SAFGRAD - ICRISAT
EASTERN/SOUTHERN AFRICA
REGIONAL SORGHUM AND MILLET PROJECT

ANNUAL REPORT
1984

SEMI-ARID FOOD GRAINS RESEARCH AND DEVELOPMENT
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COMMISSION OF THE ORGANIZATION OF AFRICAN UNITY
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AND

INTERNATIONAL CROPS RESEARCH INSTITUTE
FOR THE SEMI-ARID TROPICS
(ICRISAT)

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OBJECTIVES

The objectives of the Eastern/Southern Africa SAFGRAD/ ICRISAT regional sorghum and millet improvement project, based on the terms of reference of the regional co-ordinator, are the following:

1. to organize operational sorghum regional trials for SAFGRAD's eastern/southern Africa region.

2. to participate in the actual conduct and evaluation of such trials in eastern and southern Africa.

3. to introduce and evaluate germplasm from outside the region and make those promising germplasm introductions to the national programs of the region.

4. to work closely with ICRISAT to develop a long term comprehensive sorghum improvement program for the region.

5. to assist, in cooperation with the national programs of the region, in identification of trainees.

6. to serve as consultant and advisor in sorghum improvement to the participating national programs of the region.

INTRODUCTION

In consideration of these objectives, this 1984 annual report is presented under the following headings;

1. Results of the eastern Africa co-operative sorghum regional trials of 1983/84.
2. Regional introduction nursery.
3. The third regional workshop on sorghum and millet improvement in eastern Africa.
4. Travel and consultancy.
5. Looking ahead.
6. Reports and publications.

In 1984 the regional project was made fully operational and activities concentrating on each of the objectives have been and continue to be underway. With the establishment of the ICRISAT/SADCC sorghum and millet project in Zimbabwe during the year the concentration of this project has been on the eastern Africa region.

RESULTS OF THE EASTERN AFRICA CO-OPERATIVE SORGHUM REGIONAL TRIALS OF 1983/84

BACKGROUND

Sorghum workers of the eastern Africa region, in their meetings of 17-20 October 1982 in Ethiopia, recommended: 'In order to initiate a regional program the meeting agrees that the SAFGRAD Co-ordinator will organize a regional sorghum variety trial for each of the four major agro-ecological zones. Trials will be based on entries contributed by national programs in the region'.

The main reasons for these regional trials were to evaluate the elite varieties available in each national program across the entire region and to find out the range of acceptance, in the region, of a given variety. Outstanding varieties from these trials may be identified by each national program and used for further testing and production and/or as parents in their breeding programs. The four adaptation zones identified for the regional trials were High Elevation, Intermediate Elevation, Low Elevation, and Very Dry Lowlands.

The regional trials, along with the annual workshops, are expected to contribute to strong linkages among the national programs of eastern Africa. By the time of this Third Regional Workshop, most of the sorghum and millet researchers of the region have come to know each other in person. This workshop will be the first opportunity for the participants to discuss the results of regional trials they have set up and run. The regional trials provide a good avenue for inter-country co-operation leading to free and rapid movement of germplasm,

technical information, and research techniques. These trials also form a good basis for regional co-ordination of sorghum research. The visits to these trials by the Regional Co-ordinator provide an opportunity for the Co-ordinator and the Co-operator in each national program to jointly evaluate the trials.

MATERIALS AND METHODS

On the basis of the recommendations of the First Regional Sorghum Workshop in Ethiopia, seven countries in the region contributed 43 varieties for the four sets of regional trials. The list of entries, classified by contributing country and ecological zone, is given in Table 1. The numbers in the body of the table are the entry numbers as used in the four trials. Those contributing seeds sent 2-3 kg of each entry to the Co-ordinator in Nairobi. The trials were organized and seeds as well as trial handling guidelines and data forms were prepared and dispatched by the ICRISAT/SAFGRAD program in Kenya to 50 locations in eastern and southern Africa and the Yemens. The distribution list of the trials is given in Table 2.

All four trials were in randomized complete block design with three replications. It was recommended that the plot size used for all trials be 5m x 75cm x 5 rows with data taken from the centre three rows only. In some cases this was not followed. Cultural, crop protection, and fertilization practices were those normally used at each of the participating stations. The planting dates used at each station were also the normal planting times. In most situations, the seeds were drilled and seedlings thinned to the optimum spacing at each location. Data sheets, in duplicate, one to be returned to the Co-ordinator and the other to be retained by the Co-operator, were sent out. Data requested and recorded in full or partially were stand

Table 1. Entries contributed for the 1983 Eastern Africa Co-operative Regional Sorghum Trials

Contributing country	High elevation, >1,800m	Intermediate elevation, 1,500-1,800m	Low elevation, <1,500m	Very dry lowlands, rainfall <500mm; elevation <1,500m	Total
Yemen AR	1. Kadasi 2. Hamra Hujaria 3. Al-Ganad	12. Buraihi	21. Tajarib 22. Sepon 80-1	37. Gharib-red 38. Gharib-white	8
Burundi	4. SVR 157	13. SVR 8	23. 5DX 160		3
Uganda			24. Serena 25. Seredo 26. E525 HT 27. 2KX 17/ B/1	39. 3KX 72/1 40. 3KX 71/1 41. 3KX 73/4 42. 3KX 76/5	8
Tanzania			28. Tegemeo 29. 2KX 17/6	43. 5DX 135/13/ 1/3/1	3
Ethiopia	5. ETS 2752 6. Alemaya 70	14. ESIP-12 15. Bakomash 80	30. Gambella 1107 31. Melkamash 79	44. 76T1-23	7
Rwanda	7. BM 10 8. BM 27	16. SVR 157 17. Ikinya-ruka 18. Susa	32. Badege 33. Urumimbi		7
Kenya	9. E-1291 10. BJ 28X BG19	19. 2KX 17	34. 76T1-23 35. IS 8595	45. Mukueni 46. DB 822	7
Total no. of entries	10	8	15	10	43

Table 2. Distribution list of the 1983 Eastern Africa Co-operative Sorghum Regional Trials

Country	High elevation > 1,800m	Intermediate elevation 1,500-1,800m	Low elevation < 1,500m	Very dry lowlands, < 1,500m and < 500mm	Total
Yemen AR	1	1	2	2	6
Burundi	1	1	1	-	3
Uganda	1	1	3	2	7
Tanzania	-	2	1	1	4
Ethiopia	2	2	3	2	9
Rwanda	1	1	1	-	3
Kenya	1	1	2	2	6
Yemen PDR	1	1	1	1	4
Somalia	-	1	-	2	3
Zimbabwe	-	1	1	-	2
Sudan	-	-	1	2	3
Total no. of entries	8	12	16	14	50

count, date and days to 50% flowering, plant height, disease score, insect score, bird damage, agronomic desirability, head weight, head number, grain yield, 1,000 seed weight, and remarks.

The uniform guideline for recording data as given to all co-operators contained the following information:

Stand count

Number of plants in the centre three rows of the plot.

Days to 50% flowering

Number of days from first effective rainfall date to the date when 50% of the plants in the plot started flowering.

Plant height

The mean height of the plants in the centre three rows of the plot, in cm.

Disease score

Visually score each plot for each major disease from 1 to 5 where 1 indicates little damage and 5 very severe damage.

Bird damage

Score each plot just before harvest from 1 to 5 where 1 indicates no bird damage and 5 represents very severe damage.

Overall agronomic desirability

Visually score each plot for overall agronomic desirability and adaptability from 1 to 5 where 1 represents excellent and 5 indicates very poor.

Head weight

The weight, in gm, of the dry (<15% moisture) sorghum heads harvested from the centre rows of each plot.

Head number

Count the number of grain-bearing harvested heads from the centre three rows of the plot.

1,000 seed weight

The weight, in gm, of a random sample of 100 seeds X 10 for each plot.

In this paper grain yield for those stations which have given weight of threshed grain per plot in gm has been converted to kg/ha. For those stations which have only reported yields as head weight in gm per plot, 70% of that weight was assumed to be the grain weight per plot and conversion to kg/ha was done and reported in the yield tables.

