USAID/SAFGRAD/OAU-STRC/ICRISAT

West and Central Africa Sorghum Research Network

(WECASORN)

SYNTHESIS OF PRIMARY DATA

VOLUME TWO - TABLES AND FIGURES

ICRISAT

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SUMMARY OF VOLUME ONE

The West and Central Africa Sorghum Research Network (WECASORN) became operational in 1985 and received a grant of 1.6 million dollars in 1986 from USAID as part of Phase II of SAFFGRAD. This grant was sub-contracted to ICRISAT whose West African Sorghum Improvement Program in Mali (WASIP-Mali) executes the project with the provision of a Coordinator. WECASORN addresses the sorghum improvement problems in West Africa by concentrating on constraints having regional significance and by establishing the necessary links with national, regional and international institutes in order to serve the entire region effectively. The Network activities emphasize short term training, regional trials, research projects, monitoring tours, regional workshops and visits to NARS. The Coordinator implements the decisions of the steering committee which meets on the average twice a year, and is the driving force of the Network. The steering committee consists of representatives from Mali (Chairman), Burkina Faso, Cameroon, Senegal, Nigeria and Chad and the Coordinator. Representatives from SAFGRAD, USAID, INSAH, IRAT, and ICRISAT are observers.

During Phase II of SAFGRAD (1986-1992) changes in performance of research institutions, human resource and policy environment for research in the 17 member countries of WECASORN came about through the six major activities cited above and through policy decisions of the steering committe meeting. Since 1989 WECASORN has funded six research projects in five Lead Centers (countries). The projects are on leaf anthracnose in Burkina Faso, Long smut and grain quality in Niger, head bugs in Mali, *Striga* in Cameroon, and wheat-sorghum composite flour in Nigeria. Since 1986 two varietal and one hybrid trials were conducted. A disease nursery and a *Striga* trial were initiated in 1987 and 1988, respectively. The projects on anthracnose, long smut, head bugs and *Striga* identified resistant genotypes to the corresponding biotic stress. In the case of leaf anthracnose the genotypes included local land races from Burkina Faso. Results from the head bug project in Mali indicated that the population of the insect was more abundant towards the end of September and October. A significant finding from the long smut project was a positive correlation between infection and maturity cycle of the genotypes tested. Late maturing genotypes were more susceptible. Results from the wheat-sorghum composite flour showed that under laboratory conditions acceptable bread can be produced with up to 50% level of wheat substitution by sorghum. However, the volume of the composite bread was lower with shorter shelf life compared to 100% wheat bread. From limited sales, the composite bread was more popular especially among low income groups.

Whereas in 1986 all the test varieties in the West African Sorghum Variety Adaptation Trial early and medium duration (WASVAT-E, WASVAT-M) and the West African Sorghum Hybrid Adaptation Trial (WASHAT) were ICRISAT varieties, by 1991, 73, 53 and 11% of the test varieties, respectively, were from NARS. Similarly, NARS contributed no varieties to the West African Sorghum Disease Resistance Nursery (WASDRN) in 1987 and only 9% to the West African

Resistance Nursery (WASDRN) in 1987 and only 9% to the West African Sorghum *Striga* Trial (WASST) in 1988. By 1991, 43 and 100% of the varieties for WASDRN and WASST, respectively, were from NARS. A total of 206 varieties and 89 hybrids were tested between 1986 and 1991. Thirty-five varieties and one hybrid are at various levels of use in seven NARS. The 35 varieties constitute 17% of the total 206 varieties tested in the regional trials. Seventeen or 48.5% of the 35 varieties were contributed by NARS and 18 or 51.5% were contributed by ICRISAT. Considering the 35 varieties under use, 13 or 37.1% are being tested in farmers' fields in three countries, six (17.1%) are being observed at research stations in three countries, and one variety each (2.8%) is either in demonstration plots or in multilocation tests in two separate countries. Eight varieties (22.8%) are at the pre-release stage in five countries and one variety (2.8%) has been released in one country. Furthermore, 20 varieties (57.1%) have been used in crosses in four countries.

Between 1987 and 1991, 15 and 35 varieties from WASDRN were identified as either resistant or moderately resistant to leaf anthracnose and gray leas spot, respectively. Results from WASST between 1988 and 1991 identified 10 varieties with relatively low *Striga* counts.

Human resource development was enhanced by short-term training on *Striga* control in 1987, on agronomic research and on-farm testing in 1989, and on crop protection in 1991. Twelve, 9 and 3 participants from NARS attended the three training programs, respectively. In addition to short term training, three regional workshops, four monitoring tours, three working group meetings on research projects, a special meeting on *Striga* and visits to NARS by steering committee members were organized by WECASORN during Phase II of SAFGRAD. The steering committee, the policy making body of WECASORN, met 11 times netween 1986 and 1992.

Resident research carried out by the Coordinator identified 21 varieties resistant to grain mold, 16 varieties resistant to leaf anthracnose, 11 of which were local varieties from six NARS, and three varieties resistant to sooty stripe. Seeds of these resistant varieties and the results obtained were sent to breeders in nine NARS. In addition, an artificial inoculation technique for sooty stripe was developed and was successfully tested by the national program of Burkina Faso.

Table 1. Sorghum Production in WECASORN Countries[1].

Country	Area Harvested (1000 ha)	Yield (kg/ha)	Production (1000 MT)
Benin	125 F	840	105
Burkina Faso	1295	779	1009
Cameroon**	470	872	410
Centr.Afr.Rep.**	60 F	833	50 F
Chad	990*	697	690 *
Côte d'Ivoire	38	632	24
Gambia**	70 F	1057	74 *
Ghana	240 F	729	175
Guinea	6 F	667	4 F
Guinea Bissau	60 F	583	35
Mali**	1624 F	1170	1900 *
Mauritania**	133 F	689	89
Niger	1470	410	603
Nigeria	4500	1098	4940 F
Senegal**	1026	618	634
Sierra Leone	8 F	2375	19 F
Togo	178	674	120 *
World	45590	1355	61787
Africa	17556	870	15280

1. Source: The FAO Production Yearbook 1988.
F = FAO estimate
* = Preliminary data
** = Sorghum plus millet data.

Table 2. Distribution of the more important biotic and abiotic stress factors of sorghum and classification of national programs into Lead, associate, and Technology Adapting Countries.

