1981 - ISPYT-1 & 2	3
1981 - INTSORMIL introduction	9
Sudanese National Program	14
Miscellaneous	4
Total	200

3. Evaluation of B-lines

New B-lines introduced during the year (1981) were grown out for evaluation of their adaptation and seed yield potential both at Wad Medani and Gadambalia during summer 1981. At Wad Medani 10 other elite A & B lines already at hand were also included whereas at Gadambalia only Tx 623B, 2219B, and 2077B were included.

The results from the B-lines observation nurseries at Wad Medani and Gadambalia are presented in Tables 43 and 44 respectively. At both locations Tx 623 looked the best combining good overall adaptation and high seed yield potential. New Introductions from ICRISAT, D84265B, H70B, H-74B, looked good at Wad Medani but they had very poor head exertion and bad synchrony in flowering with female lines. Tx 625B had good yield potential but it was later than most pollinator lines.

B. Synthesis and Evluation of Experimental Hybrids

The making and evaluation of experimental sorghum hybrids in our program is handled at three different stages. Initially several hundred hybrids are generated by test-crossing a large group of diverse pollinator lines on few established A lines and vice versa. These are evaluated in observation nurseries under irrigation at Wad Medani and under rains at Gadambalia as New Experimental Hybrids (NEH) observation nursery. In the second stage experimental hybrids that looked better adapted and promising (approx. top 10 %) on the basis of relevant data collected on NEH evaluation will be resynthesized during the ensuing off-season for a preliminary yield evaluation as selected Experimental Hybrids (SEH) preliminary yield trial again at Wad Medani and Gadambalia. In the final stage the

Table 43. Results of B-lines Observation Nursery - Wad Medani, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Grain yield (gm/plot)	Agron. score (1-5)	Rank
1	D-84265-B	75	140	1900	2.0	5
2	D-84271-B	68	130	1640	3.0	9
3	D-84281-B	72	170	1250	4.0	13
4	D84301-B	68	110	610	3.0	20
5	H-701-B	74	150	2300	2.0+	3
6	H-74-B	76	160	2120	2.0+	4
7	2219-B	68	080	650	2.0	19
8	2077-B	76	120	770	2.0	17
9	TX-623-B	68	120	2900	1.0	1
10	IS-10454-B	72	090	1500	2.0+	11
11	IS-10360-B	68	100	1470	3.0	12
12	CK-74-B	68	080	970	3.0	14
13	IS-10674-B	58	100	1520	5.0	10
14	IS-10240-B	72	100	900	3.0	15
15	IS-1005-B	66	090	550	3.0	21
16	IS-1006-B	68	130	1730	2.0+	6
17	TX-625-B	76	120	2830	2.0+	2
18	1887-B	62	080	230	4.0	22
19	35-B	72	110	1730	2.0+	7
20	4R-B	70	100	1730	5.0	8
21	TX-612-B	66	090	680	3.0	18
22	599-B	60	090	770	3.0	16
	Mean	69	112	1170	2.8	-

Table 44. Results of B lines Observation Nursery - Gadambalia, 1981

Entry	Pedigre	Days to 50 % Flow.	Plant height (cm)	Head yield (gm/plot)	Agron. score (1-5)	Rank
1	BT x 623	72	120	1610	3.0+	5
2	BT x 625	76	120	1300	3.0	7
3	B 1887	64	080	930	4.0	11
4	B 35	73	100	1020	4.0	10
5	B 4R	74	080	930	4.0	12
6	BT x 612	65	090	560	4.0	14
7	B 599	66	100	1950	2.0	3
8	2077 B	73	110	1110	3.0	9
9	2219 B	71	110	1160	4.0	8
10	H-74 B	71	150	1890	3.0+	4
11	H-70 B	74	140	1410	3.0	6
12	D-84281-B	76	150	930	4.0	13
13	D-84301-B	69	090	120	4.0	15
14	D-84265-B	72	140	2190	3.0	1
15	D-84271-B	70	130	2050	2.0	2
	Mean	71	114	1277	3.2	-

most elite hybrids that filtered through the first two stages of screening will be resynthesized and put together in a multilocational yield trial - Elite Experimental Hybrids (EEH) yield trial. Multiseasonal data accumulated thus should be useful when elite hybrids are finally presented for recommendation.

1. 1981 New Experimental Hybrids (NEH)

In the most successful off-season nursery we have handled so far, we generated over 1500 new experimental hybrids during the 1980/81 winter nursery at Wad Medani. Usually the severe stem-borer infestation that occurs during the cool months results in poor quality nursery. However, with a weekly regime of insecticidal spray (sevin @ 1.5 lb/feddan) for 5 consecutive weeks following emergence, we were able to establish good nursery and undertake our crossing programs as planned.

Our 1981 NEH observation nursery consisted of 1580 hybrids made up during off-season 1980/81 and were grown out for evaluation at Wad Medani and Gadambalia. The NEH nursery at Wad Medani was planted in 2 rows of 3m long at a spacing of 60cm between rows and 15cm within rows. At Gadambalia single row plots of 5m long and a spacing of 75cm between rows and 20cm between plants were used. Both nurseries were non-replicated but an appropriate local check variety was planted after every nine hybrid entries thus making visual comparison with the neighboring plots easier.

Data on days to 50 % flowering, plant height, head yield per plot, agronomic score, lodging, disease and insect problems as appropriate were recorded. In addition at Wad Medani few heads were bagged in each hybrid entry before flowering to determine the fertility restoration of each pollinator parent.

On the basis of data collected from both at Wad Medani and Gadambali, the most promising entries will be advanced to SEH for 1982 main season. Table 45 presents agronomic data on 125 promising hybrids selected from 1981 NEH observation nursery at Wad Medani. Data in Table 45 shows that hybrids yielding as much as 236 % of the local check, Dabar were identified. On the average yield advantage was 40 % over the local variety when all entries were taken into consideration (Table 45). The resynthesis of these new selections is already underway during the 1981/82 off-season for reevaluation next season as 1982 SEH.

Table 45. Agronomic Data on I romising New Experimental Hybrids - Wad Medani, 1981

Entry	Pedigree	Days to 50 % Flow.	I lant height (cm)	Agron. score (1-5)	Head yield % gm/plot	% local
1	2219A x Su.Cr.36:49/44	72	180	2.0	2700	164
2	2219A x " 36:80/70	72	190	2.0	2800	170
3	2219A x " 36:81/71	69	190	2.0	3100	188
4	2219A x Karper 770	68	140	3.0	1700	103
5	2219A x M-66187	66	140	2.0	2500	152
6	2219A x A-3625	69	180	2.0	2200	133
7	2219A x M-90950	69	150	2.0	2400	145
8	2219A x M-90874	65	150	3.0	2100	127
9	2219A x M-90396	75	180	3.0	3000	182
10	2219A x M-90895	75	160	3.0	3000	182
11	2219A x M-91051	65	180	2.0+	2500	152
12	2219A x M-90926	78	190	1.0	3700	224
13	2219A x A-9052	68	140	3.0	2200	133
14	2219A x M-62507	65	190	4.0	2400	145
15	2219A x M-62455	75	150	3.0+	2600	157
16	2219A x A-3642	68	160	3.0	2000	121
17	2219A x A-1157-1	67	180	4.0	2900	176
18	2219A x 4/1	64	130	3.0	2100	127
19	2219A x WM 80S7199-1	68	190	2.0	3000	182
20	2219A x WM 80S7461-1	63	150	3.0+	2100	129
21	2219A x WM 80S7561-1	68	120	3.0	1800	109
22	2219A x WM 80S7971-1	69	170	3.0+	2600	158
23	2219A x WM 80S7960-1	69	160	2.0	3400	206
24	2219A x WM 80S7996-1	72	160	3.0+	2450	148
25	TX-623A x Su.Cr.67:84/56	75	170	3.0	2500	152
26	TX-623A x ALAD 6767	62	190	3.0+	1900	115
27	TX-623A x ALAD 6199	65	130	2.0	2000	121
28	TX-623A x ALAD 6323	66	150	2.0	1400	085
29	TX-623A x ALAD 6354	68	130	2.0	2600	158
30	TX-623A x Karper 405	65	140	2.0	2300	139
31	TX-623A x Karper 1281	65	130	2.0	2300	139

Table 45 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Agron. score (1-5)	Head gm/plot	yield % local
32	TX-623A x Karper 1318	65	160	2.0	2800	170
33	TX-623A x M-66187	68	200	2.0+	2500	152
34	TX-623A x A-3566	68	140	2.0	2100	127
35	TX-623A x YE 90	64	160	2.0	2300	139
36	TX-623A x Karper 1096	66	210	2.0	1700	103
37	TX-623A x M-90950	71	190	2.0	2500	152
38	TX-623A x M-90874	78	150	2.0	2700	164
39	TX-623A x M-90347	78	200	3.0	3300	200
40	TX-623A x M-90362	78	170	2.0	2800	170
41	TX-623A x M-90396	77	190	2.0	3300	200
42	TX-623A x M-90895	72	200	2.0	3300	200
43	TX-623A x M-91051	68	140	2.0	1900	115
44	TX-623A x A-3187	68	160	2.0	2200	133
45	TX-623A x A-6529	69	170	2.0	1800	109
46	TX-623A x YE 63	69	140	3.0+	2350	142
47	TX-623A x A-9052	75	140	2.0	3000	200
48	TX-623A x M-62467	73	210	2.0	3500	212
49	TX-623A x M-62455	77	170	2.0	3200	194
50	TX-623A x M-66859	68	210	2.0	2800	170
51	TX-623A x A-310-1-1	65	150	2.0	2100	127
52	TX-623A x A-1071-1	69	170	1.0	2600	157
53	TX-623A x 2/89	65	170	2.0	1900	115
54	TX-623A x 5/1	69	150	2.0	2100	127
55	TX-623A x 15/6	60	130	2.0	1800	109
56	TX-623A x 15/8	61	140	2.0	1800	109
57	TX-623A x 17/78	72	160	2.0	2500	151
58	TX-623A x WM 80S7449-1	73	200	2.0	3600	218
59	TX-623A x WM 80S7455-1	68	170	2.0	1900	115
60	TX-623A x WM 80S7460-1	68	170	2.0+	2000	121
61	TX-623A x WM 80S7885-1	72	170	2.0	2300	139
62	TX-623A x WM 80S7887-1	72	270	2.0	3300	200
63	TX-623A x WM 80S7791-1	69	150	2.0	2300	139

Table 45 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Agron. score (1-5)	Head yield gm/plot	Head yield % check
64	TX-623A x wM 80S7413-1	72	220	2.0	3000	182
65	IS-10576A x Su.Cr.36:81/71	72	150	2.0	2800	170
66	IS-10464A x Karper 1297	75	160	1.0	2200	133
67	CK-74A x Su.Cr. 36:80/70	78	150	2.0	2000	121
68	CK-74A x Su.Cr. 54:18/17	72	140	3.0	1600	097
69	CK-74A x ALAD 6323	65	110	3.0+	2500	152
70	CK-74A x M-90950	72	140	1.0	2500	152
71	CK-74A xM90347	78	180	2.0	2000	121
72	CK-74A x M-90396	77	170	2.0	2700	164
73	CK-74A x A-6535	65	160	3.0+	1100	067
74	CK-74A x M-66159	69	130	2.0	1900	115
75	CK-74A x M-62467	72	170	2.0	2700	164
76	CK-74A x 7/29	66	110	2.0	2000	121
77	CK-74A x 8/50	66	120	2.0	1500	091
78	CK-74A x 10/61	69	120	2.0	1600	097
79	CK-74A x 10/69	69	110	2.0	1200	073
80	CK-74A x 11/40	69	110	2.0	1100	067
81	CK-74A x 12/55	68	120	2.0	1300	079
82	CK-74A x 17/78	68	130	3.0+	1500	091
83	CK-74A x 19/58	68	130	2.0	2000	121
84	CK-74A x wM 80S7199-1	79	150	2.0	1800	109
85	IS-10360A x Su.Cr.54:18/17	81	120	3.0+	1500	091
86	IS-10360A x Su.Cr.65:44/37	77	150	2.0	2500	151
87	IS-10360A x Su.Cr.67:11/9	76	160	2.0	2100	127
88	IS-10360A x ALAD 6167	68	140	2.0	2000	121
89	IS-10360A x Karper 677	68	150	3.0	2100	127
90	IS-10360A x Karper 770	68	130	2.0	2000	121
91	IS-10360A x M-90874	79	130	2.0	2300	139
92	IS-10360A x M-90362	79	210	2.0	2200	133
93	IS-10360A x M-90396	77	200	2.0	2300	139
94	IS-10360A x YE 63	68	150	2.0	2000	121
95	IS-10360A x M-62467	77	200	2.0+	3900	236
96	IS-10360A x A-1157-1	68	170	2.0+	2500	152

Table 45 Cont.