RESULTS AND DISCUSSION

Out of the 11 countries in Table 2 to which the four groups of trials were distributed, four are located in the southern hemisphere and the trials planted in these countries have not been completed yet. Therefore, no data had been received from any of these countries, except Zimbabwe, at the time this report was written. Data from one or more locations have been received from all countries of the northern hemisphere. Table 3 gives a classification of the traits evaluated by country and type of trial. In some stations, some traits were evaluated in one replication only. Only data on days to flowering, plant height, agronomic desirability, and grain yield

Table 3. List of locations and traits evaluated in the 1983 Eastern Africa Co-operative Sorghum Regional Trials

	1	2	3	4	5	6	7	8	9	10	11
High Elevation Trial											
Kakamega, Kenya	X	X	X	X		X	X	X	X	X	X
Lanet, Kenya	X	X	X	X		X	X				
Ibb, YAR		X	X			X		X	X	X	X
Mukairas, YPDR	X	X	X		X	X	X	X		X	X
Nazreth, Ethiopia		X									
Intermediate Elevation Trial											
Ibb, YAR		X	X			X		X	X	X	X
Katumani, Kenya		X	X				X	X			
Nazreth, Ethiopia		X									
Labora, Uganda	X	X	X								
Harare, Zimbabwe	X	X	X					X		X	X
Low Elevation Trial											
Nazreth, Ethiopia			X								
Taiz, YAR		X	X			X	X	X	X	X	X
Zabid, YAR		X	X	X		X	X	X	X	X	X
El-Kod, YPDR	X	X	X	X	X	X	X	X	X	X	X
Ngetta, Uganda	X		X	X	X	X	X				
Serere, Uganda	X	X	X	X		X	X	X	X	X	X
Wad Medani, Sudan		X	X			X					
Katumani, Kenya		X	X			X	X				
Panmure, Zimbabwe	X	X	X					X		X	X
Very Dry Lowlands											
Taiz, YAR		X	X	X		X	X	X	X	X	X
Nazreth, Ethiopia		X									
Katumani, Kenya		X	X				X	X			
Bonka, Somalia										X	

1. Stand count
2. Days to 50% flowering
3. Plant height, cm
4. Disease score
5. Insect score
6. Bird damage score
7. Agronomic desirability
8. Head weight, gm
9. Head number
10. Grain yield, gm
11. 1,000 seed weight, gm
12. Remarks

appeared good enough to be summarized across countries and reported here.

High Elevation Trials

Data from five locations for number of days to flowering, plant height, grain yield and agronomic desirability for the High Elevation Trials are given in Tables 4, 5 and 6, respectively. The overall mean number of days to flowering across the five locations was 121 days, with Nazreth, Ethiopia reporting the lowest mean figure and Lanet, Kenya the highest. The first effective rain at Lanet was reportedly received a month after planting and the reported flowering days are apparently from the date of planting. Some entries took as long as 5 months to flower at Lanet. If 30 days are subtracted from each reported figure because of the delay in the rains the resulting numbers will be approximately as expected for the varieties in the high elevation set. The entries were also generally late at the two Yemen locations reporting data.

Table 5 shows that the entries were tallest (3m or more) at the two Yemen stations, also perhaps reflecting the photo-period sensitivity of most of the entries. The entries were generally shortest at Katumani, Kenya. The varieties contributed by Ethiopia and YAR were the tallest across most locations. The overall mean plant height for all varieties across the five stations was 264 cm. The data on flowering days and plant height taken together emphasize the point that in the high altitude areas of eastern Africa the most dominant varieties are late and tall. These are currently the most preferred plant types by local farmers of the region. The entries in this set are apparently the best available highland sorghums in each of the national programs of the region.

Table 4. Number of days to flowering of the High Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identification	Seed source	Katumani, Kenya	Kakamega, Kenya	Lanet, Kenya	Nazreth, Ethiopia	Ibb, YAR	Mukairas, PDRY	Mean
1.	Kadasi	YAR	88	92	152	74	108	115	105
2.	Hamra Hujariya	YAR	82	98	153	73	111	103	103
3.	Al-Ganad	YAR	73	81	152	73	106	111	99
4.	SVR 157	Burundi	92	90	151	80	102	122	106
5.	ETS 27	Ethiopia	112	125	138	84	141	122	120
6.	Alemaya	Ethiopia	100	122	151	97	119	127	119
7.	BM 10	Rwanda	79	89	124	73	105	129	100
8.	BM 27	Rwanda	77	84	124	70	99	127	97
9.	E-1291	Kenya	72	81	97	68	93	125	89
10.	BJ28 x BG19	Kenya	70	73	90	67	74	132	84
11.	Local check	Local	-	77	128	73	115	119	102
	Mean		84	92	133	76	107	121	102
	Local check		E-1291	E-525 HR	E-1291/ VA 206/ 26	Gambella 1107	Safari	Kori	

Table 5. Plant height, in cm, of the High Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identification	Seed source	Katumani, Kenya	Kakamega, Kenya	Lanet, Kenya	Ibb, YAR	Mukairas, PDRY	Mean
1	Kadasi	YAR	180	197	263	320	350	262
2.	Hamra Hujariya	YAR	205	294	325	362	367	311
3.	Al-Ganad	YAR	143	181	280	320	350	255
4.	SVR-157	Burundi	188	220	293	287	367	271
5.	ETS 2752	Ethiopia	225	296	252	367	359	300
6.	Alemaya 70	Ethiopia	228	303	288	330	363	302
7.	BM 10	Rwanda	220	273	312	313	366	297
8.	BM 27	Rwanda	195	206	240	240	375	251
9.	E-1291	Kenya	153	150	173	165	376	203
10.	BJ28 x BG19	Kenya	135	189	155	160	373	202
11.	Local check	Local	-	135	157	387	344	256
	Mean		187	222	249	295	363	264
	Local check		E-1291	E-525 HR	E-1291/ VA 201/ 26	Safari	Kori	

Table 6. Grain yield, in kg/ha, and agronomic desirability score, of the High Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identification	Seed Source	Katumani, Kenya	Katumani, Kenya A.D.*	Kakamega, Kenya	Lanet, Kenya A.D.*	Ibb, YAR	Mukairas, PDRY	Mean
1.	Kadasi	YAR	840	2.8	-	5.0	3,644	4,500	2,995
2.	Hamra Hujariya	YAR	1,501	2.5	-	5.0	3,393	4,200	3,031
3.	Al-Ganad	YAR	2,007	2.5	-	5.0	3,985	5,100	3,697
4.	SVR 157	Burundi	1,657	3.3	2,511	4.0	2,844	2,200	2,303
5.	ETS 2752	Ethiopia	267	4.5	-	5.0	3,585	3,300	2,384
6.	Alemaya 70	Ethiopia	-	4.8	-	5.0	3,126	3,300	3,213
7.	BM 10	Rwanda	1,867	3.3	2,481	4.0	889	2,100	1,834
8.	BM 27	Rwanda	2,135	3.3	2,980	3.7	1,733	2,000	2,212
9.	E-1291	Kenya	1,932	3.3	3,200	2.7	1,958	2,300	2,347
10.	BJ28 x BG19	Kenya	650	3.8	-	2.0	771	2,600	1,340
11.	Local check	Local	-	-	2,321	2.0	2,993	2,300	2,538
	Mean		1,428	3.4	2,699	3.9	2,629	3,082	2,459
	Local check		E-1291		E-525 HR	E-1291/ VA 201/ 26	Safari	Kori	

*Agronomic desirability, 1 most desirable, 5 least desirable

The yield data given in Table 6 are generally low. The two Yemens reported the highest mean yields with about 3 tons/ha each. Yields of over 4 tons/ha for the three entries from YAR were reported from Mukairas, YPDR. At Ibb, YAR the same three entries, Kadasi, Hamra Hujariya, and Al-Ganad, gave the highest yields of about 3.5 tons/ha each. Al-Ganad was the overall highest yielder across all locations. In agronomic desirability score at Katumani, Kenya, Al-Ganad and Hamra Hujariya were the best entries. However, at Lanet, Kenya, these Yemeni entries were scored as agronomically undesirable compared to the local check. A very special and prominent feature of the Yemeni entries was their extra large seed size. The high-altitude Rwanda sorghums with deep brown seeds were found undesirable under the high-altitude situations of Yemen and they did not seem to be very well adapted to the Yemen sorghum environment.

Intermediate Elevation Trials

Tables 7-9 give the agronomic data for the Intermediate Elevation Trials grown at four locations. The mean number of days to flowering for this group was 85 days. The varieties were latest at Ibb, YAR and Harare, Zimbabwe and earliest at Nazreth, Ethiopia. Plant height in this group was also much less than in the High Elevation Group. The only entry which was as tall as 3m was the local entry at Ibb. The Rwandaise and the Yemeni varieties were distinctly the tallest ($>$3m) at Harare, Zimbabwe. All entries were under 2m in height at Katumani, Kenya and Labora, Uganda.