	Insects		Diseases					*Striga*	Grain			
Country	PAN	BOR	GM	SS	AN	GL	LS		QL	UT	DR	ST
Burkina Faso	A	A	L	A	L	A		A	A			
Cameroon				A	A	A		L			A	A
Mali	L		A	A	A	A	A	A	A		A	A
Niger		A					L		L		A	
Nigeria	A	L	A				A	A		A	A	L
Côte d'Ivoire	A											
Ghana	A		A									
Benin												
CAR												
Tchad												
Gambia											A	
Guinea												
Guinea Bissau												
Mauritania												
Senegal												
Sierra Leone												
Togo												

1. Stress factors: PAN: panicle, BOR: borers, GM: grain molds, SS: sooty stripe, AN: leaf and stem anthracnose, GL: gray Leaf spot, LS: Long smut, QL: grain quality, UT: grain utilization, DR: draught, ST: stand establishment.
Classification: L: Lead Centers, A: Associate Centers. The others are Technology Adopting Centers.

Table 3. Country, project title, amount paid so far and reports received for the six research projects of WECASORN.

Country	Project title	Amount paid and date			Reports Received	
		$	CFA	Date	Technical	Financial[4]
Burkina Faso	Identification of sources of resistance to leaf anthracnose of sorghum (*Sorghum bicolor*) caused by *Colletotrichum graminicola* (ces) Wilson in Burkina Faso	2500	877500	28/6/89	Preliminary, 1989	Complete
		2500	787238	24/11/89	First year, 1989	Complete
		2500	712500	22/6/90	Second year, 1990	Complete
		4000	1120000	7/5/91	Third year, 1991	Complete
Cameroon[1]	Screening of local germplasms of Cameroon and other countries against *Striga hermonthica* in heavily infested field conditions	2500	705000	29/6/90	First year, 1990	Complete
		2500	700000	7/5/91	Second year, 1991	Complete
Mali	Studies on head bugs of sorghum in Mali	2500	827500	26/6/89	Preliminary, 1989	Complete
		2500	790000	25/10/89	First year, 1989	Complete
		2500	712500	19/6/90	Second year, 1990	Complete
		2500	630500	26/10/90	Third year, 1991	Complete
Niger	1. Identification of resistance to long smut	2500[2]	-	-	Preliminary, 1989	Complete
		5000	1200000	5/9/92	Third year, 1991	Complete
	2. Morphologic, Chemical and Nutritive Characterization of seeds of local and improved sorghum in West and Central Africa	2500	700000	7/5/91	-	-
Nigeria	Technology for production of acceptable wheat-sorghum composite bread and confectionery	2500[3]	-	-	Preliminary, 1989	Complete
		2500[3]	-	-	First year 1989/90	Complete
		5589[3]	-	-		

1. Received $ 5000 in 1992
2. Paid through ICRISAT Sahelian Center, Niamey.
3. Paid through ICRISAT, Kano.
4. Complete = Total amount justified.

Table 3A. Financial support to non-lead (associate) NARS towards their research activities on sorghum in 1990 and 1991.

	Country	Amount received (in US dollars) 1990	1991[2]
1.	Benin	1000	0
2.	CAR[1]	1000	2000
3.	Côte d'Ivoire	1000	2000
4.	Gambia	1000	0
5.	Ghana	1000	2000
6.	Guinea	1000	2000
7.	Guinea Bissau	1000	0
8.	Mauritania	1000	2000
9.	Senegal	1000	2000
10.	Sierra Leone	1000	2000
11.	Tchad	1000	0
12.	Togo	1000	2000
	Total	12000	16000
	Grand Total	28 000	

1. CAR = Central African Republic
2. Four countries did not receive funds because upto August 1991 when the $ 2000 was sent to the others, they had not justified expenditure of the $ 1000 sent in 1990.

Table 4. Entries in WASVAT early and medium and WASHAT Trials 1986.

WASVAT-E	WASVAT-M	WASHAT
ICSV 2 BF	ICSV 23 BF	ICSH-208
ICSV 7-1 BF	ICSV 1038 BF	ICSH-221
ICSV 16-3 BF	ICSV 1044 BF	ICSH-228
ICSV 16-5 BF	ICSV 1047 BF	ICSH-229
ICSV 85-2 BF	ICSV 1056 BF	ICSH-230
ICSV 94-1 BF	ICSV 1057 BF	ICSH-231
ICSV 1031 BF	ICSV 1058 BF	ICSH-232
ICSV 1045 BF	ICSV 1063 BF	ICSH-241
ICSV 1054 BF	ICSV 1067 BF	ICSH-357
ICSV 1055 BF	ICSV 1070 BF	ICSH-358
ICSV 1060 BF	ICSV 1074 BF	ICSH-359
ICSV 1061 BF	ICSV 1077 BF	ICSH-260
ICSV 1062 BF	ICSV 1080 BF	ICSH-263
ICSV 1064 BF	PM 11344	ICSH-284
ICSV 1065 BF	IRAT 277	ICSH-285
ICSV 1078 BF	IS 915	ICSH-287
IRAT 203	ICSV 126 IN	ICSH-290
Mali Sor 84-7	ICSV 2 IN	ICSH-299
ICSH-1 (Hybrid Control)	ICSH-1 (Hybrid Control)	ICSH-305
Local (Control)	Local (Control)	ICSH-311
		ICSH-319
		ICSH-331
		ICSH-336
		ICSH-109
		ICSH-110
		ICSH-153
		ICSH-159
		ICSH-134
		ICSH-178
		CSH-5
		CSH-6
		Framida

All ICSVs, ICSH, PM lines and Framida were contributed by ICRISAT West African Program. Malisor 84-7 is from ICRISAT/Mali Bilateral Program, IRAT lines are from the IRAT Program in Burkina Faso. IS 915 is from ICRISAT's germplasm collection.

Table 5. Entry number, variety name, Pedigree and source of entries WASVAT early duration Trial, 1987.