	Pedigree	Days to 50 % Flow.	Plant height (cm)	Agron. score (1-5)	Head yield gm/plot	Head yield % check
97	IS-10360A x 147	62	140	2.0	2500	152
98	IS-10360A x 20/68	65	140	3.0+	2800	170
99	IS-10360A x WM 80S7413-1	75	130	2.0	2100	127
100	IS-10360A x WM 80S7449-1	77	170	2.0	1800	109
101	IS-10360A x WM 80S7756-1	59	160	2.0	2700	164
102	IS-1006A x Su.Cr.36:80/70	71	160	2.0	2000	121
103	IS-1006A x Su.Cr.36:81/71	71	180	2.0	1800	109
104	IS-1006A x Su.Cr.57:1/1	75	200	2.0	1200	073
105	IS-1006A x Su.Cr.67:84/56	69	170	2.0	1600	097
106	IS-1006A x A-1481	65	120	2.0	2100	127
107	IS-1006A x Karper 735	63	170	3.0+	2200	133
108	IS-1006A x M-90874	75	160	2.0	1800	109
109	IS-1006A x M-91057	72	160	2.0	1100	067
110	IS-1006A x M-90347	77	180	2.0	1600	096
111	IS-1006A x M-90894	77	190	2.0	2000	121
112	IS-1006A x M-90362	76	210	1.0	2500	152
113	IS-1006A x M-90396	78	210	1.0	3700	224
114	IS-1006A x M-90895	78	210	2.0+	2300	139
115.	IS-1006A x M-80411	68	200	2.0+	1800	109
116	IS-1006A x M-91051	71	180	2.0+	2500	152
117	IS-1006A x M-62467	74	200	2.0+	2800	170
118	IS-1006A x M-62455	72	180	1.0	2600	158
119	IS-1006A x A-648-2-1	64	160	3.0+	2000	121
120	IS-1006A x 2/89	63	140	2.0	2500	152
121	IS-1006A x 3/97	66	120	2.0	1600	096
122	IS-1006A x 5/59	72	150	2.0	2200	133
123	IS-1006A x 20/68	66	150	3.0	1850	112
124	IS-1006A x WM 80S7473-1	69	140	2.0	1600	097
125	IS-1006A x WM 80S7479-1	69	160	2.0+	3100	188
126	Local Daber 1/1/1/1 (mean of 5 entries)	82	150	3.0	1650	100
	Mean	71	161	2.2	2298	139

2. 1981 Selected Experimental Hybrids Preliminary Yield Trial

During summer 1980, some 70 promising hybrids were selected out of over 700 new experimental hybrids evaluated during the same season (Annual Report, 1980). Of these, enough seed was generated during the 1980/81 winter off-season for 50 selected hybrids to be evaluated in replicated yield trials both under irrigation and under rains. Our 1981 SEH preliminary yield trial, thus, included 50 entries and was planted at Wad Medani and Gadambalia. CSH-5 and CSH-6 and/an appropriate local variety (Dabar at Wad Medani and Safra at Gadambalia) were included as checks.

Tables 46 and 47 provide data on SEHPYT as obtained from Wad Medani and Gadambalia respectively.

At Wad Medani entry numbers 10, 17, 33, 35 and 49 were found to be promising on the basis of grain yield, grain quality, agronomic score and general adaptation (Table 46). No major disease, insect or pest attack was observed at this station.

At Gadambalia entries 1, 2, 3 and 4 (Table 47) were the most promising. I-954066A hybrids usually have poor head exertion when grown under irrigation at Wad Medani but they showed no exertion problem at Gadambalia. With their excellent grain quality attributes, they hold good promise for the rain lands.

Seed increase of the most elite hybrids in the 1981 SEH (Tables 46 and 47) will be made for inclusion in the planned 1982 Elite Experimental Hybrids multilocational yield trial.

3. 1981 Elite Experimental Hybrids Yield Trial (EEH)

The most elite group of hybrids that had filtered through the last two seasons of evaluations at different stages were put together in our 1981 Elite Experimental Hybrids (EEH) multilocational yield trial. The trial was conducted at 5 locations - namely Wad Medani, Gadambalia, Agadi, Kadugli, and El Obeid.

Table 46. Results of Selected Experimental Hybrids Yield Trial - Wad Medani, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt (g)	Agron. score (1-5)	Rank
1	P-954066A x Su.Cr.51:32/28	78	170	56	4579	3663	2.46	3.0	32
2	P-954066A x Su.Cr.54:16/15	75	195	86	4828	3746	2.08	4.0	30
3	P-954066A x Karper 1297	62	170	71	5411	3996	3.12	3.5	25
4	P-954066A x Karper 1488	61	185	68	4828	3496	2.80	3.5	35
5	P-954066A x YE 90	65	190	80	6493	4578	2.52	3.0	17
6	P-954066A x YE 96	61	170	70	3996	2913	2.79	4.0	47
7	P-954066A x YE 293	62	185	70	4828	3580	2.54	3.5+	34
8	P-954066A x 77CS691	63	175	80	3829	2664	3.05	3.5	49
9	TX-623A x Su.Cr.36:49/44	73	190	82	7243	5661	2.02	2.0	6
10	TX-623A x Su.Cr.36:81/71*	75	200	94	8491	6660	2.24	1.5	2
11	TX-623A x Su.Cr.40:19/17	78	260	86	6077	4995	2.59	4.0	12
12	TX-623A x Su.Cr.48:43/36	78	255	82	4918	3912	2.66	4.0	27
13	TX-623A x Su.Cr.48:60/52	75	255	74	4412	3330	2.59	4.5	41
14	TX-623A x Su.Cr.51:32/28	78	270	89	6243	5078	2.42	4.0	11
15	TX-623A x Su.Cr.54:16/15	70	200	85	6327	4912	2.32	2.5+	14
16	TX-623A x Su.Cr.56:17/16	6[illegible]	190	85	7159	5494	2.89	2.0+	9
17	TX-623A x Su.Cr.56:29/26*	73	150	82	7409	5578	1.85	1.5+	7
18	TX-623A x Su.Cr.65:8/8	76	150	95	5994	4495	2.13	2.5+	19
19	TX-623A x Su.Cr.65:44/37	77	190	94	6909	5411	2.20	1.5	10
20	TX-623A x Su.Cr.66:10	74	260	70	5411	4245	2.38	4.0	22
21	TX-623A x Su.Cr.67:11/09	77	180	92	6993	5494	2.23	2.0+	8
22	TX-623A x 67:77/53	69	180	94	6244	4744	2.25	3.0	16
[illegible]	[illegible]	[illegible]	195	[illegible]	5078	3829	2.47	3.5	29

Table 46 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt (g)	Agron. score (1-5)	Rank
24	TX-623A x CS 3541	68	205	92	5744	3912	2.17	3.0	28
25	TX-623A x ALAD 6171	68	155	83	5078	3413	2.49	3.5	39
26	TX-623A x ALAD 6313	69	195	100	7409	5744	2.62	2.0	5
27	TX-623A x ALAD 6327	69	140	70	6600	4828	2.72	2.0	15
28	TX-623A x Karper 1327	68	135	71	5245	3496	2.06	2.5	36
29	TX-623A x M-62732	70	210	77	5578	4412	2.27	3.0	20
30	TX-623A x M-66302	74	235	64	5661	4162	2.33	4.0	23
31	TX-623A x M-66908	71	215	82	4579	3330	2.17	3.5	42
32	TX-623A x A-9052	71	195	88	6243	4578	2.04	2.5	18
33	IS-10252A x 77CS766*	68	155	94	8075	5910	2.24	1.5	4
34	IS-10252A x ALAD 6232	70	145	59	4745	2997	2.04	3.5	46
35	CK-74A x Su.Cr.36:80/70*	70	160	80	8908	6993	2.26	2.0	1
36	CK-74A x Dabar 1/1/1/1	77	245	68	4578	2997	2.65	4.0	45
37	CK-74A x M-62455	77	175	57	5411	3996	2.41	3.0+	26
38	CK-74A x Su.Cr.54:18/17	72	155	65	5744	4329	2.51	2.0	21
39	IS-10454A x Su.Cr.62:14/14	74	155	95	5078	3663	2.21	2.0	33
40	IS-10454A x Dabar 1/1/1/1	78	240	88	3746	2830	2.79	4.0	48
41	IS-10454A x UCHV-2	67	180	103	4662	3496	2.32	3.0	37
42	IS-10454A x A-3607	71	170	74	4162	3163	1.90	3.0	43
43	IS-10454A x A-3625	70	185	62	6160	4079	2.16	2.0+	24

Table 46 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt (g)	Agron. score (1-5)	Rank
44	IS-10454A x A-3626	71	200	95	6826	4995	2.21	2.5	13
45	IS-10454A x CS-3541	70	240	70	4745	3496	2.48	2.0	38
46	IS-3677A x Su.Cr.54: 18/17	71	170	80	5078	3413	2.17	2.5+	40
47	CSH-5	73	200	86	5827	3746	1.75	2.0+	31
48	CSH-6	61	145	61	3413	1914	2.17	4.0	50
49	TX-623A x Su.Cr.54: 18/17*	72	176	88	7909	6410	2.29	2.0	3
50	Dabar 1/1/1/1	81	160	109	3996	2997	2.49	5.0	44
	Mean	71	189	80	5694	4236	2.37	3.0	-
	$\bar{Sd}$	2.1	14.3	4.5	634.6	519.4	-	-	-
	CV %	3.1	7.5	16.7	22.2	24.8	-	-	-

* Promising entries

ble 47. Results of Selected Sorghum Hybrids Yield Trial - Gadambalia, 1981

try	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
	P-954066A x Su.Cr.51:32/28*	68	170	42	5162	3863	2.0	4
	" x Su.Cr.54:16/15*	68	190	73	5594	3896	3.0+	3
	" x Karper 1297*	61	170	69	5894	4496	2.0+	1
	" x Karper 1488*	61	150	61	6394	4462	2.0	2
	" x YE 90	63	160	36	3430	1962	3.0	31
	" x YE 96	63	170	21	2065	1465	3.0	41
	" x YE 293	68	170	36	4529	2897	3.0	11
	" x 77CS691	69	160	39	3796	2631	3.0	14
	TX-623A x Su.Cr.36:49/44	82	140	70	2897	1499	4.0	40
	" x Su.Cr.36:81/71	78	150	58	4662	2864	3.0	12
	" x Su.Cr.48:19/17	69	200	42	2464	1898	3.0	33
	P-954066A x Su.Cr.36:81/17	70	210	42	2864	2264	3.0	20
	" x Su.Cr.48:60/52	-	-	-	-	-	-	-
	TX-623A x Su.Cr.51:32/28	81	210	67	3330	2198	3.0	23
	" x Su.Cr.54:16/15	69	140	54	2298	1299	4.0	45
	" x Su.Cr.56:17/16	65	160	51	3164	2198	3.0	24
	" x Su.Cr.56:29/26	68	140	76	3330	2231	3.0+	21
	" x Su.Cr.65:8/8	77	140	76	3696	2364	3.0	19
	" x Su.Cr.65:44/37	77	140	70	2997	2031	3.0	30
	A-954066A x 77CS526	81	160	48	3863	2231	3.0+	22
	TX-623A x Su.Cr.67:11/9	68	140	85	3896	2530	3.0	16
	" x Su.Cr.67:77/53	78	160	70	4029	2897	4.0	10
	" x TX-2536	69	180	51	4729	3330	3.0	5
	" x CS-3541	78	140	67	2165	1132	5.0	46
	" x ALAD 6171	69	150	36	2131	0766	4.0	49
	" x ALAD 6313	78	130	33	1399	0833	4.0	48
	" x ALAD 6327	81	120	57	2031	1332	4.0	44
	P-954066A x 77CS606	71	150	64	4662	3297	3.0	6
	TX-623A x M-62732	83	160	67	2831	2064	5.0	29
	" x M-66302	92	140	85	3397	2098	5.0	27