The mean yield for this trial for the three yield-reporting stations, Katumani, Ibb, and Harare was about 3.8 tons/ha. At Katumani the best varieties, considering agronomic appearance and grain yield, were SVR 8 and ESIP-12. Bakomash

Table 7. Number of days to flowering of the Intermediate Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identification	Seed source	Katumani, Kenya	Labora, Uganda	Ibb, YAR	Nazreth, Ethiopia	Harare, Zimbabwe	Mean
12.	Buraihi	YAR	71	89	89	69	104	81
13.	SVR 8	Burundi	77	70	108	77	114	89
14.	ESIP-12	Ethiopia	79	70	106	74	84	82
15.	Bakomash 80	Ethiopia	78	79	109	74	80	84
16.	SVR 157	Rwanda	72	75	95	69	115	85
17.	Ikinyaruka	Rwanda	71	77	94	68	106	84
18.	Susa	Rwanda	78	79	109	69	117	91
19.	2K X 17	Kenya	-	70	103	75	85	83
20.	Local check	Local	-	70	95	72	92	82
	Mean		75	75	101	72	100	85
	Local check		-	?	Juraa	Gambella 1107	Chisumbanje	

Table 8. Plant height, in cm, of the Intermediate Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identification	Seed source	Katumani, Kenya	Labora, Uganda	Ibb, YAR	Harare, Zimbabwe	Mean
12.	Buraihi	YAR	135	190	252	358	233
13.	SVR 8	Burundi	160	181	192	314	212
14.	ESIP-12	Ethiopia	178	143	192	205	180
15.	Bakomash 80	Ethiopia	160	193	227	211	198
16.	SVR 157	Rwanda	192	121	278	376	242
17.	Ikinyaruka	Rwanda	168	166	217	289	210
18.	Susa	Rwanda	182	212	277	332	251
19.	2K X 17	Kenya	-	167	88	116	123
20.	Local check	Local	-	187	318	244	249
	Mean		168	173	227	272	217
	Local check		-	?	Juraa	Chisum-banje	

Table 9. Grain yield, in kg/ha, and agronomic desirability score of the Intermediate Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no	Identification	Seed source	Katumani, Kenya, AD*	Katumani, Kenya	Ibb, YAR	Harare, Zimbabwe	Mean
12.	Buraihi	YAR	3.3	2,035	1,656	5,200	2,963
13.	SVR 8	Burundi	2.5	2,502	2,182	6,300	3,661
14.	ESIP-12	Ethiopia	1.5	2,434	2,780	9,600	4,938
15.	Bakomash 80	Ethiopia	2.3	1,542	3,464	10,500	5,169
16.	SVR 157	Rwanda	3.0	2,194	3,367	7,000	4,187
17.	Ikinyaruka	Rwanda	3.5	1,658	2,074	7,600	3,777
18.	Susa	Rwanda	3.0	2,063	2,027	2,900	2,330
19.	2KX 17	Kenya	-	-	566	6,900	3,733
20.	Local check	Local	-	-	2,406	7,200	4,803
	Mean		2.7	2,061	2,280	7,000	3,780
	Local		-	-	Juraa	Chisumbanje	

*Agronomic desirability score, 1 most desirable, 5 least desirable

80 and SVR 157 were the best yielding entries for Ibb although the latter was not desired there because of apparent high tannin and brown seeds. At Katumani ESIP-12 has been selected for further trials and, similarly, Bakomash 80 has been advanced for further testing in the YAR. The highest yielding entries at Harare were Bakomash 80 and ESIP-12 with 10 tons grain/ha. Both of these varieties have been released by the Ethiopian program for the intermediate altitudes. The Harare station has reported a mean yield of about 7 tons/ha for the trial which was a very good yield by almost any standard. The local check variety, Chisumbanje, gave about 7 tons/ha of grain yield.

Low Elevation Trials

The Low Elevation Trials had the highest number of entries (16) and were grown by the largest number of locations compared to the other three trials. This group appeared to be of most interest in the region both from the point of view of entry contributions and request for grow-out of the trial. Taking eastern Africa as a whole, the crop in this ecological zone, below 1,500 m altitude, accounts for the bulk of the sorghum grain produced in the region.

The agronomic data reported by eight locations in seven countries are given in Tables 10-12. Data for days to flowering are given in Table 10. Compared to the high and intermediate altitude sorghums, this group was much earlier across all locations, with an overall mean of 76 days to flowering. Wad Medani, Sudan and Panmure, Zimbabwe with 95 and 94 days, respectively, reported the longest time to flowering. Since the trial at Wad Medani was irrigated, the high figure appears to be a reflection of delayed irrigation. Serere, Uganda and El-Kod, YPDR, with 62 and 65,

Table 10. Number of days to flowering of the Low Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identification	Seed source	Katumani, Kenya	Nazreth, Ethiopia	Serere, Uganda	Taiz YAR	Zabid YAR	El-Kod, YPDR	Wad Medani, Sudan	Panmure, Zimbabwe	Mea
21.	Tajarib	YAR	70	70	54	72	66	80	89	88	73
22.	Sepon	YAR	70	67	57	82	71	79	95	92	76
23.	5DX 160	Burundi	72	73	64	96	74	63	100	103	80
24.	Serena	Uganda	71	68	62	86	67	64	94	94	77
25.	Seredo	Uganda	74	70	67	87	67	63	93	97	77
26.	E525 HT	Uganda	74	69	60	88	67	62	94	98	76
27.	2KX 17/13/1	Uganda	74	72	65	89	76	63	97	99	79
28.	Tegemeo	Tanzania	76	72	65	89	75	62	97	97	77
29.	2KX 17/6	Tanzania	76	75	66	93	74	61	98	101	80
30.	Gambella 1107	Ethiopia	68	72	63	81	72	65	95	93	79
31.	Melkamash 79	Ethiopia	73	74	60	60	66	64	77	80	69
32.	Badege	Rwanda	90	92	69	-	63	65	104	*	80
33.	Urimimbi	Rwanda	89	77	67	-	66	64	106	*	78
34.	76T1-23	Kenya	70	65	59	61	61	67	77	80	68
35.	IS 8595	Kenya	76	70	58	96	61	64	102	*	75
36.	Local check	Local	-	73	59	89	67	63	97	101	78
	Mean		75	72	62	83	68	65	95	94	76
	Local check		76T1-23	Gambella 1107	E1937	?	Gairaia	Beini	Dabar	Chisumbanje	

*Vegetative only, no seed set

respectively, had the earliest flowering days. Two varieties 76T1-23 and Melkamash 79, took under 70 days to flower across all locations. The latest entries were the two Rwandaise varieties, Badege and Urumimbi. Further, since the two stations with about $15\frac{1}{2}^{o}$ N (Wad Medani) and $17\frac{1}{2}^{o}$ S (Harare) latitude have the longest days during the crop season, the late flowering days may also be a reflection of the photo-sensitivity of most of the entries in this trial.

Table 11 gives the data on plant height in cm. Compared to the high and intermediate elevation sorghums the Low Elevation group were shorter with an overall mean of 174 cm. Katumani, Kenya and Taiz, YAR, respectively, reported mean heights of 132 and 147 cm. These were the shortest reported, whereas Serere, Uganda and Taiz, YAR reported the tallest mean heights, about 2 m, for the trial. The three varieties which were tallest across all locations, Badege, Urumimbi, and Tajarib, show some very interesting interactions, if the data are not in error. Tajarib with 352 cm at El-Kod was the tallest entry at that location and yet at Katumani with 110 cm height it was one of the shortest entries. The two Rwandaise entries, Badege and Urumimbi, measured about 3 m each at Serere, Uganda and Zabid, YAR and yet the same varieties were reported as the shortest entries at El-Kod, YPDR, with about 1 m height only. These data need further checking and confirmation before any conclusion can be drawn on this apparent variety x location interaction.

For the Low Elevation Trial, data on grain yield and agronomic desirability scores are given in Tables 12 and 13, respectively. The yields were generally low with an overall mean of just over 20 q/ha. The trial at El-Kod was irrigated and those at Katumani and Taiz received supplementary irrigations as well. Seven varieties produced about 3 tons/ha or over at El-Kod out of which Sepon 80-1, Gambella 1107 and Melkamash 79 were considered most desirable for the Yemeni

Table 11. Plant height, in cm, of the Low Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identification	Seed source	Katumani, Kenya	Serere, Uganda	Taiz YAR	Zabid, YAR	El-Kod, YPDR	Wad Medani, Sudan	Panmure, Zimbabwe	Mean
21.	Tajarib	YAR	710	196	170	228	352	197	207	209
22.	Sepon 80-1	YAR	128	177	120	170	208	153	166	160
23.	5DX 160	Burundi	130	209	153	187	164	180	200	174
24.	Serena	Uganda	122	175	157	168	165	170	190	163
25.	Seredo	Uganda	122	178	160	162	160	170	182	162
26.	E525 HT	Uganda	115	178	158	164	152	180	189	162
27.	2KX 17/13/1	Uganda	110	172	167	191	162	188	188	168
28.	Tegemeo	Tanzania	120	182	145	191	196	183	191	173
29.	2KX 17/6	Tanzania	108	162	143	158	183	147	140	149
30.	Gambella 1107	Ethiopia	132	196	163	218	217	203	186	188
31.	Melkamash	Ethiopia	147	185	123	155	190	137	180	159
32.	Badege	Rwanda	208	322	-	306	105	280	*	244
33.	Urimimbi	Rwanda	185	294	-	287	112	230	*	222
34.	76T1-23	Kenya	108	130	103	149	118	143	144	128
35.	IS 8595	Kenya	-	193	170	195	118	163	*	168
36.	Local check	Local	-	189	125	360	251	137	210	212
	Mean		132	196	147	206	178	179	182	174
	Local check		76T1-23	E-1937	?	Gairaia	Beini	Dabar	Chisumbanje	