Entry Number	Variety	Pedigree	Source
1	Nagawhite	-	Ghana
2	S-35	-	Cameroon
3	Malisor 84-5	-	Mali
4	CE 180-33	-	Senegal
5	CE 194-19	-	Senegal
6	82-7-BK2	P 967 083 X SEPON 45	Niger
7	M 24733	((SC 108 x CS 3541)16-3 x -1-3/R 2751)5-2-3	ICRISAT
8	ICSV 111 IN	(SPV 35 x E 35-1) CS 3541) - 8 - 1	ICRISAT
9	ICSV 230 IN	(SPV 475 x QL - 3) - 1 - 1 - 2	ICRISAT
10	ICSV 247 IN	(E 36-1 x CS 3541) - 3 - 15 - 1 - 2 - 2	ICRISAT
11	ICSV 1082 BF	Tetron x ICSV 1002 BF	ICRISAT
12	ICSV 1083 BF	(ICSV 1004 BF x ISVAT 82/Entry 10) - 1 - 3	ICRISAT
13	ICSV 1084 BF	ICSV 1003 BF x CSV-11	ICRISAT
14	ICSV 1085 BF	(ICSV 1004 BF x CSV-11) - 1 - 2	ICRISAT
15	ICSV 1086 BF	(82-S-82 x CSV-11) - 4 - 2	ICRISAT
16	ICSV 1087 BF	Selection of ICSV 1002 BF	ICRISAT
17	ICSV 1078 BF	E 35-1 x IS 8785	ICRISAT
18	ICSV 1054 BF	E 35-1 x IS 8785	ICRISAT
19	ICSH 109 Hybrid Control	296 A x MR 844	ICRISAT
20	Local variety		

Table 6. Entry number, variety name, their pedigree, and program of origin of entries in WASVAT early, 1988.

Entry No.	Name	Pedigree	Contributing Program
1	Nagawhite	-	Ghana
2	S-35	-	Cameroon
3	Malisor 84-5	-	Mali
4	CE 180-33	-	Senegal
5	CE 194-19	-	Senegal
6	ICSV 401 IN	-	ICRISAT
7	ICSV 210 IN	-	ICRISAT
8	ICSV 111 IN	[SPV 35 x E 35-1) IS 3541]-81	ICRISAT
9	ICSV 230 IN	(SPV 475 x QL-3)-1-1-1-2	ICRISAT
10	ICSV 247 IN	(E 36-1 x CS 3541)-3-15-1-2-2	ICRISAT
11	ICSV 1082 BF	Tetron x ICSV 1002 BF	ICRISAT
12	ICSV 1083 BF	(ICSV 1004 BF x ISVAT 82/Entry 10)-1-3	ICRISAT
13	ICSV 1084 BF	(ICSV 1003 BF x CSV-11)	ICRISAT
14	ICSV 1095 BF	(ICSV 1004 BF x CSV-11)-1-2	ICRISAT
15	ICSV 1086 BF	(82-S-82 x CSV-11)-4-2	ICRISAT
16	ICSV 1087 BF	Framida X E 35-1	ICRISAT
17	ICSV 1078 BF	E 35-1 X IS 8785	ICRISAT
18	ICSV 1054 BF	E 35-1 x IS 8785	ICRISAT
19	IRAT-204 (Control)	-	ICRISAT
20	Local Control	-	ICRISAT

Table 7. Entry number, variety name and program of origin of entries in WASVAT early, 1989, 1990.

Entry No.	Variety	Originating program
1	CS 54	Cameroon
2	CS 61	Cameroon
3	CE 151-382	Senegal
4	CE 196-7-2-1	Senegal
5	Nabana Beida	Mauritania
6	Lekwere Bedha	Mauritania
7	ICSV 242 IN	ICRISAT Reg/Nigeria
8	ICSV 258 IN	-"-
9	ICSV 401 IN	-"-
10	ICSV 1079 BF	ICRISAT Reg/Mali
11	ICSV 1070 BF	-"-
12	ICSV 1177 BF	-"-
13	ICSV 1172 BF	-"-
14	ICSV 1174 BF	-"-
15	ICSV 1125 BF	-"-
16	ICSV 1175 BF	-"-
17	ICSV 1176 BF	-"-
18	Nagawhite (Control)	Ghana
19	ICSV 111 IN (")	ICRISAT
20	Local	

Table 8. Entry number, variety name and program of origin of entries in WASVAT early, 1991 and 1992.

Entry No.	Genotype	Program of origin
1	NR 71176	Nigeria
2	NR 71169	Nigeria
3	CE 145-66 TRANS 2	Senegal
4	CE 314-18	Senegal
5	CE 315-14-1-1	Senegal
6	SSV-2	Senegal
7	CSM 219	Mali
8	Mota-Maradi	Niger
9	90 W 194	ICRISAT
10	90 W 186	ICRISAT
11	90 W 197	ICRISAT
12	ICSV 401 IN (Control)	ICRISAT
13	Nagawhite (Control)	Ghana national program
14	Local (control)	

Table 9. Entry number, variety name, Pedigree and source of entries in WASVAT medium duration Trial, 1987.

Entry Number	Variety	Pedigree	Source
1	S-34	-	Cameroon
2	Malisor 84-1	-	Mali
3	BF 80-6-4-1-1	38 - 3 x IRAT S 10	Burkina Faso
4	BF 80-7-7-2-1	38 - 3 x 73 - 6/12 - 1 - 2	Burkina Faso
5	BF 80-9-8-3-1	38 - 3 x 73 - 9/46 - 2 - 1	Burkina Faso
6	BF 80-10-23-2-1	38 - 3 x 73 - 9/29 - 1 - 1	Burkina Faso
7	82-10-BK-3	P 96 7083 x SEPON 72	Niger
8	M 24781	SPV 475 (IS 12611 x SC 108-3) -3-2-7-8-2-2	ICRISAT
9	M 24791	SPV 475 (IS 12611 x SC 108-3) -3-2-2-2	ICRISAT
10	M 24525	SPV 475 (IS 12611 x SC 108-3) -5-2-2	
11	M 24723	((GPR 148 x E 35-1) 16-3 x IS 9327 deriv	ICRISAT
		(2077 B x IS 9327) -7-1-3 - 1-2-5-1	ICRISAT
12	ICSV 1088 BF	(82-S-96 x CSV - 11) - 14-2	ICRISAT
13	ICSV 1089 BF	(ICSV 1004 BF x ISVAT 82/Entry 10) - 1 - 2	ICRISAT
14	ICSV 1090 BF	(82 - S - 86 x ISVAT 82/Entry 14) - 1-2	ICRISAT
15	ICSV 1092 BF	(82 - S - 86 x CSV 4) - 3 - 3	ICRISAT
16	ICSV 1093 BF	(82 - S - 86 x CSV 4) - 2 - 9	ICRISAT
17	ICSV 1063 BF	(E 35-1 x Najjadh) x (SC 423 x CS 3541) x E 35-1)	ICRISAT
18	ICSV 1074 BF	(SEPON 72 x E 35-1) x CSV 4	ICRISAT
19	ICSH 126 IN	((SC 108-3 x Swarne) [35-1) - 6 - 1	-
20	Local control		