47 Cont.

Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yiekd (kg/ha)	yield yield (kg/ha)	Agron. score (1-5)	Rank
TX-623A x M-66908	82	160	61	2131	1432	5.0	42
" x A-9052	83	130	70	2165	1365	4.0	43
" x Su.Cr.65: 30/27	81	180	67	3330	1898	4.0	32
IS-10454A x P-954141	66	120	39	2564	1731	3.0	37
CK-74A x Su.Cr.36:80/70	69	130	70	4762	2531	3.0	15
" x Dabar 1/1/1/1	82	180	76	3430	2098	3.0	26
" x M-62455	78	140	57	4329	3030	3.0	8
" x Su.Cr.18/17	70	130	54	3230	2631	3.0+	13
IS-10454A x Su.Cr.62: 14/14	78	130	76	2831	1698	3.0	38
" x Dabar 1/1/1/1	83	170	61	3097	2198	4.0	25
" x UCMV-2	69	150	82	3830	2930	3.0	9
" x A-3607	71	160	79	3330	1832	4.0	34
" x A-3625	83	150	91	3264	1831	5.0	35
" x A-3626	82	160	51	1531	1032	5.0	47
IS-10454 x CS-3541	71	160	51	4163	2431	3.0	17
IS-3677A x Su.Cr.54: 18/17	71	150	94	5161	3097	3.0+	7
" x CSH - 5	72	160	79	3696	2065	3.0	28
" x CSH - 6	67	150	85	2264	1565	5.0	39
TX-623A x Su.Cr.54: 18/17	69	150	100	3097	2364	3.0	18
Safra	82	220	85	2264	1732	4.0	36
Mean	74	157	62	3391	2255	3.5	-

* Promising Entres

There were 30 entries in the irrigated trial at Wad Medani and 23 entries in the rainfed trials. CSH-5, CSH-6, and an appropriate local variety were included as checks. As in all other trials conducted in these locations different plant densities were used in different locations. However the trial was laid out in a randomized complete block design with 2 replications in 4 row plots of 5m long each at Wad Medani, Gadambalia and Agadi. Single row observation nurseries were planted at Kadugli and El Obeid.

Tables 48, 49 and 50 present complete data collected from the 1981 EEH yield evaluation at Wad Medani, Gadambalia and Agadi respectively. Complete data could not be collected from 2 locations; at Kadugli because of severe Striga damage, and at El Obeid because of severe drought. The combined grain yield data and the overall ranking of entries in this trial across locations is shown in Table 51.

At Wad Medani entries No. 1, 2 and 3 were the best overall. All three hybrids share the same common female parent, TX-623A. These hybrids have maintained their superiority over others in trials conducted during the previous 2 seasons as well. Plans are underway both for large scale seed multiplication of seeds of these elite hybrids and on-farm demonstration trials of the hybrids themselves in the coming crop season of 1982 in collaboration with Sudan Gezira Board.

More yield testing of promising hybrids in the rain lands is necessary to get a true picture of the type of hybrid material that will make the difference in the mechanized sorghum farms of the rainlands. Preliminary data available (Tables 49, 50 and 51) seem to suggest that early maturing hybrids that escape late-season drought and thus avoid problem of grain filling should have the most potential. TX-623A x Karper 1597 looks like one such hybrid.

Table 48. Results of Elite Experimental Hybrids Yield Trial - Wad Medani, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt (g)	Agron. score (1-5)	Rank
1	TX-623A x Su.Cr.36:80/70*	77	190	79	6763	5552	2.11	2.0	3
2	TX-623A x Su.Cr.54:18/17*	73	180	62	7181	6012	2.30	2.0	1
3	TX-623A x Karper 1597*	66	160	70	7515	5970	2.84	1.0	2
4	TX-623A x Karper 551	65	185	94	6680	4091	2.38	2.0	15
5	TX-623A x Karper 1755	67	165	68	5594	4300	2.71	1.5	11
6	TX-623A x Karper 473	66	160	79	5218	3715	2.28	2.0	20
7	TX-623A x Karper 669	69	165	90	6346	4843	2.48	1.0	7
8	TX-623A x Karper 1489	77	190	73	5761	5260	2.22	2.5	5
9	TX-623A x Karper 1368	73	245	78	5803	4550	2.44	4.5	8
10	TX-623A x ALAD 6041	68	160	72	5010	3841	2.37	3.0	18
11	TX-623A x SC-108-3	72	195	50	4509	3381	2.50	4.0	21
12	IS-10454 x A-1700	75	175	86	7014	5302	1.99	1.0	4
13	IS-10454A x Karper 443	63	130	92	5511	4258	2.17	2.5	12
14	IS-10454A x M-62671	80	235	76	3924	2922	2.80	3.5	27
15	IS-10360A x Su.Cr.54:18/17	63	235	77	2254	2296	2.18	5.0	30
16	IS-10360A x Su.Cr.36:80/70	80	165	58	5761	4258	2.09	2.5	13
17	CK74A x Su.Cr.65:30/27	85	155	98	3924	3131	2.56	4.0	25
18	IS-10674A x Su.Cr.54:18/17	62	150	55	4258	3173	2.37	5.0	24
19	IS-10240A x Su.Cr.54:18/17	64	190	98	4425	3882	2.13	4.5	17
20	IS-1005A x Su.Cr.54:18/17	65	180	73	4342	3256	2.22	5.0	22

Table 48 (cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt (g)	Agron. score (1-5)	Rank
21	IS-1006A x Su.Cr.54: 18/17	62	150	66	3674	2755	3.06	5.0	29
22	IS-648A x Su.Cr.54: 18/17	63	170	67	3924	2839	2.38	4.5	28
23	2219A x MR-169 (710)	63	155	86	4509	3214	2.10	3.5	23
24	2219A x MR-379 (703)	57	145	75	5928	4425	1.92	2.0	9
25	2219A x MR 377 (701)	60	130	55	4258	3131	2.03	3.0	26
26	2219A x MR 393 (708)	60	160	78	4425	3757	2.02	3.5	19
27	2077A x MR 381	70	220	74	5845	4383	2.23	2.0	10
28	TX-623A x MR 175 (726)	72	210	82	5177	4133	2.34	2.5	14
29	CSH - 5	73	210	82	5803	5010	2.00	2.5	6
30	CSH - 6	58	145	68	4509	4000	2.08	3.5	16
	Mean	68	176	75	5345	4047	3.0	3.0	-
	$\bar{Sd}$	1.6	15.1	NS	968.6	734.8	-	-	-
	CV %	2.4	8.6	20.8	17.8	18.2	-	-	-

* Most Promising Entries

ble 49. Results of Elite Experimental Hybrids Yield Trial - Gadambalia, 1981

try	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
	TX-623A x Su.Cr.54:18/17	65	200	76	2831	2264	3.0	10
	" x Su.Cr.36:80/70	75	160	76	2847	1998	3.0	18
	" x Karper 1597*	70	145	84	4512	3014	3.0	3
	" x Karper 551	65	150	88	4346	2731	3.0	6
	" x Karper 1755	68	130	68	3064	2115	3.0	15
	" x Karper 669*	65	145	96	6063	4063	2.0	1
	" x Karper 1489	67	155	76	3297	2198	3.0	14
	" x ALAD 6041	66	145	92	3713	2697	3.0	7
	" x SC-108-3	71	170	96	4013	2814	3.0	5
	IS-10360A x Su.Cr.54:18/17	65	175	108	3663	2847	3.0	4
	IS-10360A x Su.Cr.36:80/70	75	145	88	3513	1981	3.0	19
	IS-10240A x Su.Cr.54:18/17	66	185	76	3380	2264	3.0	12
	IS-1006A x Su.Cr.54:18/17	60	215	60	2964	2248	3.0	13
	IS-648A x Su.Cr.54:18/17	61	205	80	3696	2581	3.0	8
	2219A x MR-710	62	150	100	2764	1898	4.0	20
	" x MR 703	62	150	84	3130	2264	3.0	11
	" x MR-701	63	145	100	2797	1798	3.0	22
	" x MR-708	60	155	92	3247	2115	3.0	16
	" x MR-381	75	170	76	3230	2031	3.0	17
	TX-623A x MR 726	75	170	92	2781	1848	4.0	21
	CSH - 5	76	155	92	3830	2414	3.0	9
	CSH - 6	66	135	76	2964	1565	4.0	23
	Safra (Local)	82	215	96	4079	3130	3.0	2
	Mean	68	164	86	3507	2386	3.3	-
	$\bar{sd}$	4.4	14.4	NS	832.5	606.1	-	-
	CV %	6.6	8.8	14.6	23.8	25.3	-	-

* Appear Promising

e 50. Results of Elite Experimental Hybrids Yield Trial - Agadi, 1981

y	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yiekd (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
	TX-623A x Su.Cr.54:18/17	71	190	51	2664	1915	3.0	2
	" x Su.Cr.36:80/70	83	145	45	1748	1248	3.5	16
	" x Karper 1597 *	70	140	59	3163	2580	3.0	1
	" x Karper 551	71	158	61	2414	1748	3.0	5
	" x Karper 1755	72	145	52	1581	1248	3.0	17
	" x Karper 669	78	150	36	1415	0999	4.0	20
	" x Karper 1489	83	143	48	1964	1415	4.0	13
	" x ALAD 6041	79	150	38	1248	0916	3.0	22
	TX-623A x SC-108-3	83	150	56	2081	1581	4.5	11
	IS-10360A x Su.Cr.54:18/17	82	173	61	1248	0982	3.5	21
	" x Su.Cr.36:80/70	91	145	61	1998	1498	4.0	12
	IS-10240A x Su.Cr.54:18/17	77	170	52	1748	1332	3 5	15
	IS-1006A x Su.Cr.54:18/17	72	180	47	2164	1665	5.0	7
	IS-648A x Su.Cr.54:18/17	77	170	52	2414	1698	4.0	6
	2219A x MR-169 (710)	70	150	58	2580	1665	3.5	8
	" x MR-379 (703)	72	155	55	2247	1665	3.5	9
	" x MR-377 (701)	74	150	39	1165	0832	4.5	23
	" x MR-393 (708)	73	140	56	2364	1665	4.0	10
	2077A x MR-381	81	175	45	2664	1914	3.0	3
	TX-623A x MR-175	84	175	64	2164	1748	3.0	4
	CSH - 5	84	153	52	1998	1415	3.0	14
	CSH - 6	76	160	44	1498	1082	4.0	19
	Local (Dabar 1/1/1/1)	86	133	50	1498	1215	3.0	18
	Mean	79	157	51	2001	1479	3.6	-
	$\bar{Sd}$	3.4	10.9	NS	NS	NS	-	-
	CV %	4.3	7.0	15.0	31.9	34.3	-	-

* Appears promising

Table 51. Mean Grain Yield (kg/ha) of Elite Experimental Hybrid at Irrigated (Wad Medani) and Rainfed (Gadambalia and Agadi) locations