*Vegetative only, no seed set

Table 12. Grain yield, in kg/ha, of the Low Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identification	Seed source	Katumani, Kenya	Serere, Uganda	Taiz, YAR	Zabid, YAR	El-Kod, YPDR	Panmure, Zimbabwe	Mean
21.	Tajarib	YAR	1,119	1,182	2,177	643	2,400	2,200	1,620
22.	Sepon 80-1	YAR	910	952	3,423	1,389	3,800	3,800	2,379
23.	5DX 160	Burundi	2,207	2,588	1,343	1,493	2,800	3,800	2,372
24.	Serena	Uganda	1,559	2,862	2,583	1,514	3,100	4,100	2,620
25.	Seredo	Uganda	1,626	2,613	3,303	1,493	2,900	4,700	2,772
26.	E525HT	Uganda	1,966	1,898	2,644	1,493	3,000	3,900	2,483
27.	2KX 17/13/1	Uganda	313	604	3,080	1,058	2,100	4,500	1,942
28.	Tegemeo	Tanzania	525	460	1,813	1,244	1,400	3,800	1,540
29.	2KX 17/6	Tanzania	1,186	479	1,680	1,182	1,300	2,500	1,387
30.	Gambella 1107	Ethiopia	1,311	1,070	2,769	1,082	2,800	4,200	2,205
31.	Melkamash 79	Ethiopia	1,142	1,935	2,303	1,224	2,900	3,600	2,184
32.	Badege	Rwanda	2,593	1,898	-	124	2,100	*	1,679
33.	Urumimbi	Rwanda	2,121	2,626	-	124	1,300	*	1,543
34.	T6T1-23	Kenya	381	2,103	1,431	1,411	1,300	4,300	1,821
35.	IS 8595	Kenya	-	1,157	840	291	1,400	*	825
36.	Local check	Local		1,842	2,924	352	1,700	3,500	2,063
	Mean		1,293	1,642	2,308	1,007	2,269	3,800	2,053
	Local check		T6T1-23	E-1937	?	Gairaia	Beini	Chisumbanje	

Table 13. Agronomic desirability score* of the Low Elevation Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identi-cation	Seed source	Katumani, Kenya	Serere, Uganda	Taiz, YAR	Wad Medani, Sudan	Mean
21.	Tajarib	YAR	3.5	2.3	2.7	4.7	3.3
22.	Sepon 80-1	YAR	3.0	3.0	2.0	2.8	2.7
23.	5DX 160	Burundi	2.3	1.7	4.3	4.0	3.1
24.	Serena	Uganda	3.0	1.0	4.0	4.0	2.8
25.	Seredo	Uganda	2.8	1.0	2.0	3.3	2.3
26.	E525 HT	Uganda	3.0	1.7	2.7	4.0	2.8
27.	2KX 17/13/1	Uganda	2.5	2.3	2.0	3.0	2.4
28.	Tegemeo	Tanzania	2.5	1.7	2.3	3.3	2.4
29.	2KX 17/6	Tanzania	2.5	1.7	3.0	4.0	2.8
30.	Gambella 1107	Ethiopia	2.0	2.0	2.0	2.5	2.1
31.	Melkamash 79	Ethiopia	2.3	2.0	3.0	2.7	2.5
32.	Badege	Rwanda	3.0	1.3	5.0	5.0	3.6
33.	Urumimbi	Rwanda	3.0	1.3	5.0	5.0	3.6
34.	76T1-23	Kenya	3.3	1.7	4.0	2.7	2.9
35.	IS 8595	Kenya	3.5	3.0	3.3	5.0	3.7
36.	Local check	Local	-	2.0	2.3	3.0	2.4
	Mean		2.8	1.8	3.0	3.6	2.8
	Local check		T6T1-23	E-1937	?	Dabar	

*Most desirable, 5 least desirable

situation. Sepon 80-1 was the highest yielding entry at Taiz and El-Kod. This variety has recently been released in YAR. Although varieties like Seredo have yielded well in Yemen, their grain quality is not considered good enough for acceptance by Yemeni farmers. Based on the overall agronomic desirability score, the best entries for Katumani were Gambella 1107, Melkamash 79 and 5DX 160. At Serere the best varieties were the Serere bred varieties Serena and Seredo, but these varieties did not have good scores in Wad Medani, Sudan, mainly because of their poor grain quality. In Taiz the best agronomic desirability scores were given to Sepon 80-1, Seredo, 2KX 17/13/1 and Gambella 1107. At Panmure, Zimbabwe, five varieties, Seredo, Serena, 2KX 17/13/1, Gambella 1107, and 76T1-23 gave over 40 q/ha. The first three varieties are from Serere whereas the last two are from the Ethiopian program.

Very Dry Lowlands Trials

Sorghum production under very dry lowland situations in eastern Africa has a high probability of failure. In this region there are areas below 1,500 m in altitude having less than 500mm annual rainfall. Since such conditions make sorghum production very difficult, most countries in the region have indicated a strong interest in the trial designed for this ecological zone. All countries in the region, except Burundi and Rwanda, requested this trial for testing in their very dry lowlands. In all of the countries that have grown this set in very dry lowland rainfed stituations the trials have reportedly failed. The data for this set reported in Tables 14 and 15 are from areas with more reliable rainfall and supplemental irrigation conditions. All the three stations reporting some results on this set, Katumani, Taiz, and Nazreth, have reported giving supplemental irrigation.

As expected, this group contained some of the earliest entries of the four trials discussed in this report. The

overall mean number of days to flowering for the three reporting stations was 73 days, with Katumani and Nazreth reporting 62 and 69 days, respectively, as location mean. Gharib red and Gharib white were by far the earliest entries (53 days) at Katumani. They were, however, too grass-like with very low seed number on the panicle and were rated lowest in agronomic desirability at that location. At Taiz, some of the entries, such as Mukueni, DB 822, and 5DX 135/13/1/3/1 were relatively late, taking 100 days or more to flower.

Grain yield (Table 15) for this group, both at Katumani and Taiz, was very low. The very low yields at Katumani are mostly due to very poor stand establishment. At Katumani, the most desirable entries in the lot were the two local entries, Makueni and DB 822. The varieties available from the national programs for this zone would need a lot of improvement so that better and more stable yields could be realized from this difficult sorghum production zone of the region.

CROP PROTECTION AND OTHER COMMENTS FOR ALL SETS

For all of the four sets, the data recorded on stand count, disease and insect score, bird damage, and 1,000 seed weight appeared erratic in some of the locations and did not lend themselves to analysis across locations. Some varieties, such as 2KX 17, entry No. 19 in the Intermediate Elevation Set, had very poor stands across all locations. This was apparently due to weevil damage on the seed that was sent out. Many of the entries with white and pearly grains were severely damaged by birds at several locations. In general, however, diseases

Table 14. Number of days to flowering and plant height (cm) for the Very Dry Lowlands of the Eastern Africa Co-operative Sorghum Regional Trials

Entry no.	Identification	Seed source	Katumani, Kenya		Days to flowering		Mean days to flowering
			Days to flowering	Plant height cm	Taiz, YAR	Nazreth Ethiopia	
37.	Gharib Red	YAR	53	135	75	64	64
38.	Gharib White	YAR	53	140	67	68	63
39.	3KX 72/1	Uganda	70	93	90	66	75
40.	3KX 71/1	Uganda	72	110	94	65	77
41.	3KX 73/4	Uganda	67	128	88	67	74
42.	3KX 76/5	Uganda	62	115	88	64	71
43.	5DX 135/13/1/3/1	Tanzania	70	115	103	71	81
44.	76T1-23	Ethiopia	72	118	67	67	69
45.	Makueni	Kenya	76	188	102	75	84
46.	DB 822	Kenya	81	180	99	74	85
47.	Local check	Local	-	-	85	74	80
	Mean		62.3	132	87	69	73
	Local check		DB 822		SPV 386	Gambella 1107	

Table 15. Grain yield, in kg/ha, and agronomic desirability* score of the Very Dry Lowlands Set of the Eastern Africa Co-operative Sorghum Regional Trials, 1983

Entry no.	Identification	Seed source	Katumani, Kenya*	Katumani, Kenya	Taiz, YAR	Mean grain Yield
37.	Gharib Red	YAR	5.0	461	1,365	913
38.	Gharib White	YAR	5.0	393	1,423	908
39.	3KX 72/1	Uganda	3.0	321	1,345	833
40.	3KX 71/1	Uganda	3.0	437	733	585
41.	3KX 73/4	Uganda	3.5	552	1,039	795
42.	3KX 76/5	Uganda	4.0	880	773	826
43.	5DX135/13/1/3/1	Tanzania	2.8	1,847	1,071	1,459
44.	76T1-23	Ethiopia	3.0	635	983	809
45.	Mukumi	Kenya	2.3	1,143	1,481	1,312
46.	DB 822	Kenya	2.5	356	1,308	832
47.	Local check	Local	-	-	1,308	1,308
	Mean		3.4	702	1,166	934
	Local check		DB 822		SPV 386	

*Agronomic desirability score, 1 most desirable, 5 least desirable

and insects were reported not serious at most locations. High insect scores were indicated at the YPDR locations without designation of the insect causing the problem. Aphids and shoot-fly were reportedly seen on the trials. Zabid, YAR, reported significant leaf blight with the YAR variety Tajarib being the most susceptible and 2KX 17/6 from Tanzania the most tolerant entries. The Yemeni high altitude sorghums did not set seed at the high altitude location in Kenya (Lanet). At Lanet, high disease scores were recorded without designation of the disease.