Table 10. Entry number, variety name, their pedigree, and program of origin of entries in WASVAT medium, 1988.

Entry No.	Name	Pedigree	Contributing Program
1	S-34	-	Cameroon
2	Malisor 84-1	-	Mali
3	BF 80-6-4-1-1	38-3 x IRAT S10	Burkina Faso
4	BF 80-7-7-2-1	38-3 x 73-/12-1-2	Burkina Faso
5	BF 80-9-8-3-1	38-3 x 73-9/46-2-1	Burkina Faso
6	BF 80-10-23-2-1	38-3 x 73-9/29-1-1	Burkina Faso
7	SEPON-82	P 967083 x SEPON 82	Niger
8	M 24581	SPV 475 (IS 12611 x SC 108-3)-3-2-7-8-2-2	ICRISAT
9	M 24791	SPV 475 (IS 12611 x SC 108-3)-3-2-2-2	ICRISAT
10	M 24525	SPV 475 (IS 12611 x SC 108-3)-5-2-2	ICRISAT
11	M 24723	[GPR 148 x E 35-1) - 16-3 x IS 9327 deriv (2077B x IS 9327)-7-1-3)]	ICRISAT
12	ICSV 1088 BF	(82596 x CSV-11)-14-2	ICRISAT
13	ICSV 1089 BF	(ICSV 1004 BF x ISVAT 82/Entry 10)-1-2	ICRISAT
14	ICSV 1090 BF	(82-S-86 x ISVAT 82/Entry 14)-1-2	ICRISAT
15	ICSV 1092 BF	(82-S-86 x ISV 4)-3-3	ICRISAT
16	ICSV 1093 BF	(82-S-86 x ISV 4)-2-9	ICRISAT
17	ICSV 1063 BF	[(E 35-1 xNajjadh) x (ISC 423 x SC 3541) x E 35-1]	ICRISAT
18	ICSV 1074 BF		ICRISAT
19	ICSV 126 IN	(SEPON 2 x E 35-1) x ICSV 4	ICRISAT
20	Local Control	[(SC 108-3 x Swarna) E 35-1]-6-1	National Program

Table 11. Entry number, variety name and program of origin of entries in WASVAT medium, 1989 and 1990.

Entry No.	Variety	Originating program
1	CS 95	Cameroon
2	CS 85	Cameroon
3	NSV-1	Ghana
4	SEPON-82	Niger
5	F2-20	Senegal
6	Takamalit	Mauritania
7	Niobougou	Mauritania
8	BF 80-10/6-2-3	Burkina Faso
9	BF 82-3/25-1-1	Burkina Faso
10	BF 82-4/4-1-1	Burkina Faso
11	IS 6928	ICRISAT Reg/Nigeria
12	IS 23526	-"-
13	IS 22380	-"-
14	ICSV 1163 BF	ICRISAT Reg/Mali
15	ICSV 1157 BF	-"-
16	ICSV 1171 BF	-"-
17	Blanc de Karimama	Benin
18	ICSV 1063 BF (Control)	ICRISAT
19	ICSV 1089 BF (" ")	ICRISAT
20	Local (" ")	National Program

Table 12. Entry number, variety name and program of origin of entries in WASVAT medium, 1991 and 1992.

Entry No.	Genotype	Program of origin
1	S 219	Côte d'Ivoire
2	83-3/3-1-1	Burkina Faso
3	83-3/48-2-1	Burkina Faso
4	Kadaga	Ghana
5	CSM 388	Mali
6	NR 71158	Nigeria
7	NR 71149	Nigeria
8	Blanc de Bagou	Benin
9	90 W 187	ICRISAT
10	90 W 188	ICRISAT
11	90 W 190	ICRISAT
12	90 W 191	ICRISAT
13	90 W 193	ICRISAT
14	90 W 195	ICRISAT
15	90 W 196	ICRISAT
16	CS 85 (Control)	Cameroon
17	Local (control)	

Table 13. Hybrids, their female and male parents and source of WASHAT, 1987.

Hybrids	Female Parent		Male Parent	Source
ICSH 641	ICSA-1	X	MR 904	ICRISAT
ICSH 229	ICSA-11	X	MR 841	ICRISAT
ICSH 230	ICSA-11	X	MR 844	ICRISAT
ICSH 231	ICSA-11	X	MR 860	ICRISAT
ICSH 232	ICSA-11	X	MR 862	ICRISAT
ICSH 401	ICSA-11	X	MR 913	ICRISAT
ICSH 642	ICSA-11	X	MR 927	ICRISAT
ICSH 569	ICSA-11	X	SPL 23 R	ICRISAT
ICSH 233	ICSA-11	X	SPL 59 R	ICRISAT
ICSH 479	ICSA-37	X	MR 922	ICRISAT
ICSH 331	ICSA-38	X	MR 862	ICRISAT
ICSH 643	ICSA-38	X	MR 871	ICRISAT
ICSH 644	ICSA-38	X	MR 877	ICRISAT
ICSH 507	ICSA-38	X	MR 926	ICRISAT
ICSH 526	ICSA-38	X	MR 930	ICRISAT
ICSH 645	ICSA-38	X	MR 941	ICRISAT
ICSH 646	ICSA-39	X	MR 877	ICRISAT
ICSH 336	ICSA-40	X	MR 862	ICRISAT
ICSH 647	ICSA-43	X	MR 875	ICRISAT
ICSH 648	ICSA-44	X	MR 875	ICRISAT
ICSH 109	269 A	X	MR 844	ICRISAT
Hageen Durra	ATX 63	X	Karper 1597	ICRISAT
Framida (local control)				
Nagawhite (local control)				
Local variety				

Table 14. Hybrids in WASHAT, 1988 and 1989.