Pedigree	Wad Medani	Gadambalia	Agadi	Mean
TX-623A x Karper 1597	5970 (2)**	3014 (3)	2580 (1)	3855 (1)
TX-623A x Su.Cr.54:18/17	6012 (1)	2264 (10)	1915 (2)	3397 (2)
TX-623A x Karper 669	4843 (7)	4013 (1)	0999 (20)	3285 (3)
TX-623A x Karper 1489	5260 (5)	2198 (14)	1415 (13)	2958 (4)
TX-623A x Su.Cr.36:80/70	5552 (3)	1998 (18)	1248 (16)	2933 (5)
CSH - 5	5010 (6)	2414 (9)	1415 (14)	2946 (6)
TX-623A x Karper 551	4091 (15)	2731 (6)	1748 (5)	2857 (7)
2219A x MR-703	4425 (9)	2264 (11)	1665 (9)	2785 (8)
2077A x MR-381	4383 (10)	2031 (17)	1914 (3)	2776 (9)
TX-623A x SC-108-3	3381 (21)	2814 (5)	1581 (11)	2592 (0)
IS-10360A x Su.Cr.36:80/70	4258 (13)	1981 (19)	1498 (12)	2579 (1)
TX-623A x MR-926	4133 (14)	1848 (21)	1748 (4)	2576 (2)
TX-623A x Karper 1755	4300 (11)	2115 (15)	1248 (17)	2554 (3)
2219A x MR-393	3757 (19)	2115 (16)	1665 (10)	2512 (4)
IS-10240A x Su.Cr.54:18/17	3882 (17)	2264 (12)	1332 (15)	2493 (5)
TX-623A x ALAD 6041	3841 (18)	2697 (7)	0916 (22)	2485 (6)
IS-648A x Su.Cr.54:18/17	2839 (28)	2581 (8)	1698 (6)	2373 (7)
2219A x MR 710	3214 (23)	1898 (20)	1665 (8)	2259 (8)
IS-1006A x Su.Cr.54:18/17	2755 (29)	2248 (13)	1665 (7)	2222 (9)
CSH - 6	4000 (16)	1565 (23)	1082 (19)	2216 (20)
⋮	⋮	⋮	⋮	⋮
Mean	4047	2386	1479	2733
$\bar{Sd}$	734.8	606.1	NS	-
CV %	18.2	25.3	34.3	-

C. Introduced Hybrids Yield Trials and Nurseries

In addition to the large number of experimental hybrids we generated and evaluated locally during the year, we also introduced and evaluated few sorghum hybrid trials and nurseries from ICRISAT Centre and other programs elsewhere. Below is a summary of the results of yield trials and observation nurseries conducted on introduced sorghum hybrids during the Summer, 1981.

1. ICRISAT Sorghum Hybrids Yield Trial-I (ICSHYT-I)

This trial consisted of 25 hybrids including CSH-5 and CSH-9 that had passed preliminary screening at ICRISAT Centre. Only hybrids with female parents 296A or 2077A were included in this nursery. Two sets of this trial were received and they were grown out under irrigation at Wad Medani and under rains at Gadambalia. At both locations a randomized complete block design with 2 replications in plots of 4 rows of 5m long each was used.

Tables 52 and 53 provide the summary of data on ICSHYT-I at Wad Medani and Gadambalia respectively. As a group entries in this nursery were well adapted at Wad Medani with excellent crop expression - very impressive size of well-filled heads, good grain quality, and free from any major problem. Some plots in this nursery fell on low spots with some drainage problem earlier in the season that resulted in low stand establishment (Table 52); however later on there was good compensation resulting in huge head size and good overall grain yield. Visually this nursery looked the most impressive as could be judged from the overall mean agronomic score of 2.5 (Table 52). Entries No. 2, 10, 17, 18, 24 and 25 (Table 52) looked the most promising. Seed of these will be increased during this winter off-season for inclusion in 1982 EEH yield trial.

At Gadambalia seedling emergence and crop establishment were equally good as in Wad Medani. However the growing season was a little too short (late onset and early stoppage of rains) for such a group of high yield potential hybrids. Table 53 presents data on ICSHYT-I at Gadambalia. As can be seen from this table the overall mean grain yield data was low and there was no statistically significant difference in yield among entries. However several entries gave numerically higher yield than CSH-5 and CSH-9.

Table 52. Results of ICRISAT Sorghum Hybrids Yield Trial-I Wad Medani, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt (g)	Agron. score (1-5)	Rank
1	2077A x A-724	72	185	60	4133	3047	2.14	3.0	23
2	2077A x MR-737*	70	195	72	6596	5177	1.69	1.5	4
3	2077A x A-717	72	195	57	6972	5302	1.83	2.0+	3
4	2077A x MR-729	70	195	127	4509	3549	2.75	3.0	17
5	2077A x MR-746	72	180	70	3966	3131	1.86	3.0	22
6	296A x 603	73	195	70	5344	3882	1.93	2.0+	12
7	296A x CS-3541 (CSH-9)	69	170	58	5928	4550	1.98	2.5+	7
8	2077A x A-701	73	205	63	5678	4258	1.79	2.5	8
9	296A x A-964	69	190	85	6930	5386	2.05	2.5	2
10	2077A x MR-727	71	185	61	5051	4050	2.35	2.5	10
11	2077A x A-725	73	190	88	6137	4801	1.85	2.5	5
12	2077A x A-739	77	230	80	2864	2171	2.48	4.5	25
13	2077A x MR 734	73	250	65	4450	3465	2.08	5.0	18
14	2077A x CS-354/(CSH-5)	71	175	80	5135	3799	1.75	2.0+	13
15	296A x MR-750	68	205	73	5218	3715	1.87	2.0	14
16	2077A x A-707	70	195	60	4383	2881	1.59	3.0	24
17	296A x MR-747*	69	180	48	4676	3674	2.86	1.5	16
18	296A x A-608*	72	185	69	5469	4091	2.03	2.0	9
19	2077A x A-729	71	205	61	4509	3465	1.92	2.0	19

Table 52 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt (g)	Agron. score (1-5)	Rank
20	2077A x MR-726	70	195	61	4876	3674	1.95	2.5	15
21	296A x MR-748	68	210	67	4550	3465	2.35	2.5+	20
22	2077A x A-711	72	195	67	5177	4008	1.49	2.5	11
23	2077A x MR-730	70	205	56	4133	3173	1.76	2.5	21
24	296A x A-1052*	70	175	65	7097	5386	1.93	2.0	1
25	2077A x MR-732*	70	170	75	6054	4760	2.40	2.0+	6
	Mean	71	194	68	5193	3954	2.03	2.5	-
	$\bar{Sd}$	1.3	15.8	NS	885.1	734.8	-	-	-
	CV %	1.8	8.1	29.8	17.1	18.8	-	-	-

Table 53. Results of ICRISAT Sorghum Hybrids Yield Trial-I Gadambalia, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Rank
1	2077 A x A-729	81	170	58	1720	1094	24
2	" x MR-727	80	170	56	3273	2138	6
3	" x A-725	78	145	79	2355	1219	22
4	" x A-701	80	165	61	1586	994	25
5	" x MR-726	73	170	53	2780	1962	10
6	" x A-724	79	160	87	3073	1887	11
7	296A x MR-750	75	175	76	3899	2513	1
8	2077 x A-739	76	225	82	2831	2196	5
9	" x MR-729	74	180	66	2221	1570	17
10	296A x A-603	75	170	65	2914	2104	7
11	" x CS-3541 (CSH-9)	71	160	75	3223	2037	8
12	2077A x MR-737	75	150	63	2138	1369	21
13	296A x A-1052	73	155	65	2371	1687	15
14	2077A x MR-734	81	215	57	2238	1378	20
15	296A x A-608	74	145	73	2909	1829	13
16	" x A-748	70	165	80	2572	1620	16
17	2077A x MR-732	69	170	38	2363	1503	18
18	296A x A-964	73	170	75	3891	2296	3
19	2077A x A-707	76	170	62	2755	1996	9
20	" x MR-730	73	170	62	3574	2305	2
21	2077A x CS-3541 (CSH-5)	69	145	59	2897	1870	12
22	" x A-711	78	160	70	1879	1127	23
23	" x MR-746	74	155	45	2037	1445	19
24	" x A-717	75	150	46	2772	1703	14
25	296A x MR-747	70	150	49	3282	2188	4
	Mean	75	166	64	2616	1753	-
	$S\bar{d}$	NS	11.7	NS	NS	NS	-
	CV %	5.2	7.0	28.8	34.2	38.1	-

2. ICRISAT Sorghum Hybrids Yield Trial-II (ICSHYT-II)

Twenty hybrid selections including CSH-6, all with 2219A female parentage were put together for yield trial in 1981 ICSHYT-II. As in ICSHYT-I, 2 sets of this trial were grown out at Wad Medani and Gadambalia in a similar design, layout, and plot spacing.

The results of ICSHYT-II from Wad Medani and Gadambalia are given in Tables 54 and 55 respectively.

At Wad Medani this trial was grown in a lower spot and suffered from some poor drainage problem. As a result the crop expression in this trial was not as impressive as in ICSHYT-I. Both mean grain yield and agronomic acceptability scores as well as field impressions noted, indicate that the 2219A set of hybrids were not as good as those in ICSHYT-I discussed above. Table 54 also shows that there was no significant statistical difference among entries in this trial for percent plant stand, head yield and grain yield.

Table 35 presents data on ICSHYT-II at Gadambalia. Emergence and crop establishment were satisfactory in this nursery, but due to the short growing season at this station this season, the grain filling and development was poor resulting in low grain yield. Again there was no significant statistical difference in yield of entries in ICSHYT-II at Gadambalia, as well.

3. Introduced Hybrids Observation Nursery

A total of 98 experimental and U.S. Commercial hybrids received from several sources were put together in the Introduced Hybrids Observation Nursery. Below is a short list of the number and source of the entries in this nursery.

	Source	Number
1.	ICRISAT Population Breeding Program	21
2.	ICRISAT Mould Resistance " "	39
3.	INTSORMIL (via Texas A & M Univ.)	15
4.	U.S. Commercial (via INTSORMIL and MFC, Khartoum)	23
	Total	98

Table 54. Results of ICRISAT Sorghum Hybrids Yield Trial-II - Wad Medani, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent* plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt(g)	Agron. score (1-5)	Rank
1	2219A x MR-707	57	145	60	4342	3048	2.19	3.0	6
2	2219A x MR-717*	70	175	80	5218	3507	1.98	2.0	3
3	2219A x MR-705	59	150	55	3214	2171	2.22	4.0	17
4	2219A x MR-725	73	140	88	3757	2547	1.90	3.5+	13
5	2219A x MR-703	58	160	70	3841	2672	2.41	3.5	12
6	2219A x A-519	79	160	70	3975	2380	1.58	3.0	15
7	2219A x MR-719	72	155	81	5093	2755	2.14	2.5	9
8	2219A x A-567*	73	150	81	5678	4041	1.92	2.5	1
9	2219A x MR-702	62	175	70	4258	3006	2.20	3.0	7
10	2219A x A-531	73	200	88	4634	2797	1.74	4.0	8
11	2219A x MR-716	65	145	60	3340	2212	2.32	4.0	16
12	2219A x A-546	68	165	81	3590	2755	1.99	3.0	11
13	2219A x A-505*	68	140	61	5010	3590	2.31	2.0	2
14	2219A x MR-711	68	185	77	3089	2129	2.24	4.0	18
15	2219A x A-537	71	135	73	5093	2755	1.91	2.5	10
16	2219A x MR-724	74	165	80	4676	3214	2.00	3.5	5
17	2219A x CS-3541 (CSH-6)	64	125	39	2855	1586	2.36	4.0	20
18	2219A x MR-712	62	165	45	3382	2421	2.37	5.0	14
19	2219A x A-535	72	130	57	2338	1586	1.77	3.5	19
20	2219A x MR-718	71	145	65	4634	3340	1.95	3.0+	4
	Mean	67	155	69	4101	2726	2.07	3.2	-
	$\bar{Sd}$	2.1	17.8	NS	NS	NS	-	-	-
	CV %	3.2							

Table 55. Results of ICRISAT Sorghum Hybrids Yield Trial-II, Gadambalia, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	Rank
1	2219A x A-505	68	150	53	2321	1445	20
2	" x MR-712	64	210	75	3881	2413	4
3	" x A-535	68	155	69	2797	1937	16
4	" x MR-705	66	160	69	3390	2371	7
5	" x MR-719	67	155	66	3307	2330	9
6	" x MR-702	66	175	80	3290	2346	8
7	" x CS-3541 (CSH-6)	66	145	28	3056	2146	14
8	" x MR-725	65	145	72	3507	2229	12
9	" x A-567	69	140	61	3816	2154	13
10	" x MR-718	65	140	72	3499	2405	5
11	" x A-519	66	155	75	3340	2371	6
12	" x A-546	63	150	82	3532	2463	3
13	" x MR-703	65	155	62	3607	2647	1
14	" x A-537	74	150	82	3398	2280	10
15	" x MR-716	64	155	49	3115	2229	11
16	" x MR-711	65	200	50	2121	1578	18
17	" x MR-724	64	150	62	2204	1453	19
18	" x MR-707	68	140	67	2822	1854	17
19	" x A-531	66	175	40	2897	2129	15
20	" x MR-717	65	160	59	3699	2497	2
	Mean	66	158	54	3180	2164	-
	$\bar{Sd}$	NS	9.0	5.5	533.5	NS	-
		4.5	5.7	17.4	20.5	16.9	

This nursery was grown out at 2 locations - Wad Medani (irrigated) and Gadambalia (rainfed). Two row plots each 3m long were used in the observation nursery at Wad Medani, and single row plots of 5m long were used at Gadambalia. Row and plant spacing and all other cultural practices were the same as in all the hybrid trials discussed above. Local varieties Dabar and Safra were planted on every 10th plot at Wad Medani and Gadambalia respectively. Data on days to 50 % flowering, plant height, plant stand, agronomic score and head yield in grams per plot were recorded.