SUMMARY OF ENTRIES ADVANCED FOR FURTHER TESTING AND/OR UTILIZATION

For the seven countries from which results of one or more of the four trials were expected, the advanced entries are given below by country:

Yemen Arab Republic

In general, the local Yemeni varieties were considered superior to all of the introduced varieties, primarily based on grain size and colour. Two entries from Ethiopia, Bakomash 80 and Melkamash 79, have been selected for further testing.

Yemen People's Democratic Republic

The preference for extra large seed without testa seems to hold here just as in YAR. The entries from YAR and Ethiopia were considered best for YPDR conditions. Promising entries selected for further testing were Al-Ganad, Kadasi, Hamra

Hujariya, Tajarib and Sepon 80-1 from YAR and ETS 2752, Alemaya 70, Gambella 1107 and Melkamash 79 from Ethiopia.

Sudan

No information on entries advanced from these trials has been given. However, based on agronomic appearance score, the entries which were better than Dabar-1, the standard local check, were Gambella 1107, Melkamash 79, 76T1-23, and Sepon 80-1.

Ethiopia

Since the Ethiopian quarantine regulations have not allowed the growing of the four trials in the appropriate ecological zones, all observations for the four sets of trials were made at the central co-ordinating station, Nazreth, only. Therefore, tight selection pressure was not applied on those materials which should have been grown in stations ecologically different from Nazreth. Accordingly, Kadasi, Hamra Hujariya, Al-Ganad and Badege were selected for future high elevation trials. Some 12 entries with brown seeds were selected for a special brown seeded sorghums trial for the Nazreth area. Some of the 2KX entries and Sepon 80-1 were also selected for further testing. Entries selected as parents for the Ethiopian crossing program were Tajarib, DB 822, and 3KX 73/4.

Kenya

The results presented of trials planted at Kakamega and Lanet did not indicate entries to be advanced. At Katumani, the selections made for further testing were ESIP-12, Bakomash 80, 5DX 160, Gambella 1107 and Melkamash 79. These selections were made in the 1983 short rains and they have already been

planted in this 1984 long rainy season.

Uganda

No comment has been made about advancing any of the entries from the trials. In general, the Serere bred varieties such as Serena, Seredo and 5DX 160 (from Burundi) had the best rating for agronomic desirability.

Somalia

Incomplete results received from the Bonka station indicate that in the Very Dry Lowlands Trial the 3KX series, from Uganda, gave a mean yield of about 5 q/ha and reportedly appeared promising.

Zimbabwe

The best performing varieties in the Intermediate set in Harare were Bakomash 80 and ESIP-12. Both of these varieties have been released by the ESIP. For the Panmure area the best varieties were Seredo, Serena, and 2KX 17/13/1 from Uganda and Gambella 1107 and 76T1-23.

Burundi, Rwanda and Tanzania

Results have not been received yet.

In general, looking at the performance of several varieties it can be said that the transferability of varieties within the same ecological zone, i.e. between countries in Eastern Africa, is quite good. The implication of this good transferability of varieties between countries is that a regional breeding program, based on distinct ecological zones, can develop varieties suitable for a number of countries of the region.

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LIST OF CO-OPERATORS IN THE 1983/1984 EASTERN AFRICA CO-OPERATIVE SORGHUM REGIONAL TRIALS

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Yemen Arab Republic

Dr Ali Kambal

Yemen Peoples Democratic Republic

Mr Abdul Aziz Bawazir

Zimbabwe

Mr Joseph N. Mushonga

REGIONAL INTRODUCTION NURSERY

A lowland introduction nursery consisting of 1572 entries (Table 16) was grown and evaluated in the 1983/84 short rains season at Katumani. The entries were received from diverse sources including Burundi, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda, Mali, Mexico, Texas, and ICRISAT (Hyderabad). On the basis of overall agronomic appearance scores at Katumani, the most promising 15% of the entries were selected and advanced for more thorough testing during the 1984 long rains season. These selected entries are also included in the 1985 Eastern Africa Co-operative Sorghum Screening Nursery (EACSSN).

In the 1984 long rains planting the selections advanced from the 1983/84 short rains were assigned to three groups of trials. Trial 1 consisted of the visually best 15 entries i.e. those receiving an overall agronomic appearance score of 1.5 or better (in 1 to 5 scale where 1 was most desirable and 5 was least desirable). Trial 2 consisted of the 42 entries which scored between 1.6 and 2.5. Trial 3 had 180 entries which scored 3 in 1983 short rains season. The experimental design used for Trials 1 and 2 was randomized complete block with 4 and 3 replications, respectively. The plot size used in each case was 4 rows x 0.75m x 5m. Trial 3 was planned to be an observational trial with 3 reps x 2 rows x 0.75m x 5m.

For Trials 1 and 2 data were taken on flowering days, plant height, agronomic appearance, and grain yield (Tables 17 &18). Although supplemental irrigation was given the grain yields obtained in general were not impressive.

Table 16. List of Sorghum Introduction to Eastern Africa

No. of Entries	1983 SR Katumani Plot No.	Description of Material and Source
198	1-198	Elite pollinators from Sudan
61	199-260	Advanced breeding lines from Sudan
47	261-308	R lines from Texas
29	309-338	A & B lines from Texas
14	339-353	Populations from Texas
27	354-381	Drought resistant lines from ICRISAT
23	382-405	ISVAT 83 ICRISAT
13	406-419	Sudan entries for 1983 EA Trial
34	420-454	Populations from Mali and Mexico
37	455-492	Elite varieties for Lowlands from Mexico
135	493-628	F_4 or F_5 Lowland lines from Mexico
75	629-704	F_3 Lowland lines from Mexico
227	705-932	A and B lines for Lowlands from Mexico
1	933	Population from Mexico
83	934-1017	Entries of the 1983 Eastern Africa Cooperative Trial
8	1018-1026	Population from Mexico
20	1027-1047	Advanced Variety Trial 1983K from ICRISAT
305	1048-1353	Breeding lines from ICRISAT
21	1129-1150	A and B lines from ICRISAT
79	1354-1433	Striga resistant breeding lines from ICRISAT
29	1434-1463	Breeding lines from ICRISAT
59	1464-1523	Population comparison trial from ICRISAT
6	1524-1530	Tanzania breeding lines from ICRISAT
41	1531-1572	Borer resistant lines from Seshu Reddy

Table 17. Agronomic data for selected entries in Trial 1 planted at Katumani, 1984 long rains.

1983 SR Katumani Plot No.	Designation	Origin or Seed Source	Days to flower-ing	Plant height, cm	Agron. appear-ance score	Grain/Yie kg/ha
365	(22-40xSPV-105)-6 -12-1-1-1-1B	D 38084	79	180	2.8	1163
366	(GPR-143xBG-10) -13-1-1-2-1	D 38028 PC 81R	79	150	2.2	1197
367	(20-67xSB-1067) -4-1-1-1	D 38073 PC 81R	73	160	2.8	1079
395	(CSV-4xGGx370) -2-1-1-3	ICSV-148	80	160	2.3	1334
487	M-90393	521-530	72	155	2.5	544
505	M-36209	F_3A 26-1	77	135	1.8	718
570	CS 3541-7	F_3A 361	73	145	1.6	1790
946	ESIP-12	Ethiopia	78	170	2.0	548
947	Bakomash-12	"	76	175	1.8	990
953	5DX 160	Burundi	75	125	2.6	1330
960	Gambella 1107	Ethiopia	71	140	2.6	1246
961	Melkamash 79	"	72	150	1.7	981
974	Makueni	Kenya	69	190	2.5	1298
	DB 822	"	63	130	2.8	1423
	Mean		74	155	2.3	1117

Table 18. Agronomic data for selected entries in Trial 2 planted at Katumani, 1984 long rains

1983 SR Katumani Plot No.	Designation	Origin or Seed Source	Days to flower-ing	Plant height, cm	Agron. appear-ance score	Grain/Yie kg/ha
368	(SPV-101x15-3541) -2-1-1-2	D 38029 PC 81R	74	140	2.7	1030
369	[(WAxNig.Bulk)x xE35-1]-1-1-1-1B	D 71258 PC 79R	76	145	2.0	1006
370	(IS-3443xDH-559 -77R-7-1-1B	D 71185 PC 79R	80	150	2.0	969
371	[SPV-105x(SC1-108-4-8xCSV-4)]-1-14-2-2-1	D 40225 BS 82S	72	155	2.7	979
372	(E36-1xDH547-77R) -10-2-1-3-2-1	D 40455 BS 82S	79	145	2.5	892
382	[(SC-108-3xSwarna) xE35-11-6-2	ICSV-126	71	170	1.7	790
384	(IS-5622xWABC-1121 xCS-3541)-11-1-3	ICSV-157	73	145	2.2	1371
386	[(148xE35-1)-4-1x CS-3541 Deriv.]-5-3-2	ICSV-120	73	125	1.5	1445
393	(CSV-4xGGx370)-2-1 -1-1-4	ICSV-138	78	180	2.2	1108
403	(E35-1xRs/B-342)-2-2-3-1	ICSV-133	72	170	2.3	889
412	P-967083	ex Sudan	78	130	2.5	1115
456	(GPR168xCS170-6 -17)-1-1	TL 83A K5 S26	68	120	2.0	1559
457	M-90812	TL 83A K5 S60	77	110	1.7	2037
458	M-66152	L1 3-4	78	110	1.7	1495
462	(JS 12611xSC108) -4-4-8	K5 S32	73	130	2.3	1600