WASVAT - 1988	WASHAT 1989
Hybrids	Hybrids
ICSH 230	ICSH 230
ICSH 231	ICSH 232
ICSH 232	ICSH 642
ICSH 780	ICSH 780
ICSH 527	ICSH 89001 NG
ICSH 88038	ICSH 479
ICSH 88039	ICSH 88038
ICSH 369	ICSH 88039
ICSH 643	ICSH 507
ICSH 507	ICSH 89002 NG
ICSH 330	ICSH 330
ICSH 88040	ICSH 646
ICSH 88041	ICSH 88042
ICSH 88042	ICSH 89003 NG
ICSH 88043	ICSH 89004 NG
ICSH 336	Tx 623A x MR 732
ICSH 88044	(INRAN Sorghum Hybrid)
ICSH 88045	Tx 631A x SUCR 36
	(INRAN Sorghum Hybrid)
Controls	Controls
ICSV 111	ICSH 109
Local	ICSH 111
	Local

Table 15. Entry number, hybrids and pedigree of entries of WASHAT, 1990.

Entry	Designation	Origin/pedigree
1	ICSH 780	ICSA 11 x MR 908
2	ICSH 89001 NG	ICSA 11 x ICSV 247
3	ICSH 88038	ICSA 37 x MR 864
4	ICSH 89005 NG	ICSA 37 x MR 904
5	ICSH 89006 NG	ICSA 37 x ICSV 247
6	ICSH 507	ICSA 38 x MR 926
7	ICSH 89002 NG	ICSA 38 x ICSV 247
8	ICSH 88007 NG	ICSA 38 x MR 917
9	ICSH 89008 NG	ICSA 38 x MR 912
10	ICSH 89009 NG	ICSA 39 x MR 906
11	ICSH 89010 NG	ICSA 39 x MR 908
12	ICSH 89011 NG	ICSA 39 x MR 912
13	ICSH 89012 NG	ICSA 39 x MR 917
14	ICSH 89013 NG	ICSA 39 x MR 941
15	ICSH 89004 NG	ICSA 41 x MR 841
16	ICSH 89014 NG	ICSA 41 x ICSV 247
17	INRAN Sorghum Hybrid	Tx 623A x MR 732
18	INRAN Sorghum Hybrid	Tx 631A x Suc 36
19	ICSV 111	Early maturing Variety Control
20	Local	Early Maturing/Variety/Hybrid Control

Table 16. Entry number, hybrids and pedigree of entries in WASHAT, 1991

Entry No	Hybrid	Originating Pedigree
1	ICSH 90001 NG	ICSA 2 X ICSV 361
2	ICSH 780	ICSA 11 X MR 908
3	ICSH 89001 NG	ICSA 11 X ICSV 247
4	ICSH 89005 NG	ICSA 37 X MR 904
5	ICSH 90002 NG	ICSA 37 X MR 861
6	ICSH 90003 NG	ICSA 37 X MR 912-2
7	ICSH 90004 NG	ICSA 37 C M 24525
8	ICSH 507	ICSA 38 X MR 926
9	ICSH 89002 NG	ICSA 38 X ICSV 247
10	ICSH 89007 NG	ICSA 38 X MR 917
11	ICSH 9005 NG	ICSA 38 X M 24525
12	ICSH 89009 NG	ICSA 39 X MR 906
13	ICSH 89012 NG	ICSA 39 X MR 917
14	ICSH 89013 NG	ICSA 39 X MR 941
15	ICSH 90006 NG	ICSA 39 X M 24791
16	ICSH 89004 NG	ICSA 41 X MR 841
17	INRAN SORGHUM HYBRID-1	Tx 623A X MR 732
18	INRAN SORGHUM HYBRID-2	Tx 613A X Suc 36
19	ICSV 111	Early Variety Control
20	Local	Early Maturing Variety Hybrid Controls

Table 17. Entry number and variety name of entries in WASDRN, 1987 and 1988.

Entry No	Genotype
1	84 S 22
2	84 S 82
3	84 S 92
4	84 S 103-1
5	84 S 103-2
6	84 S 105-2
7	84 S 109
8	84 S 115
9	84 S 126
10	84 S 130
11	84 S 157
12	84 W 19
13	84 W 838
14	84 W 848
15	84 W 852
16	ICSV 2 IN
17	ICSV 16-5 BF
18	ICSV 85-4 BF
19	ICSV 1002 BF
20	ICSV 1011 BF
21	ICSV 1034 BF
22	IS 956
23	IS 3443
24	IS 3555
25	IS 6991
26	IS 9225
27	ICSV 1023 BF
28	IS 9928
29	IS 18495
30	IS 21629
31	IS 21658
32	IS 22380
33	IS 23526
34	ICS 20-1 BF
35	84 S 85
36	IS 18696

All entries are from ICRISAT West Africa Program, except the IS lines from ICRISAT germplasm collection.

Table 18. Entry number and variety name of entries in WASRDN, 1989 and 1990.

Entry No.	Genotype
1	84 S 82
2	84 S 85
3	84 S 103-1
4	84 S 103-2
5	84 S 109
6	84 S 115
7	84 S 126
8	84 S 130
9	84 S 157
10	ICSV 1002 BF
11	84 W 838
12	84 W 848
13	84 W 852
14	ICSV 2 IN
15	ICSV 85.BF
16	ICSV 1011 BF
17	ICSV 1023 BF
18	IS 956
19	IS 3443
20	IS 3555
21	IS 6991
22	IS 9225
23	ICSV 1034 BF
24	ICSV 16-5 BF
25	IS 18696

All genotypes are from ICRISAT breeding programs, except for the IS lines which are from ICRISAT'S germplasm collection.