Table 56 provides data on some hybrids with good adaptation and good yield potential identified at Wad Medani. Nonetheless none of these looked superior to elite experimental hybrids already at hand. (Although most of the entries did not do very well at Gadambalia hybrids 2077A x MR-744, 2077A x MR-745, 2077A x MR-M747 looked better overall).

Table 56. Agronomic Data on Some Introduced Hybrids With Good Adaptation - Wad Medani, 1981

Pedigree	Days to 50 % Flow.	Plant height (cm)	Agron. score (1-5)
2219A x A504	68	150	2.0
2219A x A505	70	160	2.0
2219A x A546	68	170	2.0+
296A x A603	72	160	2.0
296A x A630	66	150	2.0
296A x A670	72	160	2.0+
2077A x A717	74	170	2.0
2077A x MR736	72	160	2.0+
2077A x MR740	74	160	3.0+
TX623A x MR707	68	140	3.0+
TX623A x MR735	70	180	2.0
TX623A x TX430	66	130	3.0+
TX623A x TX430	68	110	2.0
TX623A x 77CS1	70	170	2.0
TX623A x TX2536	66	130	3.0+
TX623A x TAM428	72	120	3.0+
Pioneer Exp. 5	70	170	2.0
Pioneer Exp. 9	70	210	3.0+
CSH - 5	72	170	3.0+
Dabar	82	160	4.0

III INTERDISCIPLINARY COOPERATIVE RESEARCH ACTIVITIES

A. Breeding For Drought Resistance

Our research on breeding for drought resistance , thus far, was limited to screening of suspected Sources of drought resistance under moisture stress field conditions and utilizing confirmed sources in crossing with local sorghum types. The project has been jointly undertaken with Dr. Faisal M. Ali, ARC cereal physiologist. In addition to ICRISAT Centre, genotypes for screening have been received from Purdue University, Texas A & M University, University of Nebraska and the Ethiopian Sorghum Improvement Project. Two locations, Gadambalia and El Obeid, with mean annual rainfall of approx. 550 mm and 350 mm, respectively have been used as testing sites for drought resistance screening.

Progress made from such an empirical approach is very encouraging. Following is a summary of field reevaluations of suspected sources of drought resistance. Our activities in intercrossing of introduced genotypes with preflowering drought resistance and local sorghum types known to have post flowering drought resistance is briefly mentioned earlier in our "Breeding Nurseries" section.

1. Drought Tolerant Varieties Yield Trial

From screening of a large number of sorghum germplasm under moisture stress field situations during the last 2 seasons, sorghum genotypes with good levels of drought tolerance were identified. Following our approach of field testing in drought prone sorghum growing zones, genotypes that succeeded in making a crop when all others failed were declared drought tolerant. As such we have no clear knowledge of what mechanism of drought tolerance is actually involved.

During the 1981 crop season, 14 such genotypes were put together in a yield trial for evaluation at Gadambalia and El Obeid. A randomized complete block design with 2 replications in 4 row plots of 5m long each was adopted. Planting was done in early July at El Obeid and late July at Gadambalia following the onset of rains at both locations.

The nursery at El Obeid had good germination and was establishing well when a severe drought period of 3 weeks (July 28 to August 16) proved too much for the young seedlings, and as a result plant stand was very erratic and no meaningful data could be collected.

At Gadambalia the rains started late, but the rains following planting were good and crop emergence and establishment were thus not affected. In spite of early stoppage of rains in September crop expression in this nursery was very good. Table 57 provides data on the 1981 Drought Tolerant Varieties Yield Trial. Six entries gave mean grain yield higher than Safra, a good local variety widely grown in the rainlands; the yield differences were not statistically significant, however. Considering the height and maturity differnce between the local and some of these selections, the results are encouraging. A program is underway for intercrossing of the drought tolerant selections with locals with the goal of identifying adapted genotypes that are photosynthetically efficient.

A special mention needs to be made of two sorghum lines - Karper 886 and P-898012, both identified as being drought tolerant in observation nurseries conducted during the 1979 crop season. Since then their performance under severe moisture situations has been very impressive. In both 1980 and 1981 crop season Karper 886 was the top yielding entry in Drought Tolerant Varieties Yield Trials conducted at Gadambalia. In the same trial conducted at El Obeid the same season, P-898012 was the top yielder; and this past season a seed increase field of P-898012 at El Obeid yielded 1.8 tons/ha, where almost all other things planted together failed. Below is a summary of the performance of these two selections at our drought testing sites during the last 2 crop seasons:

Year	Location	Karper 886 kg/ha (% local)	P-898012 kg/ha(% local)
1980	Gadambalia	1866 (190)	1633 (183)
	El Obeid	700 (168)	2250 (540)
1981	Gadambalia	2271 (119)	2046 (107)
	El Obeid	-	1833 (?)

Table 57. Results of Drought Tolerant Varieties Yield Trial - Gadambalia, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Percent plant stand	Head yield (kg/ha)	Grain yield (kg/ha)	100 seed wt (g)	Agron score (1-5)	Rank
1	P-898012	65	125	115	2714	2046	2.54	2.0	3
2	YE-333	76	95	79	2171	1603	1.79	3.0	12
3	Karper 1318	70	90	115	2547	1753	2.28	3.0	9
4	Karper 414	74	100	96	2856	1762	1.63	3.0	8
5	Karper 443	67	105	91	2421	1712	3.33	2.0	10
6	IS-2321	71	210	97	2572	1971	3.37	3.0	6
7	DJ-1195	70	215	100	2797	2037	2.59	3.0	4
8	M-35-1	73	210	54	2171	1511	2.73	2.0	13
9	D-71249	80	185	44	2079	1511	2.59	2.0	14
10	D-71245	78	150	42	2897	2171	2.38	2.0	2
11	IS-10376 B	69	100	83	2296	1637	2.42	3.0	11
12	IS-418-2 B	69	115	98	2046	1428	1.86	3.0	15
13	Karper 886	71	85	76	3098	2271	2.27	2.0	1
14	Karper 1116	78	90	94	2839	2004	2.27	3.0	5
15	Safra	81	195	75	2413	1904	3.33	2.0	7
	Mean	73	138	84	2520	1821	2.49	2.5	-
	$\bar{Sd}$	4.1	14.5	6.8	NS	NS	-	-	-
	CV %	5.6	10.5	16.2	23.8	25.4	-	-	-

2. Drought Tolerant Yellow Endosperm Selections

In 1979 we introduced a total of 1808 accessions of Karper Yellow Endosperm Sorghum Collection from GRU, ICRISAT for evaluation and possible use in the Sudan. After 3 seasons of successive evaluation both under irrigated and drought prone rainfed locations several useful types have been generated from these accessions. Pollinator parents identified from this source of material produced one of the most elite group of experimental hybrids available to us in the program. Selections from this nursery have also been used as parents in our pedigree breeding program for their grain quality and other agronomic attributes. Sources of head-bug resistance have also been identified from this collection of yellow endosperm lines.

In the 1980 crop season, screening of the same nursery for drought tolerance at Gadambalia and El Obeid resulted in 100 elite selections (Annual Report 1980). These were immediately utilized in a crossing program with local rainfed sorghums to combine different mechanisms of drought tolerance. A further evaluation of the same 100 selections was undertaken during the 1981 crop season, again, at our drought stress locations of Gadambalia and El Obeid. The trial - at El Obeid failed because of severe drought and some other associated problems. The nursery at Gadambalia emerged and established well and data could be collected accordingly. At maturity selections were made for genotypes with good crop expression in contrast to an adapted local variety, Safra, which was planted on every 10th plot. Many of the entries looked adapted and showed good crop performance, but only the most elite 30 entries were selected. Table 58 provides agronomic data on these elite selections. These will be included in 1982 Drought Tolerant Sorghum Varieties Yield Trial.

3. International Sorghum Drought Tolerant Observation Nursery

This nursery consisted of 50 entries that passed preliminary screening for drought tolerance at ICRISAT Centre, CSH-5, and an appropriate local variety as checks. The nursery was planted as an observation nursery at two drought prone locations in the Sudan namely Gadambalia and El Obeid. At both locations two row plots of 5m long each were planted to each entry.

Table 58. Most Elite Drought Resistant Karper Yellow Endosperm Selections - Gadambalia, 1981

1981 Plot No.	Accession No.	Days to 50 % Flow.	Plant height (cm)	Agron. score (1-5)
GD 531	GSA 1022	71	110	2.0+
GD 534	GSA 1032	72	105	3.0+
GD 538	GSA 1092	82	120	2.0+
GD 539	GSA 1122	84	090	3.0+
GD 547	GSA 1331	85	090	2.0
GD 548	GSA 1334	85	110	2.0
GD 549	GSA 1346	85	080	2.0
GD 551	GSA 1404	81	080	3.0+
GD 552	GSA 1413	80	130	2.0
GD 558	GSA 1530	84	110	3.0+
GD 559	GSA 1533	86	100	3.0+
GD 561	GSA 1576	80	100	2.0
GD 568	GSA 1631	80	100	3.0+
GD 572	GSA 1784	84	100	2.0+
GD 575	GSA 1812	74	120	3.0+
GD 577	GSA 1880	80	130	3.0+
GD 583	GSA 1949	92	080	2.0
GD 595	GSA 2001	70	130	3.0+
GD 601	GSA 2049	83	140	2.0
GD 604	GSA 2057	80	080	2.0
GD 606	GSA 2062	70	120	2.0
GD 607	GSA 2063	70	120	3.0+
GD 609	GSA 2074	70	100	2.0
GD 613	GSA 2125	74	110	2.0
GD 614	GSA 2141	71	110	3.0+
GD 615	GSA 2149	79	120	2.0
GD 617	GSA 2170	73	080	3.0+
GD 621	GSA 2213	89	090	2.0
GD 622	GSA 2222	71	080	2.0
GD 623	GSA 2226	76	100	2.0
GD 624	GSA 2228	79	090	3.0+
GD 637	GSA 2370	83	140	2.0

Table 59 presents data on the nursery at Gadambalia. The local variety, Safra, showed the best adaptation and gave the highest grain yield. However entries D-71425, D-71245, D-71239, D-71278, D-71082, D-71383 and D-71267 looked well adapted as well. Many of the entries in this nursery lodged heavily and thus were scored poorly visually though yields were good. The trial failed at El Obeid because of severe early season drought.

4. Drought Tolerant U.S. Lines Observation Nursery

Dr. Rosenow, Texas Agr. Exp. Station, organized a nursery of drought tolerant sorghum lines from U.S. universities in the INTSORMIL system, for evaluation in the Sudan. The nursery consisted of 30 lines and was grown out at our drought tolerance testing sites - Gadambalia and El Obeid - in a non-replicated observation plots of 2 rows each 5m long. Data on days to 50 % flowering, plant height, head yield, agronomic score and general notes on emergence, establishment and adaptation were recorded.