Table 18. (Continued)

1983 SR Katumani Plot No.	Designation	Origin or Seed Source	Days to flowering	Plant height, cm	Agron. appearance score	Grain/Yield kg/ha
467	GPR148x35-1)-4-1x (CS3541 dial.)-5-1-3	DT S9	73	110	2.3	1309
483	M-91057	PR83 AG_3 D 271-280	79	130	2.7	1106
485	(2430x3922)xM-35565	PR 83AG_3 D 371-380	76	120	2.3	1464
486	(SC108-3xE35-1) x(CS3541 dial.) -3-4	PR 83A G_3D451-460	69	110	2.3	861
492	(CS3541 crosses-39 -2-2-1-1	PR 83AG_3 D 731-740	77	125	2.3	220
496	TAM 428 LASON	F_3A 6	80	100	2.3	1202
504	LU-380	F_3A 24	79	135	2.5	1057
506	Exp.23(ENT.1012)	F_3A 27	79	125	2.2	1411
511	SA-81A#26(Salvador)	F_3A 38	76	130	2.8	636
549	(SC110x56120) (CN 5718xP721)	F_3A 199-2	68	105	2.5	1227
552	M-90378	F_3A 207	78	140	2.2	1398
554	(GPR48xE35-1)-4 -1x(CS3541 dial) -3-4	F_3A 213	78	120	1.5	1974
558	(GPR48xE35-1)-4-1x(CS3541 dial. -5-13	F_3A 225	69	125	2.2	1315
578	(SC120xTx7000)x (Tx954052xCS3541) -72-1	F_3A 429	74	115	2.2	1811
620	[(WAxNig.Bulk)x (E35-1)-5-8-1-3] -7-1-1-1	F_3A 886	75	150	1.8	1986

Table 18. (Continued)

1983 SR Katumani Plot No.	Designation	Origin or Seed Source	Days to flower-ing	Plant height, cm	Agron. appear-ance	Grain/Yield kg/ha
626	M-90318	F_3A 916	73	135	2.0	1081
628	M-36286 - grain mould resist.	F_3A 930	75	110	2.0	2004
652	F_3S76xF_3A143	F_3D 291-295-1	81	155	2.8	1719
655	F_3A170xF_3A98	F_3D 336-340-4	71	115	2.3	1161
659	F_3A890xF_3A137	F_3D591 595-4	82	160	2.3	884
666	G_3A115xG_3A58	PR83A 686-690	82	165	2.8	1387
667	G_3S168xG_3A149	PR83A 681-685-1	78	210	3.0	1190
668	G_3A87xG_3A185	PR83A 691 -695-10	76	150	2.3	1115
676	F_3A839xG_3A160	PR83A 771 -775	77	165	2.5	1240
678	G_3E51-55xF_3A536	PR83A 796 -800-1	79	150	2.7	804
1056	(GPR148xE-35-1) -4-1xCS-3541deriv.) -5-3-4-4-1	82R 82618	72	140	2.3	847
	DB 822		63	120	2.8	1087
	Mean		75	137	2.3	1233

In examining the results of both trials only 10 entries gave over 15 ha/q grain yield.

In Trial 3 only visual scoring was done. Accordingly, the best 34 entries (Table 19) were selected and advanced for further testing in the 1984/85 short rains season.

In the 1984/85 season the 90 advanced entries in Trials 1, 2 and 3 are under evaluation at Katumani and Kampi ya Mawe.

In addition to the introductions mentioned above about 2200 entries both for highlands and lowlands were introduced from the breeding nurseries of the Ethiopian Sorghum Improvement Program (ESIP). The lowland Ethiopian introductions were planted at Alupe and the highland ones were planted at Kakamega in the 1984 long rains. These breeding materials consisted of populations and lines in F_2, F_3 and F_4 generations. The nurseries at both locations were well established.

At Alupe out of about 1600 populations and lines planted about 15% of them were selected for further observations and preliminary yield trials. Both leaf blight and midge were severe at Alupe.

At Kakamega, because of severe bird damage and high incidence of sugary disease, it was not possible to make any reliable section. However, the expression of the crop and the adaptation of the material at Kakamega was excellent. The entire nursery was cut back at maturity with intention of establishing a ratoon nursery for selection in the 1984/85 season.

Table 19. List of the 34 selected entries out of Trial 3 planted at Katumani in the 1984 long rains. All of these entries received overall agronomic appearance score of 2 or better

Serial No.	1983 SR Katumani Plot No.	1984 LR Katumani Plot No.	Pedigree or identification	Origin or seed source
1.	358	352	(2077BxSPV-86)-2-2-2B	D38017 PC81R
2.	373	345	(DH-512-77RxIS-2328)-3-1-2-2-1	D40462 BS82S
3.	374	344	IS 1037	IS 1037
4.	383	340	ICSV-151	ISVAT 83
5.	390	338	ICSV-108	ISVAT 83
6.	398	335	ICSV-154	ISVAT 83
7.	401	334	ICSV-150	ISVAT 83
8.	404	332	ICSV-149	ISVAT 83
9.	409	331	M-62641	ICRISAT/Sudan
10.	419	328	P-967083	ICRISAT/Sudan
11.	455	327	M-90378	ICRISAT/Mexico
12.	480	313	M-90306	ICRISAT/Mexico
13.	503	302	LU-186	ICRISAT/Mexico
14.	508	301	LU-175-508	ICRISAT/Mexico

Table 19. (Continued)

Serial No.	1983 SR Katumani Plot No.	1984 LR Katumani Plot No.	Pedigree or identification	Origin or seed source
15.	509	300	LU-175-509	ICRISAT/Mexico
16.	540	280	43-1 (Upper Volta)	ICRISAT/Mexico
17.	542	279	CS 3541 crosses-1	ICRISAT/Mexico
18.	543	278	M-66118	ICRISAT/Mexico
19.	545	277	SC108-3xE-35-1)-5-1xCS3541 dial.)-3-4	ICRISAT/Mexico
20.	548	274	SEPON 78Bulkx(Tx95052xCS3541) -47-1	ICRISAT/Mexico
21	555	271	M-90322	ICRISAT/Mexico
22.	559	268	F_3B89xF_3B56	ICRISAT/Mexico
23.	571	262	M-66152(NDEC-647xE35)-7	ICRISAT/Mexico
24.	581	255	F_3B720xF_3B558	ICRISAT/Mexico
25.	585	251	CS 3541 crosses	ICRISAT/Mexico
26.	589	248	(SC110xSC120)xM-62641	ICRISAT/Mexico
27.	601	243	G_3C700xG_3C1141	ICRISAT/Mexico
28.	617	234	M-3685(SC108xE35-1)-2-1-1-1	ICRISAT/Mexico
29.	619	232	(CS3541 crosses-147)-1-1-1-1	ICRISAT/Mexico
30.	625	227	M-91057	ICRISAT/Mexico
31	629	225	F_3A102xG_3A173	ICRISAT/Mexico
32.	630	224	F_3A286xG_3A10	ICRISAT/Mexico
33.	653	211	F_3A109xF_3A22	ICRISAT/Mexico
34.	658	208	F_3A764xF_3A61	ICRISAT/Mexico

The main purpose of introducing the breeding populations and lines from the ESIP was to diversify the working collection in the Kenyan national sorghum program. The Alupe station is already making good use of the material.

THE THIRD REGIONAL WORKSHOP ON SORGHUM AND MILLET IMPROVEMENT IN EASTERN AFRICA HELD IN MOROGORO, TANZANIA, 5-8 JUNE, 1984

According to the recommendations of the 1983 workshop, the 1984 Regional Workshop on Sorghum and Millet Improvement in Eastern Africa was held in Morogoro, Tanzania from 5-8 June, 1984. The time of the meeting was made to coincide with the best stage to observe sorghums in the field in Tanzania. There were 33 participants out of which 16 were from Tanzania. The participants came from 12 different countries. Only active sorghum and millet researchers and representatives of SAFGRAD, ICRISAT, IDRC, TARO, and the University of Dar es Salaam attended the workshop.

As in our two previous regional workshops, the main purpose of this workshop was to enable the sorghum and millet researchers of Eastern Africa to continue to effectively share experiences and to give the participants opportunity to further interact on an annual basis with each other. Such workshops have been found to be appropriate forums to discuss the problems, solutions and prospects of sorghum and millet improvement in the region. The workshop also contributed significantly to strengthen further the existing linkages among the sorghum and millet workers of the region in that the flow of technical information and germplasm in all directions appears smoother and easier now. The sorghum and millet workers of the region now know each other well and have developed personal friendship which in turn is already fostering stronger professional ties regionally.