Table 19. Entry number and varieties in WASDRN, 1991 and 1992.

Entry No.	Genotype
1	48887
2	BF 82-7/18-2-1
3	ICSV 94-3 BF
4	BF 83-3/3-2-2
5	BF 58581
6	BF 83-3/32-1-1
7	E 35-1
8	BF 83-3/48-2-1
9	BF 83-3/3-1-1
10	BF 83-3/52-1-1
11	SPV 386
12	84 W 849
13	84 W 966
14	F2-20
15	84 S 82
16	IS 18442
17	IS 13922
18	ICSV 745

Controls: 84 S 82 = resistant to most leaf diseases. IS 18442, IS 13922, ICSV 745 are susceptible to leaf anthracnose, gray leaf spot, and sooty stripe, respectively.

Table 20. Entry number, variety name, pedigree and source of entries in *Striga* trial - 1988, 1989, 1990.

Entry	Cultivar	Pedigree	Source
1	ICSV 1078 BF	(Framida x E 35-1)-4-2-13	ICRISAT
2	ICSV 1079 BF	(Framida x E 35-1)-4-2-15	ICRISAT
3	ICSV 1007 BF (SRN 39)	CSV x Framida	Niger
4	ICSV 1098 BF	(ICSV 1011 BF x ISVAT 82/2022)-3-2	ICRISAT
5	ICSV 1112 BF	(Framida x E 35-1)-3-7	ICRISAT
6	ICSV 1115 BF	(Framida x E 35-1)-4-2-37	ICRISAT
7	ICSV 1156 BF	(ICSV 1011 BF x CSV 4)-2-8	ICRISAT
8	ICSV 1164 BF		ICRISAT
9	HV 80-10/23-2-1	-	IRAT/BF
10	IS 9830	Framida	ICRISAT
11	ICSV 1001 BF	-	ICRISAT
12	Local check		National Program

Table 21. Entry number and varieties in *Striga* trial, 1991 and 1992.

Entry No.	Genotype
1	CS 54
2	IS 15823
3	CS-61 X Framida
4	82 S 51 X CS 61
5	IS 1260
6	S 35 X S-34
7	CS 54 X CS 63
8	CS 95
9	CS 54 X Djigari
10	S 35
11	CS 210
12	CS 141
13	Local (control)

1. All entries were submitted by the WCASRN's *Striga* Projecti in Cameroon as per recommendation of the Steering Committee.

Table 22. Number of sets of regional trials dispatched and number of results received by country in 1986.

Country	Trials and number of sets				
	WASVAT				
	Early	Medium	*Striga*	Diseases	WASHAT
Benin	0	0	0	0	0
Burkina Faso	3 R(3)	4 R(4)	0	0	6 R(5)
Cameroon	1 R	1 R	0	0	2 R(2)
CAR	0	0	0	0	0
Côte d'Ivoire	0	0	0	0	2 R(2)
Gambia	1 R	1 R	0	0	0
Ghana	1 R	1 R	0	0	1 R
Guinea	0	0	0	0	0
Guinea Bissau	0	0	0	0	0
Mali	0	0	0	0	0
Mauritania	0	0	0	0	0
Niger	0	0	0	0	0
Nigeria	0	0	0	0	0
Senegal	0	0	0	0	0
Sierra Leone	0	0	0	0	0
Tchad	0	0	0	0	0
Togo	1 R	1 R	0	0	2 R(2)
TOTAL DISPATCHED	7	8			14
TOTAL RESULTS RECEIVED	7	8			12

WASVAT = West African Sorghum Variety Adaptation Trial. Early and medium refer to maturity cycle. WASHAT = West African Sorghum Hybrid Adaptation Trial. Disease nursery started in 1987 and *Striga* trial started in 1988. R = Results received, with number in parenthesis.

Table 23. Number of sets of regional trials dispatched and number of results received by country in 1987.

Country	Trials and number of sets				
	WASVAT		*Striga*	Diseases	WASHAT
	Early	Medium			
Benin	0	1 R	0	0	0
Burkina Faso	5 R(5)	5 R(5)	0	2 R(2)	7 R(7)
Cameroon	1 R	0	0	0	2 R(2)
CAR	0	0	0	0	0
Côte d'Ivoire	0	1 R	0	1 R	2 R(2)
Gambia	1 R	1 R	0	0	0
Ghana	0	1 R	0	0	1 R
Guinea	0	0	0	0	0
Guinea Bissau	0	0	0	0	0
Mali	1 R	1 R	0	1 R	1 R
Mauritania	0	0	0	0	0
Niger	1	1	0	1 R	1 R
Nigeria	1 R	1 R	0	0	0
Senegal	0	0	0	0	0
Sierra Leone	0	0	0	0	0
Tchad	0	0	0	0	0
Togo	0	1 R	0	0	1 R
TOTAL DISPATCHED	10	13	0	5	15
TOTAL RESULTS RECEIVED	9	12		5	15

WASVAT = West African Sorghum Variety Adaptation Trial. Early and medium refer to maturity cycle. WASHAT = West African Sorghum Hybrid Adaptation Trial. Disease nursery started in 1987 and *Striga* trial started in 1988. R = Results received, with number in parenthesis.

Table 24. Number of sets of regional trials dispatched and number of results received by country in 1988.

Country	Trials and number of sets				
	WASVAT				
	Early	Medium	*Striga*	Diseases	WASHAT
Benin	0	1 R	0	0	0
Burkina Faso	2 R(2)	2 R(2)	0	2 R	1 R
Cameroon	1 R	1 R	1 R	0	0
CAR	0	1	0	0	0
Côte d'Ivoire	0	1 R	0	1 R	2 R
Gambia	1	1	0	0	0
Ghana	1 R	1 R	1 R	1 R	1 R
Guinea	0	1	0	0	0
Guinea Bissau	0	1	0	0	0
Mali	2 R(2)	2 R(2)	1 R	1 R	2 R
Mauritania	1 R	0	0	0	0
Niger	2 R(2)	2 R(2)	1	1 R	3 R(3)
Nigeria	2 R(2)	2 R(2)	1	1 R	2 R(2)
Senegal	1 R	0	0	0	0
Sierra Leone	0	1	0	0	0
Tchad	1	1	0	0	0
Togo	0	1 R	1	0	1 R
TOTAL DISPATCHED	14	19	6	7	12
TOTAL RESULTS RECEIVED	12	13		7	12

WASVAT = West African Sorghum Variety Adaptation Trial. Early and medium refer to maturity cycle. WASHAT = West African Sorghum Hybrid Adaptation Trial. Disease nursery started in 1987 and *Striga* trial started in 1988. R = Results received, with number in parenthesis.