Table 60 provides the data on the Drought Tolerant Sorghums from INTSORMIL. At El Obeid, where the drought was more severe, entries TX-7000, TX-7078, TnGb Resw, TX-2737, and NT 9BR-121 exhibited good level of drought tolerance. Both nurseries were also evaluated by Dr. Rosenow who came over in November on his way back from Sorghum in the 80's Conference held at Hyderabad.

B. Breeding For Striga Resistance

Striga hermonthica is a major production problem in most of the area where sorghum is grown. In appreciation of the severity of the problem IDRC has been funding a project with University of Khartoum on Striga related research

Our project is involved in screening of genotypes for tolerance to Striga and their utilization in the breeding of improved sorghum genotypes. We have developed a Striga "sick-plot" at the Gezira Research Station where most of our screening is made. In addition, should any of our nursery be planted inadvertently, in fields infested with Striga, selection is made for types with good level of tolerance. To date several lines with suspected sources of Striga resistance have been accumulated from various nurseries,

Table 59. Results of International Sorghum Drought Tolerant Observation Nursery - Gadambalia, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Head yield (kg/ha)	Grain yield (kg/ha)	Agren. score (1-5)	Rank
1	D-71261	84	170	3424	2187	3.0	5
2	D-71234	89	140	1470	0868	5.0	47
3	D-71240	84	190	2388	1336	3.0	25
4	D-71451	95	150	1119	0651	5.0	50
5	D-71341	87	140	1236	0701	4.0	49
6	D-71563	83	140	1837	1002	3.0	42
7	D-96019	84	160	2989	2288	3.0	4
8	D-71283	90	120	1737	0935	4.0	44
9	D-71196	88	130	3173	2121	3.0	6
10	D-71425	88	150	3507	2472	3.0+	2
11	D-71396	87	110	2054	1086	3.0	41
12	D-71474	86	140	2255	1570	4.0	17
13	D-71506	84	150	2505	1369	4.0	23
14	D-71513	80	120	2154	1336	4.0	24
15	D-71245	83	170	2722	1820	3.0+	13
16	Safra (Local)	82	230	4927	3507	3.0+	1
17	CSH-5	74	140	2422	1152	4.0	39
18	D-96075	87	140	1720	0919	5.0	45
19	D-71305	73	120	2923	0952	4.0	43
20	D-71463	80	150	2772	1169	5.0	36
21	D-71464	88	150	1353	0585	5.0	51
22	8025	70	170	2989	2121	3.0	7
23	D-81680	79	150	2188	1253	5.0	28
24	D-81406	84	170	2004	1169	3.0	37
25	D-71709	71	110	2312	1453	4.0	22
26	D-71326	84	130	2037	1303	4.0	27
27	D-71239	84	170	2488	1887	3.0+	12
28	D-71253	88	150	1202	0785	4.0	35
29	D-71395	74	220	1937	1253	3.0	29

Table 59 Cont.

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Head yield (kg/ha)	Grain yield (kg/ha)	Agron. score (1-5)	Rank
30	D-71152	84	200	1603	1169	4.0	38
31	D-71500	83	160	3540	2355	3.0	3
32	D-71403	70	170	2605	1670	3.0	14
33	D-71221	80	140	2188	1236	4.0	31
34	D-71278	85	160	3006	2071	3.0+	8
35	D-71384	84	160	2204	1503	3.0	21
36	D-71269	88	130	0701	0451	5.0	52
37	D-71231	88	150	1069	0752	5.0	48
38	D-71612	86	130	1870	1253	3.0	30
39	D-93070	80	140	2789	1937	4.0	11
40	D-93087	80	170	2522	1336	4.0	26
41	D-96186	85	140	2255	1102	4.0	40
42	D-96074	84	170	2538	1553	3.0	18
43	D-71258	83	180	2923	2071	2.0+	9
44	D-71390	89	140	2338	1503	4.0	20
45	D-71082	71	150	2238	1637	3.0+	15
46	D-71020	79	100	1754	1219	4.0	32
47	D-71383	90	130	3373	1954	3.0+	10
48	D-71267	85	140	2438	1520	3.0+	19
49	D-71306	90	140	2104	1219	4.0	33
50	D-71672	81	110	2188	1219	4.0	34
51	D-75290	84	160	2204	1637	3.0	16
52	D-71174	85	140	1754	0919	3.0	46
	Mean	83	148	2270	1433	3.7	-

Table 60. Results of Drought Tolerant Sorghum Nursery From INTSORMIL - Gadambalia, 1981

Entry	Pedigree	Days to 50 % Flow.	Plant height (cm)	Head yield (kg/ha)	Agron. score (1-5)	Rank
1	BTX 623	83	110	3023	2.0	5
2	TX 430	71	100	2622	3.0	7
3	BTAM 618	64	090	1520	4.0	20
4	Early Hegari	61	120	1253	4.0	23
5	B 35-6	90	080	0919	5.0	28
6	TX-7078	67	090	3557	3.0	1
7	TX-7000	67	100	2338	3.0	12
8	R-9188	70	100	1353	4.0	22
9	BTX 399	74	080	1737	3.0	17
10	BTX 3042	68	110	2071	3.0+	14
11	1790 E	66	080	2088	3.0	13
12	SC-56-6	63	080	1620	4.0	18
13	R-5388	75	110	2572	3.0	8
14	TrGb Resw	72	110	3173	3.0	4
15	TX-2737	70	100	3307	3.0+	2
16	PCV 182	86	100	2405	3.0	11
17	SC-414-12	70	090	2555	4.0	9
18	GR-148	84	090	2438	4.0	10
19	Rs-610	63	130	3257	3.0	3
20	A-35 x TX 7078	68	100	2756	4.0	6
21	NP 9BR-121	71	100	0985	5.0	25
22	NP 9BR-126	79	090	0935	5.0	27
23	NP 9BR-142	81	100	0951	5.0	26
24	NP 9BR-146	82	100	1102	5.0	24
25	NP 9BR-226	83	090	1436	5.0	21
26	NP 9BR-272	71	150	1954	4.0	15
27	1028-75	81	110	0902	5.0	29
28	1044-39-2	83	110	1603	4.0	19
29	1044-64-1	85	100	0752	5.0	30
30	1044-75	84	100	1754	3.0	16
	Mean	74	101	1965	3.7	-

including our early generation breeding nurseries, local collections and introductions. Some of them have been reevaluated and confirmed as having tolerance to Striga. Few of them have been intercrossed with elite agronomic types to combine Striga tolerance with good agronomic attribute.

Below is a summary of our activities this past season in Striga related research. Some collaborative research undertaken with national scientists is also briefly discussed.

1. Striga Tolerant Sorghum Selections Screening Nursery

In the crop season of 1980, a large collection of hybrid pollinator lines was planted in a Striga "sick-plot" for screening. Few lines were identified as having tolerance to Striga hermonthica. During the same season an F3 breeding nursery was inadvertently grown in a field with heavy Striga infestation that covered most of the nursery. At harvest the nursery was scored for Striga tolerance and progenies that showed good level of Striga tolerance were selected.

During 1981 crop season, 62 sorghum lines selected from the above two sources were planted in a Striga "sick-plot" at Wad Medani for further screening. The nursery was organized as a randomized complete block design with 3 replications of 3 row plots each 3m long. Emergence and establishment of the sorghum crop as well as Striga was good. The level of Striga infestation in our "sick-plot" was also very good, this season. However the level of infestation within replications was very uniform in replication I, moderately uniform in replication III and not so uniform in replication II.

Data on number of sorghum plants established, number of Striga plants, and visual score on tolerance to Striga were taken on the centre row of each plot. Because of lack of uniformity in levels of Striga infestation among the replications, data from the nursery was not summarized. The raw data from the 1981 Striga tolerant selections observation nursery is presented in Table 61. Both Drs. Vasudeva Rao and K.V. Ramaiah who visited the nursery at different times during the season suggested that the data be thus presented. Dr. Ramaiah also helped in the evaluation of the nursery. As can be seen from Table 61, entries identified as showing good Striga tolerance include:

Table 61. Results of Striga Tolerant Sorghum Selection Observation Nursery - Wad Medani, 1981

Entry No.	Pedigree	Plant Count			Striga Count			Visual Score		
		Rep I	Rep II	Rep III	Rep I	Rep II	Rep III	Rep I	Rep II	Rep III
1	Tetron*	18	31	28	5	1	7	1	1	3
2	IS-534*	20	14	22	6	19	18	2	3	3
3	IS-8686*	8	24	23	3	1	20	1	1	3
4	SIV-103	22	14	17	25	9	11	3	2	3
5	N - 13*	23	15	19	53	7	24	3	2	3
6	H - 513	17	18	16	29	0	35	3	1	5
7	M - 548	23	24	23	44	52	31	3	1	4
8	K - 526	25	20	30	43	8	4	4	1	1
9	E - 35-1	18	21	25	5	42	6	4	5	2
10	Najadh	24	17	22	101	7	12	5	2	2
11	IS-3940	25	22	15	54	15	5	5	3	1
12	CK-60B	11	14	16	12	7	0	4	2	1
13	IS-2781	12	14	22	70	29	39	5	4	5
14	GSA-2473	10	10	23	41	4	31	4	1	3
15	" 2484	7	26	14	12	5	5	2	2	1
16	" 2521	5	8	20	1	2	39	3	1	5
17	" 2527	6	20	18	14	77	10	2	5	3
18	" 2577	6	22	23	20	9	24	2	3	4
19	" 2618	7	28	15	8	26	14	3	5	4
20	" 2665*	19	18	10	9	1	7	2	1	2
21	" 2679	23	13	24	31	22	7	5	3	2
22	" 2707	26	14	24	10	35	21	5	4	4
23	" 2715*	14	23	14	2	29	15	1	3	2

Table 61 Cont.

Entry No.	Pedigree	Plant Count			Striga Count			Visual Score		
		Rep I	Rep II	Rep III	Rep I	Rep II	Rep III	Rep I	Rep II	Rep III
25	GSL-2755	1	2	0	0	0	0	-	1	-
26	" 2799	17	18	7	38	61	0	4	5	1
27	" 2803	19	18	4	98	90	0	4	5	1
28	" 2835	17	21	24	73	37	61	5	4	5
29	" 2842	20	20	2	68	0	0	5	1	1
30	" 2896	14	16	14	81	12	127	5	4	5
31	" 2930	13	26	8	74	4	0	5	3	1
32	" 2991*	27	15	9	48	6	0	4	3	1
33	" 3014	9	11	12	42	19	0	5	4	1
34	" 3079*	19	15	24	63	47	32	3	4	3
35	" 3089	15	24	13	91	0	78	5	1	5
36	" 3090*	16	27	11	48	0	4	3	1	3
37	" 3092	18	15	20	71	20	38	5	4	5
38	" 3273*	19	22	18	28	21	36	2	4	5
39	" 3311	7	1	3	4	0	0	1	1	1
40	" 3397*	11	10	19	3	12	11	2	3	3
41	" 324	14	22	19	33	19	60	5	2	5
42	" 7047	8	18	11	28	25	1	4	3	2
43	Su.Cr.67:78/54	29	12	26	76	33	26	5	4	4
44	ALAD-6138	9	6	10	15	0	16	4	1	3
45	-6150	14	15	9	45	17	0	5	3	1
46	-6167	15	32	15	5	14	9	5	3	2
47	-6169	16	17	18	46	34	11	5	3	3
48	-6170	19	14	15	11	0	15	4	1	2

Table 61 Cont.