Our first regional workshop held in Ethiopia in 1982 concentrated on assessing and collecting information on the

then current status of sorghum improvement in each country of Eastern Africa and Zimbabwe. This has been done effectively and the proceedings of that workshop have been published and distributed widely. Additional copies are still available with the SAFGRAD Co-ordinator in Nairobi.

In our second workshop held in Rwanda in 1983 the emphasis was on presentations of reports of the sorghum and millet research and extension activities of each national program in the region for that crop season. Invited papers on Striga, stem borers, and breeding strategies were also presented. The English version of the proceedings of that workshop has been published and distributed under IDRC cover because they paid for the workshop. Now the French version is also ready and is being distributed by SAFGRAD and IDRC.

The third workshop held in Tanzania in 1984 has generally followed the format of the Rwanda workshop but in addition a special section and emphasis on the Results and Discussions of the 1983 Eastern Africa Co-operative Sorghum Regional Trials was included. These results are presented separately in this report. During the Tanzania workshop the participants were able to exchange views on how useful the regional trials have been, what changes were to be made in future regional trials, what entry contributions are to be made from the national programs, and what countries were interested in growing the 1985 regional trials.

In the third regional workshop the main centre of attraction was the Tanzanian national program on sorghum and millets. Placing special emphasis on the national program of the host country has been the main characteristic of these regional workshops.

Our Tanzanian colleagues presented papers in breeding, agronomy, intercropping, pathology, utilization, overview of

the national program, and history of sorghum improvement in Tanzania. Through these papers as well as through the visits to the laboratories and experiment fields at Morogoro and Ilonga the participants of the workshop were able to get a good understanding and comprehensive picture of sorghum improvement in Tanzania.

The complete list of papers presented to the workshop given below. The list gives an overall idea about the range of topics covered. In addition to Tanzania, each country of the region represented in the workshop gave at least one paper. The proceedings of the Tanzania workshop have already been published. Copies can be obtained from the SAFGRAD/ICRISAT Program, Nairobi, Kenya.

The list of the recommendations passed by the workshop is also given below.

LIST OF PAPERS PRESENTED AT THE THIRD REGIONAL WORKSHOP ON SORGHUM AND MILLET IMPROVEMENT IN EASTERN AFRICA, HELD IN MOROGORO, TANZANIA, 5-8 JUNE 1984

1. Welcome address - H.M. Saadan
2. Introduction address - J.N.R. Kasembe
3. Background and purpose of the workshop - Brhane Gebrekidan
4. An overview of the sorghum and millet improvement program in Tanzania - H.M. Saadan
5. The history of sorghum improvement in Tanzania - A.L. Dotto
6. Present status of sorghum breeding in Tanzania - H.M. Saadan
7. Agronomic research on sorghum and millet in Tanzania - C.S. Mushi
8. Diseases of sorghum in Tanzania - F.M. Shao
9. Intercropping of sorghum with legumes with particular reference to their plant population and legume time of planting - F.F.A. Mbowe
10. Sorghum processing and utilization in Tanzania: constraints and potentials - M. Seenapa and N.T.A. Bangu
11. Research activities of the Ethiopian sorghum improvement program, 1983/84 - Yilma Kebede and Abebe Menkir
12. Review of sorghum and millet research conducted in Western Kenya during 1983 - N.W. Ochanda
13. The sorghum and millet program in eastern Kenya in 1983 - L.R. M'Ragwa and B. Kanyenji
14. Sorghum and millet research in Rwanda in 1983 - Celestin Sehene
15. The somalia sorghum improvement project - E.K. Alahaydoian and Ali Nur Duale

16. The sorghum improvement program in the Sudan
- Abd Ellatif M. Nour

17. Sorghum in Eastern Equatoria of the Southern Sudan
- Trygve Berg

18. Report on sorghum and millet improvement in Uganda
- Vincent Makumbi Zake and J.P. Esele

19. Sorghum improvement in Yemen PDR - Abdul A.A. Bawazir

20. The sorghum and pearl millet improvement program in Zimbabwe, 1983 - J.N. Mushonga and V.E.E. Gwarazimba

21. Results of the Eastern Africa Co-operative Sorghum Regional Trials of 1983-84 - Brhane Gebrekidan

22. The role of INTSORMIL in sorghum and millet improvement in eastern Africa - J.A. Mann

RECOMMENDATIONS OF THE WORKSHOP

1. The workshop records its appreciation and thanks to the Tanzania Agricultural Research Organization (TARO), the Morogoro campus of the University of Dar es Salaam, the International Development Research Centre (IDRC), the Semi-Arid Food Grains Research and Development (SAFGRAD) JP 31 of the Organization of African Unity, and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) for sponsoring, organizing and hosting the workshop.

2. Since the recommendations made by the 1983 workshop are still valid further efforts should be made to follow up and implement more of the recommendations.

3. Appreciating the usefulness of having invited speakers address the workshop on selected topics of interest to the participants, the workshop recommends that further efforts be made to invite speakers on such topics as millet improvement, Quelea, sorghum and millet grain quality, and breeding for drought resistance.

4. It is recommended that the Eastern Africa Co-operative Sorghum Regional Trials be continued with contributions from the national programs of the region and the ICRISAT/ SAFGRAD regional program.

5. It is recommended that a regional screening nursery, composed of the most promising and advanced breeding lines from Ethiopia, Tanzania, Uganda, and ICRISAT, plus selected disease and insect nurseries, be organized for

initial grow-out and evaluation in Ethiopia, Tanzania, and Uganda. It is further recommended that after evaluation the best entries from this screening nursery be made available to the other national programs of the region.

6. Recognizing the importance of current scientific literature and the unavailability of literature to the national sorghum and millet researchers in eastern Africa, it is strongly recommended that ICRISAT be requested to provide an expanded literature service to the national programs of the region.

7. Since crop loss assessment, quarantine, and other crop protection issues have repeatedly come up in the workshop it would be desirable to have more crop protection researchers participate in future sorghum and millet regional workshops.

8. As in the past, this workshop was appreciated and commended by all those who took part. It is again strongly recommended that the workshop continue to be held on an annual basis with the same format and style. It is further recommended that the Fourth Annual Regional Workshop on Sorghum and Millet Improvement in Eastern Africa be held in Uganda in 1985.

TRAINING

There was very little training fund under the direct control of this SAFGRAD/ICRISAT regional project. During the year only one trainee from Kenya was sponsored and financed by the project for six months training at ICRISAT, Hyderabad.

Most of the contributions of the regional project was only through identification of trainees for ICRISAT's various training programs. The regional project has served as ICRISAT's contact for sorghum and millet training and related issues in eastern Africa.

TRAVEL AND CONSULTANCY

The SAFGRAD co-ordinator for sorghum and millets in eastern and southern Africa was engaged in a wide range of travel and consultancy activities throughout the year. Although most of the activities were in the eastern Africa region proper, travels were also made to Burkina Faso, India and the US. The details and purposes of all the travels undertaken by the co-ordinator during 1984 are given in the following list:

List of Travel and Consultancy Activities in 1984 of the SAFGRAD Co-ordinator for Sorghum and Millets, Eastern and Southern Africa

1. January 1984. Participated in the third SAFGRAD Committee (TAC) meeting, Ouagadougou, Burkina Faso, 7 to 14 January.

2. February 1984. Attended the ICRISAT In-House Review on sorghum and millet, Hyderabad, India, 3 to 17 February.

3. February 1984. Participated in the SAFGRAD evaluation mission discussion, Ouagadougou, Burkina Faso, 21 to 26 February.

4. March 1984. Served as consultant to UNDP and the Ministry of Agriculture of PDRY on strengthening

the PDRY National Sorghum Improvement Program, Aden, PDRY, 17 to 27 March.

5. April 1984. Consulted in designing planting plans and supplied seed for the Kenyan highland sorghum breeding program at Kakamega and the lowland nursery at Alupe, Kakamega, Kenya, 5 to 7 April.

6. May 1984. Planned and finalized arrangements for the 1984 Regional Sorghum and Millet Workshop, Dar es Salaam, Tanzania, 15 to 20 May.

7. June 1984. Organized and conducted the 1984 Regional Sorghum and Millet Workshop, Morogoro, Tanzania 1 to 10 June.

8. August 1984. Consulted and participated in evaluation and selection of the SAFGRAD/ICRISAT introduced nursery planted at Alupe, Busia, Kenya, 16 to 18 August.

9. September 1984. Served in the INTSORMIL external evaluation panel, College Station, Texas and Lincoln, Nebraska, USA, 6 to 17 September.

10. October 1984. Participated in and presented papers to the 4th SAFGRAD TAC meetings, Ouagadougou, Burkina Faso, 13 to 20 October.

11. October 1984. Attended the ICRISAT/SADCC sorghum and millet workshop, Harare, Zimbabwe, 22 to 27 October.

12. October 1984. Consulted and participated in evaluation of the SAFGRAD/ICRISAT introduced nursery planted at Kakamega, Kenya, 31 October to 1 November.

13. November 1984. Served as consultant to INTSORMIL in evaluating the INTSORMIL supported sorghum and millet projects in the Sudan. Participated also in sorghum nursery evaluations of the national programs of the Sudan and Ethiopia - visited Khartoum, Wad Medani, and El Obeid, Sudan and Addis Ababa, Nazreth, and Arsi Negelie, Ethiopia, 4 to 20 November.