Table 25. Number of sets of regional trials dispatched and number of results received by country in 1989.

Country	Trials and number of sets				
	WASVAT				
	Early	Medium	*Striga*	Diseases	WASHAT
Benin	0	1 R	1	0	0
Burkina Faso	2 R(2)	2 R(2)	1 R	2 R(1)	1 R
Cameroon	1 R	1 R	1 R	1	1 R
CAR	0	1	0	1	0
Côte d'Ivoire	0	1	0	0	1 R
Gambia	1	1	0	0	0
Ghana	2 R(2)	2 R(2)	1 R	1	0
Guinea	0	1	0	1	0
Guinea Bissau	0	1	1	1	0
Mali	2 R(2)	2 R(2)	1 R	1 R	2 R(2)
Mauritania	1	0	0	0	0
Niger	2 R(2)	1 R	0	1	2 R(2)
Nigeria	1 R	1 R	1 R	0	2 R(1)
Senegal	1 R	1 R	0	0	0
Sierra Leone	1 R	1 R	0	1	0
Tchad	1	1	1	0	0
Togo	1	1 R	1 R	0	0
TOTAL DISPATCHED	16	19	9	10	9
TOTAL RESULTS RECEIVED	12	13	6	2	8

WASVAT = West African Sorghum Variety Adaptation Trial. Early and medium refer to maturity cycle. WASHAT = West African Sorghum Hybrid Adaptation Trial. Disease nursery started in 1987 and *Striga* trial started in 1988. R = Results received, with number in parenthesis.

Table 26. Number of sets of regional trials dispatched and number of results received by country in 1990.

Country	Trials and number of sets				
	WASVAT				
	Early	Medium	*Striga*	Diseases	WASHAT
Benin	0	1	1	0	0
Burkina Faso	2 R(2)	2 R(2)	0	1 R	0
Cameroon	1 R	1 R	1 R	1	2 R(2)
CAR	0	1	0	0	0
Côte d'Ivoire	0	1 R	0	0	2 R(2)
Gambia	1 R	1 R	0	0	0
Ghana	1 R	2 (1)	1	1	0
Guinea	0	1 R	0	1 R	0
Guinea Bissau	0	1	1	1	0
Mali	2 R(2)	2 R(2)	1	2 R(1)	3 R(3)
Mauritania	1 R	0	0	0	0
Niger	1 R	1 R	1 R	1 R	2 R(2)
Nigeria	2	2	4	0	1 R
Senegal	1 R	1 R	0	0	0
Sierra Leone	1 R	1 R	0	0	0
Tchad	1 R	1 R	0	0	0
Togo	1 R	0	1 R	0	0
TOTAL DISPATCHED	15	19	11	8	10
TOTAL RESULTS RECEIVED	13	13	3	4	10

WASVAT = West African Sorghum Variety Adaptation Trial. Early and medium refer to maturity cycle. WASHAT = West African Sorghum Hybrid Adaptation Trial. Disease nursery started in 1987 and *Striga* trial started in 1988. R = Results received, with number in parenthesis.

Table 27. Number of sets of regional trials dispatched and number of results received by country in 1991.

Country	Trials and number of sets[1]				
	WASVAT				
	Early	Medium	*Striga*	Diseases	WASHAT
Benin	0	1 R (1)	0	0	1 R (1)
Burkina Faso	2 R (2)	2 R (2)	0	1 R (1)	1 R (1)
Cameroon	1 R (1)	1 R (1)	1 R (1)	1	2 R (1)
CAR	0	1	0	0	0
Côte d'Ivoire	0	1	0	0	2 R (2)
Gambia	1 R	0	1	0	0
Ghana	1 R (1)	2 R (1)	0	1 R (1)	1 R (1)
Guinea	0	1 R (1)	0	1	0
Guinea Bissau	0	1	0	1	0
Mali	2 R (2)	2 R (2)	1 R (1)	2 R (1)	2 R (2)
Mauritania	1 R (1)	0	0	0	0
Niger	1 R (1)	1 R (1)	1	1	2 R (2)
Nigeria[2]	2 R (1)	2 R (2)	0	0	2 R (2)
Senegal	1 R (1)	1 R (1)	1 R (1)	0	1 R (1)
Sierra Leone	1 R (1)	1 R (2)	0	1 R (1)	0
Tchad	1 R (1)	1	1	0	0
Togo	1 R	0	1	0	0
TOTAL DISPATCHED	15	18	7	9	14
TOTAL RESULTS RECEIVED	11	13	3	4	13

1. WASVAT = West African Sorghum Variety Adaptation Trial. Early and medium refer to maturity cycle. WASHAT = West African Sorghum Hybrid Adaptation Trial. Disease nursery started in 1987 and *Striga* trial started in 1988. R = Results received, with number in parenthesis.

2. Results from WASVAT early and medium from Nigeria were not analyzed.

Table 28. Percent response (results received) from NARS of regional trials, 1986 to 1991).