Entry No.	Pedigree	Plant Count			Striga Count			Visual Score		
		Rep I	Rep II	Rep III	Rep I	Rep II	Rep III	Rep I	Rep II	Rep III
49	ALAD-6171*	7	5	15	2	0	6	2	1	2
50	-6232	21	16	21	29	51	49	5	5	5
51	ALAD-6269	24	23	17	59	35	21	5	5	4
52	-6275	21	16	21	74	91	46	5	5	5
53	-6313	23	23	23	14	1	22	4	1	4
54	-6323	20	8	18	17	2	8	4	3	3
55	-6328	17	22	18	28	1	13	5	1	3
56	-6337	24	12	14	36	1	17	5	1	3
57	A-1696	8	3	6	15	5	4	2	2	1
58	Karper 149	16	15	15	15	4	43	3	2	5
59	" 742	18	19	15	44	2	52	5	3	5
60	" 1257	0	19	9	0	57	23	0	5	4
61	CK-148	20	23	18	78	12	42	5	3	5
62	Dabar 1/1/1/1	22	11	19	38	6	12	4	3	4

* Promising Entries

Tetron, IS-534, IS-8686, N-13, GSA-2665, GSA-2715, GSA-2991, GSA-3079, GSA-3090, GSA-3273, GSA-3397 and ALAD-6171.

Two separate collaborative projects are underway with national scientists as a follow-up of the Striga screening nursery conducted this past season. At the request of Dr. Osman Khidir, IDRC/Sudan Striga Project at Shambat, Khartoum, seed samples of all the entries in the nursery were recently sent to their laboratory for stimulant production testing. At Wad Medani, Dr. Abdel Jabbar, botanist, GRS is currently growing in pots 5 Striga tolerant selections and 2 susceptible checks to ascertain tolerance, and also to study the resistant mechanisms involved in the resistant selections.

2. Identification of a Probable Striga Reistant Line

In cooperation with Western Sudan Agricultural Research Project, sorghum nurseries were grown out for evaluation at Kadugli in the Nuba Mountains area this past season. The plot of land where the sorghum nurseries were planted was very heavily infested with Striga that many of the entries developed poorly. In spite of good emergence and establishment earlier in the season, crop performance was highly reduced because of Striga infestation. However the nursery was observed for differences in levels of tolerance to Striga and scores were taken accordingly. Few entries were identified as showing good tolerance. The most remarkable was the performance of entry P-967083-1, an introduction from Purdue University, U.S.A. This entry supported few Striga plants in both replications of the nursery while neighboring plots were heavily infested; it also gave the highest grain yield. This entry was advanced on the basis of agronomic performance at Wad Medani the previous season. A summary of its performance across locations this past season (summarized in an earlier section) puts it as the top yielding entry in the trial (Table 34). In addition this entry is a tan plant type with good evident grain quality. Further evaluation will be made next season, hopefully, at several locations to confirm resistance and check for strain specificity.

The following is a list of entries that showed good levels of Striga tolerance in nurseries conducted at Kadugli, this past season:

M - 66145
M - 62641
M - 90362
M - 90894
M - 90360
P - 967083-1
P - 967059-1
Su.Cr.35:5
Safra

C. Breeding For Insect Resistance

Insects pests of economic importance in the major sorghum growing zones of the Sudan include: Stem-borers, shoot-fly, head-bug, and American bollworm.

Stem borers (Sesamia cretica and Chilo partellus) are the most predominant pests of sorghum in the country with severe crop losses. Shoot-fly (Atherigona soccta) is also commonly observed on sorghum in the rainlands and is reported to be of major concern in the Blue Nile Province. Delayed planting of sorghum increases the level of infestation of both stem borers and shoot-fly, and this is known to most farmers. But there are always causes for delayed planting. Head-bugs (Colocorus angustatus), locally known as "Andet", in some years results in heavy losses of the sorghum crop. Its occurrence has been occasional, however. American bollworm or earworm (Heliothus armigera), commonly a cotton pest uses early planted sorghum as a secondary host. This pest is of major concern to sorghum farming under irrigation, mainly in the Gezira. All of these pests have been observed in our sorghum nurseries at one time or another. Customarily, any time a high and uniform level of any pest is observed in our nurseries, damage is rated and suspected sources of resistance are identified. Few crosses are also made involving pest resistant parents.

In cooperation with Dr. Nasr El Din Sharaf El Din, cereal entomologist at GRS, studies on stem-borers have been underway during the last 2 seasons. A two-year study on biweekly planting of sorghum to identify time of peak infestation of stem borers and a survey of the kind of species of stem borer is still under investigation and will be reported by Dr. Nasr El Din in the GRS Annual Report. A study on screening of genotypes that shows tolerance to stem borers in deliberately late planted nurseries, was also jointly undertaken, during the last 2 seasons, - and the result is summarized below.

1. Screening for Stem-borer Resistance

A total of 120 stem borer tolerant selections identified from various nurseries conducted during the 1980 crop season were reevaluated in a screening nursery this past crop season at Wad Medani. The material evaluated included early generation breeding lines, local sorghums, and introductions identified as showing tolerance to stem borer (Annual Report 1980).

The trial was organized in a non-replicated single row observation plots. Two late planting dates (August 15th and 30th) were used to increase chances of borer infestation. Initially the infestation level seemed low with few leaf damage and dead-heart symptoms in both planting dates. As the season progressed, however, damage symptoms were more evident and differences in tolerance levels were noted. Data on number of plants with dead heart, number of plants with leaf damage were taken at about 45 days after planting. At harvest, number of plants with main heads and with tiller heads were counted and data on head yield per plot were recorded. In addition an overall stem borer tolerance score was also made. Table 62 lists the entries with the best visual score rating on tolerance.

Table 62. Elite Stem Borer Resistant Selections From 1981 Stem Borer Screening Nursery - Wad Medani, 1981

WM81S Plot No.	Number of plants with				Visual score (1 - 5)	Head yield (g/plot)
	Dead heart	Leaf damage	Main heads	Tiller heads		
5529	0	0	5	1	1.0	740
5553	0	1	19	1	1.0	1270
5557	0	2	19	1	1.0	1780
5567	0	0	12	1	1.0	1050
5572	0	3	23	1	1.0	1440
5574	0	1	21	0	1.0	1670
5575	0	4	13	2	1.0	990
5583	0	2	23	3	1.0	1840
5591	0	2	21	0	1.0	1540
5592	0	1	16	2	1.0	1220
5593	0	1	13	2	1.0	1130
5595	0	1	12	3	1.0	1110
5598	0	3	19	2	1.0	1760
5627	0	0	14	1	1.0	1120

2. Sources of Head-bug Resistance

Unlike the 1980 crop season, no major incidence of head-bug attack was observed in our nurseries at any of our test locations this past season. However in accordance with the recommendation of the entomology group during the In-House Review 1981, I examined our 1980 field books to catalogue suspected sources of head-bug resistance from field notes taken at the time. Below is a list of the entries that we identified as having good level of head-bug resistance. Many of these entries showed no damage from head-bug, though several bugs were seen on the heads - thus presumed to be highly suspected sources of head-bug resistance.

Head-Bug Resistant Selections:

Source: SEAON - 79 & 80

M - 62618
M - 90906
M - 62456

Source: Kamper Yellow Endosperm Nursery:

GSA 1025	GSA 1269	GSA 1431	GSA 1592
GSA 1026	GSA 1296	GSA 1439	GSA 1593
GSA 1027	GSA 1297	GSA 1479	GSA 1627
GSA 1163	GSA 1305	GSA 1489	GSA 2182
GSA 1166	GSA 1392	GSA 1490	GSA 2299
GSA 1221	GSA 1400	GSA 1552	

D. Breeding for Disease Resistance

Our disease resistance effort so far has been mainly on charcoal rot *Macrophomina phaseolina* of sorghum. Dr. Hilu Omer, Plant Pathologist, GRS is responsible for work on sorghum diseases. During the 1979 and 1980 crop seasons, Dr. Hilu screened several genotypes for tolerance to charcoal rot both under artificial inoculation at Wad Medani and natural infection of the disease at Gadambalia. The results from these field screening experiments were reported earlier (Annual Reports, 1979 and 1980). During the 1981 crop season, no screening nurseries were conducted. Instead as a prelude to better understand the nature of charcoal rot disease Dr. Hilu, in collaboration with Dr. L. Mughogo, ICRISAT Sorghum Pathologist, carried out crop management experiments both at Wad Medani and Gadambalia. In addition the area around Kadugli, in the Nuba Mountains was very briefly surveyed for sorghum diseases during this past season. Below is a brief report on these activities:

1. Effect of plant populations and moisture stress on Incidence of charcoal rot

Two separate crop management experiments were conducted at Wad Medani and Gadambalia. At Wad Medani, three different plant populations D_1 (66,675 plants/ha), D_2 (133,350 plants/ha(and D_3 (266,700 plants/ha) and four different stress stages, viz. S_1 (stop irrigation when final leaf in whorl), S_2 (stop irrigation at boot stage), S_3 (stop irrigation at 50 % flowering) and S_4(continuo irrigation till physiological naturity) were adopted to investigate the natural incidence of charcoal rot.

Quite an array of data has been collected and all these will be reported to Dr. Mughogo for analysis and interpretation. Locally part of the data had been summarized and this is presented in Table 63. The data had not been analysed statistically. Without prejudging the final report much, the following points come on clearly from the data in Table 63:

Table 63. Effect of Plant Populations and Moisture Stress at Different Stages of Growth on Incidence of Charcoal Rot - Wad Medani, 1981.

Treatment		Plant Population Established	% Lodging	% Charcoal rot	1000 seed wt (g)	Grain yield (kg/ha)
S_1	D_1	89,285	61	68	18.9	3574
	D_2	169,642	77	88	18.2	5225
	D_3	226,785	80	85	18.9	4326
	Mean	161,904	73	80	18.7	4375
S_2	D_1	76,190	36	54	19.0	3248
	D_2	154,761	65	76	20.2	4080
	D_3	214,285	67	72	18.8	3207
	Mean	148,214	56	67	19.4	3512
S_2	D_1	80,952	5	22	22.8	3717
	D_2	160,714	4	26	20.4	3765
	D_3	201,190	5	21	21.3	4502
	Mean	147,619	5	23	21.5	3995
S_2	D_1	91,666	3	3	22.5	4050
	D_2	147,023	2	2	21.4	4173
	D_3	210,714	3	3	20.0	4552
	Mean	149,999	3	3	21.3	4258

1. The longer the moisture stress period, the more the incidence of charcoal rot (% charcoal) and lodging.
2. Stresses occurring before anthesis (S_1 and S_2) are the most critical.
3. At critical stress levels, incidence of charcoal rot and lodging increases with plant population.
4. Moisture stress was more critical than stress due to high plant densities.

At Gadambalia, a drought prone location, the effect of plant densities D_1 (66,675 plants/ha), D_2 (133, 350 plants/ha) and D_3 (266,700 plants/ha) on the incidence of charcoal rot under natural moisture stress was investigated. Table 64 provides a partial summary of the data from this experiment. The trial was planted in late July and although the total effective precipitation of 557 mm was more than the long time average, the distribution was poor and the moisture stress was severe as there was no rain after mid-September. Most of the rain fell in the month of August and the growing season was then shorter than normal. The results presented in (Table 64) show that at the natural moisture stress situation, there was a high level of charcoal rot incidence and associated lodging problems. The effect due to differences in levels of plant densities is not great presumably because even the lowest plant population of D_1 was too high for the growing condition at Gadambalia.

Table 64. Effect of plant population on incidence of charcoal rot under natural moisture stress - Gadambalia, 1981

Treatment	Plant Pop. Established	% Lodging	% Charcoal rot	100 seed wt (g)	Grain yield (kg/ha)
D_1	48,888	68	87	17.8	1369
D_2	91,666	77	89	15.9	1792
D_3	111,666	79	92	16.6	1528

2. Kadugli Area - A 'hot-spot' for Leaf Diseases ?

In addition to our sorghum experimental nurseries at Kadugli, farmers fields around the Kadugli Research Station were surveyed in early December by Dr. Hilu Omer and myself.