14. January to December 1984. Throughout the year, in co-operation with the National Dryland Research Station of Katumani, planned, planted, evaluated and harvested sorghum trials and nurseries. Two seasons were completed during the year, short rains and long rains season. Selections from these nurseries and trials have been contributed to the 1985:

a) Eastern Africa Co-operative Sorghum Regional Trials
b) Eastern Africa Co-operative Sorghum Screening Nursery.

Note: Reports appropriate to these activities have been written and are detailed in the list of reports section of this annual report.

LOOKING AHEAD

The planned activities for 1985 of the ICRISAT/SAFGRAD Eastern Africa Regional Project will cover the six broad categories listed below:

Regional Trials

According to Recommendation No. 4 of the Tanzania workshop the sorghum workers of the region have expressed desire to continue the regional trials essentially as in 1983. This means that there will be four different regional trials for the four major sorghum ecological zones of the region. The proposed list of entries by country and ecological zone is given in Table 20. The number of entries for the four trials will range from 9 to 17 and the number of entries contributed by the co-operating countries will range from 2 to 8 with a total of 47 entries for the four trials (Table 20). The number of locations by country and ecological zone proposed to receive the 1985 Regional Trials are indicated in Table 21, a total of 40 locations with 6, 9, 15, 10 for high, intermediate, low elevation, and very dry lowlands, respectively. The preparation of seeds for the regional trials has been completed and these are ready for distribution.

Regional Nurseries

Recommendation No. 5 of the Tanzania workshop calls for the initiation of a regional sorghum screening nursery composed of the most promising and advanced breeding lines from Ethiopia, Tanzania, Uganda, ICRISAT/Hyderabad and SAFGRAD/ICRISAT/EA (Table 22). These three countries have the strongest national sorghum programs in the region. Since the complete nursery is initially to be grown out in each

Table 20. Proposed list of entries by country and ecological zone for the 1985 Eastern Africa Cooperative Regional Sorghum Trials.

Contributing country	ECOLOGICAL ZONE				Total
	High elevation, >1800m	Intermediate elevation, 1500-1800m	Low elevation, <1500m	Very dry lowlands, <500mm rainfall, <1500m elevation	
Sudan			20. Variety 1 21. Variety 2	31. Variety 3 33. Variety 4	4
Yemen AR	1. Kadasi 2. Hamra-Hujaria 3. Al-Ganad	11. Buraihi	22. Tajarib 23. Sepon-80-1	39. Gharib-red 40. Gharib-white	8
YPDR	4. Kori	12. Abu Ali	24. Beini		3
Burundi	5. SVR 157	13. SVR 8	25. 5DX 160		3
Uganda			26. 4MX11/10 27. Seredo 28. E525 HT	41. 7Z 42. 3KX 76/5	5
Somalia			29. Elmi Jama	43. Baidoa Local	2
Tanzania			30. Tegemeo 31. 2KX 97	44. 5DX 135/13/1/3/1	3
Ethiopia	6. ETS 2752 7. Alemaya 70	14. ESIP-12 15. 80ESIP11	32. Gambella 1107 33. Melkamash 79	45. 76T1-23	7
Rwanda	8. BM 10 9. BM 27	16. SVR 157 17. Susa 18. WS 1297	34. Urumimbi		6
Kenya	10. E-1291	19. 2KX 17	35. MY 146 36. 3DX 57	46. Mukeni 47. DB 822	6
Total no. of entries	10	9	17	11	47

Table 21. Number of locations by country and ecological zone proposed to receive the 1985 Eastern Africa Cooperative Sorghum Regional Trials.

Country	ECOLOGICAL ZONE				Total
	High elevation, >1800m	Intermediate elevation 1500-1800m	Low elevation, <1500m	Very dry lowlands, <1500m & <500mm	
Yemen AR	1	1	1	1	4
Burundi	1	1	1	-	3
Uganda	1	1	2	2	6
Tanzania	-	1	1	1	3
Ethiopia	1	1	1	1	4
Rwanda	-	1	1	-	2
Kenya	1	1	2	2	6
Yemen PDR	1	1	1	-	3
Somalia	-	-	2	2	4
Zimbabwe	-	1	1	-	2
Sudan	-	-	2	1	3
Total no. of entries	6	9	15	10	40

Table 22.

LIST OF SEED SOURCES FOR THE 1985 EASTERN AFRICA CO-OPERATIVE SORGHUM SCREENING NURSERY (EACSSN)

	SOURCE	NO. OF ENTRIES CONTRIBUTED	1985 EACSSN NO. RANGE
1.	Ethiopia	180	1-180
2.	Tanzania	200	181-380
3.	Uganda	200	381-580
4.	ICRISAT/Hyderabad	196	581-776
5.	SAFGRAD/ICRISAT/ KENYA	224	777-1000
	Total	1000	

of these countries and Kenya, the planned screening nursery gives opportunity to sorghum workers of these countries to have multilocational evaluation of their advanced breeding lines. More importantly, since agreements have been made among the sorghum workers of the region to distribute the best entries, after the initial evaluation, to the other national programs of the region, this regional nursery provides a mechanism where the stronger national programs play a direct and active role of strengthening the national programs of all the countries in the region. In the long run, more and more of the national programs of the region are expected to contribute entries to this and other such nurseries that are likely to be initiated at the regional level.

Regional workshops

The importance of the annual regional workshops to strengthen professional ties among the sorghum workers of the region can not be overemphasized. This activity is planned to continue. The sorghum and millet workers of the region would like to see it continue. Recommendation No. 8 of the Tanzania workshop says that the 1985 workshop should be held in Uganda. Plans are underway to hold the Uganda workshop in mid-June.

Regional introduction, evaluation, distribution, and utilization of germplasm

This activity is an on-going one and will continue. About 4,000 sorghum lines covering a wide range of materials from diverse sources (elite lines from selected national programs, A, B, and R lines, populations, advanced varieties

from the US, Mexico, ICRISAT India and many of the national programs of Eastern Africa have been introduced and initially evaluated at Katumani, Alupe (Busia), and Kakamega, Kenya. The best of these introductions have been channeled and will continue to be channeled to interested national programs of the region. The national programs are in turn free to utilize these lines directly or as parents in their breeding efforts. Carefully selected introductions will continue to be made in 1985. Our evaluation, distribution, and utilization of germplasm in 1985 will continue with more emphasis on the latter two activities. Some recently introduced sorghums, about 2,000 lines from the ICRISAT germplasm bank, include elite and early brown seeded sorghums and elite basic collections of ICRISAT, Hyderabad. These introductions are planned to be evaluated in 1985 in Kenya and Ethiopia.

Strengthening the Regional S & M Network and the National Programs

Mainly through the four activity areas mentioned above our efforts to strengthen the regional sorghum and millet network will continue. As much as funds will allow we will attempt to send more trainees from the region to the ICRISAT centre. The regional co-ordinator will continue to travel in the region and work with as many of the national programs as possible, particularly at the time of selection and evaluation of trials and nurseries.

1984 REPORTS AND PUBLICATIONS OF THE SAFGRAD/ICRISAT EASTERN AFRICA PROGRAM (Brhane Gebrekidan)

1. January 1984. Report on the third SAFGRAD Technical Advisory Committee meeting, Ouagadougou
   3 pages

2. February 1984. Brief report of the ICRISAT/SAFGRAD Program in Eastern Africa - presented to the SAFGRAD evaluation mission at Ouagadougou, Burkina Faso
   6 pages

3. March 1984. Report on a visit to Peoples Democratic Republic Yemen - consultancy report to UNDP, Aden, PDRY.
   22 pages

4. May 1984. Agronomic techniques to reduce Quelea damage in cereals by R.W. Bullard and Brhane Gebrekidan.
   50 pages

5. June 1984. Results of the eastern Africa co-operative sorghum regional trials - presented at the 3rd Eastern Africa Regional Workshop on Sorghum and Millets, Morogoro, Tanzania.
   28 pages

6. June 1984. Breeding for insect resistance in sorghum in eastern Africa - presented at "International Study Workshop on Host Plant Resistance and Its Significance in Pest Management, 10-15 June 1984".

24 pages

7. September 1984. Report of the ICRISAT/SAFGRAD eastern and southern Africa sorghum and millet program - prepared for the 4th TAC meeting of SAFGRAD

43 pages

8. October 1984. Suggestion for co-ordinated sorghum and millet work for Kenya - prepared for the ISNAR mission to Kenya

3 pages

9. October 1984. Report on the 4th SAFGRAD TAC meeting and the first ICRISAT/SADCC S & M workshop

3 pages

10. November 1984. Report on INTSORMIL/Sudan projects – consultancy report to INTSORMIL, Lincoln, Nebraska

25 pages

11. December 1984. Sorghum and millet improvement in eastern Africa - Proceedings of the eastern Africa regional sorghum and millet workshop held at Morogoro, Tanzania, 5-8 June, 1984.

255 pages

STAFF LIST

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1984-06

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Gebrekidan, Brhane

AU-SAFGRAD