Leaf blight (Helminthosporium turcicum) was the most severe in the experimental nurseries but it was not very heavy in farmers fields. On the other hand heavy levels of infection of anthracuose (Colletotrichum graminicola) and grey leaf spot (Cercospora sorghi) were observed on the local sorghums in several fields. In fields of a pure stand of a single local variety a uniform infection of only one pathogen could be seen. In addition to the leaf diseases smuts particularly covered kernel smut (Sphacelotheca sorghi) were also wide spread. In general this area, as observed during this past season, looked like it might be a hot-spot for various leaf diseases. It is, therefore, proposed that screening against leaf diseases be initiated at Kadugli. Initially perhaps a set of the ICRISAT Leaf Disease Nursery will be requested.

E. Agronomic Trials

1. Effect of Nitrogen and Plant Population on local and improved sorghum cultivars

Dr. Faisal M. Ali, Cereal Physiologist at GRS carried out two similar experiments this past season on the effect of nitrogen fertilization and plant population on promising sorghum cultivars at Wad Medani (under irrigation) and Gadambalia (rainfed).

For the experiment under irrigation, three cultivars namely (a) Dwarf White Milo (local) (b) CSH-5 and (c) M-62641 were tested in the presence (2N) and absence (0N) of nitrogen fertilization at two plant populations R_1 (70,000 plants/feddan) and R_2 (42,000 plants/feddan). The treatments were randomized in a factorial experiment with four replications.

Data on head yield, straw yield, weight per head, number of seeds per head, and 1000 seed weight were recorded. The details of this experiment will be fully discussed and presented by Dr. Faisal in the forthcoming GRS Annual Report. In this report data on grain yield has been analyzed and presented in Table 65.

The results showed that the cultivar effects were highly significant ($\alpha = 0.001$) while other main effects and interactions were not significant. The application of 2N resulted in a significant increase in yield (40 %) over the control (0N). In addition, overall treatments, CSH-5 and M-62641, which were not significantly different from each other, outyielded the local variety by 45 and 44 percent respectively.

The experiment at Gadambalia could not be presented in this report, for the data was still under analysis at the time this report was written up.

Table 65. Effects of Nitrogen and Plant Population on Grain Yield (kg/fed.)* of Irrigated Sorghum Cultivars.

Levels of N	0N			2N**			
Plant Population	R_1	R_2	Mean	R_1	R_2	Mean	Mean
Varieties	S.E. ± 149.2						
A	662	1145	904	1287	1192	1240	1072 a
B	1249	1182	1217	1799	2109	1954	1585 b
C	1234	1529	1382	1800	1614	1707	1544 b
Mean	1048	1285	1167 c	1629	1638	1634 d	1400

S.E. ± 74.6

* 1 Feddan = 4200 M^2

** 2N = 85.8 kg N per hectare.

Plant Population Means

R_1 = 1338 e

R_2 = 1462 e

S.E. ± 60.9

IV 1981/82 OFF-SEASON SORGHUM RESEARCH ACTIVITIES

The bulk of the sorghum research activity during the current off-season is concentrated on increasing seed of experimental hybrids at various stages of evaluation in the program.

1. Three most promising hybrids: Tx 623A x Su.Cr.54:18/17, Tx 623A x Su.Cr.36:80/70 and Tx 623A x Karper 1597 have been identified in field evaluation during the last 3 seasons. Large quantities of seed of these hybrids will be increased for on-farm trial in the crop season of 1982.

2. Seeds of forty hybrids identified as being elite will be increased for multilocational yield trial next season as 1982 Elite Experimental Hybrids.

3. Out of over 1500 new experimental hybrids evaluated this past season, 125 were selected from evaluation at Wad Medani and Gadambalia. Seed of these will be resynthesized for evaluation as 1982 Selected Sorghum Experimental Hybrid Preliminary Yield Trial.

4. Two hundred new pollinator lines selected mainly out of F4 progenies of (Local x Introduced) intercrosses in the program will be test-crossed onto 3 established female lines - Tx 623A, 2077A and 29 A. The resultant hybrids will be evaluated during the crop season of 1982.

5. Twenty nine new female (A lines) introductions will be test-crossed with an established pollinator line - Su.Cr.54:18/17; and resulting hybrids will be evaluated in summer 1982.

6. A total of two hundred and fifty three F1 varietal crosses (local x introduction) will be selfed and advanced during the off-season for F2 evaluation next crop season.

7. Twenty seven elite varieties selected from various trials and nurseries during the 1981 crop season will be increased for multi-locational Elite Varieties Yield Trial in the 1982 crop season.

8. Seed increases of the most promising varieties M-90950 and M-62641 will be made for on-farm trial in 1982.

Appendix I. List of Pearl Millet Trials and Nurseries Planted in Rainy Season of 1981

S.N.	Trial/Nursery	Planting date Wad Medani/ El Obeid	No. of entries	Repli-cations	Plot size No. of rows x row length (M)	Locations
A-	National Trials and Nurseries:					
1.	Advance Yield Trial	1/7, 3/7	16	5	6 x 5	Wad Medani, El Obeid
		12/7, 7/7, 8/7				Kadugli, Nyertete, Dimsu
2.	Initial Yield Evaluation Trial-1	1/7, 2/7, 3/7	25	5	4 x 5	Wad Medani, El Obeid, Dimsu
3.	Initial Yield Evaluation Trial-2	1/7, 2/7, 3/7	25	5	4 x 5	Wad Medani, El Obeid, Dimsu, El Fula
4.	Intervariety Population (F.S.'s)	2/7, 3/7	136	2	1 x 5	Wad Medani, El Obeid
5.	Variety Crosses (F1's)	2/7	405	1	1 x 5	Wad Medani
6.	F2 Populations	3/7, 3/7	217	1	20 x 5	Wad Medan, El Obeid
7.	F3 Progenies	1/7, 4/7	245	1	2 x 5	Wad Medani, El Obeid
8.	F4 Progenies	1/7, 4/7	302	1	2 x 5	Wad Medani, El Obeid
9.	F5 Progenies	1/7, 5/7	43	1	2 x 5	Wad Medani, El Obeid
10.	Wad Medani Selections (K-1980)	1/7, 5/7	173	1	2 x 5	Wad Medani, El Obeid
11.	El Obeid Selections (K-1980)	5/7	121	1	2 x 5	El Obeid
12.	Isolation Plots		-	-	-	
	(1) Bristled Population	25/7	-	-	-	Wad Medani
	(2) Ugandi	25/7	-	-	-	Wad Medani
B.	Regional Trials and Nurseries:					
13.	African Regional Trial	17/7	16	4	6 x 5	El Obeid
14.	Exchange Nursery	3/7, 5/7	36	1	2 x 5	Wad Medani, El Obeid

S.N.	Trial/Nursery	Planting date Wad Medani/ El Obeid	No. of entries	Repli-cations	Plot size No. of rows x row length (M)	Locations
C.	International Trials & Nurseries:					
15.	IMMT - 7	4/7	21	3	6 x 5	El Obeid
16.	Elite Varieties Trial	4/7	20	4	6 x 5	El Obeid
17.	Experimental Varieties Trial	5/7	36	4	6 x 5	El Obeid
18.	1981 UKN II	3/7	20	1	2 x 5	El Obeid
19.	Variety Crosses (1) Multilocation	2/7	20	1	1 x 5	Wad Medani
20.	F1 Crosses Involving African x African parents	2/7	139	1	1 x 5	Wad Medani
21.	B O 1(F1)	2/7	13	1	1 x 5	Wad Medani
22.	SM F2	3/7,3/7	26	1	5 x 5	Wad Medani, El Obeid
23.	F3 Progenies	3/7	28	1	2 x 5	El Obeid
24.	Material from USA (INTSORMIL)	27/7	54	1	1-3 x 5	Wad Medani, El Obeid

Appendix II. List of Sorghum Trials and Nurseries Conducted in Rainy Season of 1981

	Trial/Nursery	Source of Material	No. of entries	Rep/Design	Plot Size Rows x Length	Locations**
I	Breeding Nurseries:					
	1. Crossing Block	Wad Medani				WM
	(Elite Introd.x Elite Locals)	"	7 x 7			
	(Drought Tol. Introd.x Drought Tol. Locals)	"	100 x 5			
	(Elite B.Lines x Local R.lines)	"	6 x 6			
	2. F2 Populations	"	178	1	5 x 12m	WM, GD
	3. F3 Progenies	"	130	1/Running check	1 x 5m	WM, GD
	4. F4 Progenies	"	1270	1/Running check	1 x 5m	WM, GD, OBD, AGD
	5. F5 Progenies	"	400	1/Running check	1 x 5m	WM
II	New Local Collections (1980)	"	85	1	1 x 5m	WM, GD
III	Varietal Trials and Nurseries:					
	1. 1981 Elite Sorg. Var. Yield Trial	"	25	4/RCBD	4 x 5m	WM, GD, OBD, AGD, KDG
	2. 1981 Selected Sorg. Var.Trel.Yield Trial	"	60	2/RCBD	3 x 5m	WM,GD,OBD,AGD,KDG
	3. 1980 Head Selections	"	210	1/Running check	1 x 5m	WM,GD,OBD,AGD,KDG
	4. ICRISAT Sorg. Var. Trial	Hyderabad	25	2/RCBD	4 x 5m	WM,GD
	5. Sorghum Elite Progeny Obs. Nursery-1981	"	48	1	2 x 5m	WM, GD
	6. Int. Sorg. Trel.Yield Trial-I	"	25	1	2 x 5m	WM, GD
	7. Int. Sorg. Trel.Yield Trial-II	"	27	1	2 x 5m	WM, GD

Trial/Nursery	Source of material	No. of entries	Rep/Design	Plot size rows x length (m)	Locations*
IV Hybrid Program:					
1. B-lines Evaluation	Hyderabad Wad Medani INTSORMIL	25	1	2 x 5	WM, GD
2. R-line Tool	Wad Medani	540	1/Running check	1 x 5m	WM
3. Elite Experimental Hybrids Yield Trial	Wad Medani	30	2/RCBD	4 x 5m	WM,GD,AGD,Obs. nursery at OBD, KDG
4. Sel.Experimental Hybrids Yield Trial	Wad Medani	50	2/RCBD	3 x 5m	WM,GD
5. ICRISAT Hybrids Yield Trial-I	Hyderabad	25	2/RCBD	4 x 5m	WM, GD
6. ICRISAT Hybrids Yield Trial-2	"	20	2/RCBD	4 x 5m	WM, GD
7. New Experimental Hybrids	Wad Medani	1500	1/Running check	2 x 3m	WM, GD
8. Introduced Hybrids Obs. nursery	Hyderabad U.S.Commercial INTSORMIL	110	1/Running	2 x 3m	WM, GD
V Drought Tolerance:					
1. Drought Tolerant Yellow end, Selections	Wad Medani	100	1/Running check	2 x 5	GD, OBD
2. Drought Tol.Var.Yield Trial	"	15	2/RCBD	4 x 5	GD, OBD
3. Int.Sorg.Drought Tol.Obs. Nursery	Hyderabad	52	1	2 x 5	GD, OBD
4. Drought Tolerant U.S.lines	INTSORMIL	30	1	2 x 5	GD, OBD

	Trial / Nursery	Source of Material	No. of entries	Rep/Design	Plot Size Rows x Length	Locations*
VI	Pest/Disease/Agronomy:					
	1. Stem Borer Tolerant Lines Obs. Nursery[a]	Wad Medani	120	2/RCBD	1 x 5	WM
	2. Striga Tolerant Lines Obs. Nursery	"	64	3/RCBD	3 x 5	WM
	3. Effect of Populations and water stress charcoal rot[b]	Hyderabad	3 x 4	3/RCBD	8 x 5	WM, GD
	4. Effect of fertilizer levels and populations on diff. varieties[c]	Wad Medani	3 x 2 x 2	4/RCBD	6 x 5	WM, GD
VII	Southern Sudan:					
	1. F2 Populations (Selections from Wau x Elite Introd.) - nursery at Wau					
	2. Introductions from Tanzania (Serere material from S.Z. Mukuru) - nurseries at Wau and Yei					

*a in cooperation with Dr. Nasr El Din, ARC Entomologist
b " " " Dr. Hilu, ARC Pathologist
c " " " Dr. Faisal, ARC Agronomist

** WM = Wad Medani
GD = Gadambalia
KGD = Agadi
KDG = Kadugli
OBD = El Obeid