Year	Trial[1]	Dispatched	Results received	
			Number[2]	Percentage
1986	WASVAT-E	7	7	100
	WASVAT-M	8	8	100
	WASHAT	14	12	86
1987	WASVAT-E	10	9	90
	WASVAT-M	13	12	92
	WASHAT	15	15	100
	WASLDN	5	5	100
1988	WASVAT-E	14	12	86
	WASVAT-M	19	13	68
	WASHAT	12	12	100
	WASLDN	7	7	100
	WCASST	6	3	50
1989	WASVAT-E	16	12	75
	WASVAT-M	19	13	68
	WASHAT	9	8	89
	WASLDN	10	2	20
	WCASST	9	6	67
1990	WASVAT-E	15	13	87
	WASVAT-M	19	13	68
	WASHAT	10	10	100
	WASDLN	8	4	50
	WCASST	11	3	27
1991	WASVAT-E	15	11	80
	WASVAT-M	18	13	77
	WASHAT	14	13	93
	WASLDN	9	4	55
	WCASST	7	3	43

1. WASVAT-E = West African Sorghum Variety Adaptation Trial, Early Maturing Cycle. M= Medium cycle. WASHAT = West African Sorghum Hybrid Adaptation Trial. WASLDN = West African Sorghum Leaf Disease Nursery. WCASST = West and Central Africa Sorghum *Striga* Trial.

Table 29. Percentage of varieties contributed by NARS to the regional trials, 1986 to 1992.

Year	Trial[1]	Total number of test entries	Test entries from NARS	
			Number[2]	Percent
1986	WASVAT-E	18	0	0
	WASVAT-M	18	0	0
	WASHAT	30	0	0
1987	WASVAT-E	18	6	33
	WASVAT-M	18	7	39
	WASHAT	22	0	0
	WASLDN	36	0	0
1988	WASVAT-E	18	5	28
	WASVAT-M	18	7	39
	WASHAT	18	0	0
	WASLDN	36	0	0
	WCASST	11	1	9
1989	WASVAT-E	17	6	35
	WASVAT-M	17	10	59
	WASHAT	17	2	12
	WASLDN	25	0	0
	WCASST	11	1	9
1990	WASVAT-E	17	6	35
	WASVAT-M	17	10	59
	WASHAT	18	2	11
	WASDLN	25	0	0
	WCASST	11	1	9
1991	WASVAT-E	11	8	73
	WASVAT-M	15	8	53
	WASHAT	-	-	-
	WASLDN	14	6	43
	WCASST	12	12	100
1992[3]				

1. WASVAT-E = West African Sorghum Variety Adaptation Trial, Early Maturing Cycle. M= Medium cycle. WASHAT = West African Sorghum Hybrid Adaptation Trial. WASLDN = West African Sorghum Leaf Disease Nursery. WCASST = West and Central Africa Sorghum Striga Trial.

2. Rest of test entries contributed by ICRISAT. 3. As in 1991

3. As in 1991.

Table 30. Details on participation of NARS in three short-term training program between 1987 and 1991.

Type	Location	Year	Date	N° of days	Participants	
					Number	No of countries[1]
1. *Striga* Control	Ouagadougou	1987	5-10 Oct	6	12	11
2. Agronomy/on-Farm Testing	Bamako	1989	9-29 Sept	21	9	9
3. Plant Protection	Bamako	1991	3-12 Oct	10	3	3

1. For *Striga*: Burkina Faso, Cameroon, Gambia, Ghana, Kenya, Mali, Niger, Nigeria, Sudan, Togo, Uganda.

For Agronomy: Côte d'Ivoire, Gambia, Ghana, Guinea Bissau, Mauritania, Niger, Nigeria, Senegal, Sierra Leone.

For Plant Protection: Tchad, Côte d'Ivoire, Senegal on *Striga*, entomology and Pathology, respectively.

Table 31. Details on participation of NARS in two regional workshops held in 1988 and 1991.

Location[1]	Year	Date	No of days	Participants	
				Number	No of countries
Cameroon	1988	20-23 Nov	4	52	14
Niamey	1991	7-14 March	8	20	16

1. Cameroon and Nigeria were the third and fourth workshops. The first and second workshops in 1984 and 1985, fall outside the period under review.

Table 32. Details on participation of NARS in five monitoring tours between 1986 and 1991.

Countries visited	Year	Date	No of days	Participants[1]	
				Number	No. of countries
1. Cameroon Gambia Nigeria Senegal	1986	23 Sept-6 Oct	14	6	6
2. Burkina Faso	1986	3-16 Oct	4	5	5
3. Burkina Faso	1987	30 Sept-3 Oct	4	11	11
4. Mali Burkina Faso Niger	1988	9-18 Oct	10	7	7
5. Mali	1991	10-12 Oct	3	3	3

1. 1986 (1) : Benin, Central African Republic, Gambia, Mauritania, Nigeria, Senegal.
   1986 (2) : Ghana, Guinea Bissau, Mali, Niger, Sierra Leone.
   1987 : Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Gambia, Niger, Nigeria, Senegal, Togo, Mali.
   1988 : Benin, Burkina Faso, Cameroon, Guinea, Mali, Chad, Togo.
   1991 : Niger, Nigeria, Tchad.

Table 33. Details on members of the steering committee who assisted in visiting non-lead NARS.

Made by Country[1]	Countries visited	Year	Date	No of days
Mali	Senegal Gambia	1989	5/9-16/9	8
Nigeria	Ghana	1990	18/8-27/8	10
Burkina Faso	Benin	1990	28/9-6/10	10

1. Countries of the Steering Committee members who assisted the Coordinator in visiting the weaker NARS.

Table 34. Details on participation of NARS in four working group meetings on research projects.

Working group	Location	Year	Date	Number of days	Participants from NARS[1]
1. Pathology-Entomology	Bamako, Mali	1990	19-20 April	2	5
2. Grain Utilization	Zaria, Nigeria	1990	13 Sept	1	4
3. *Striga*	Niamey, Niger	1991	10 March	1	5
4. All projects	Bamako, Mali	1992	9-10 March	2	11

1. Participants from NARS were either the principal investigator(s) of the research projects or individuals invited as evaluators. The principal investigators of the projects on anthracnose (Burkina Faso) and grain quality (Niger) were absent in 1992.

Table 35. Details on participation of NARS in a special meeting on *Striga*.

Location:	Bamako
Date:	10-11 March, 1992
Number of days:	2
Participants from NARS:	3
Objective:	Discuss results and develop a common research agenda.
Observers:	FAO, PASCON, SAFGRAD, ICRISAT, IRAT/CIRAD.

Table 36 Location, date, number of days and number of participants from NARS of WECASORN's steering committee meetings.

Location	Year	Date	No of days	Participants from NARS as Member[1]	Participants from NARS as Observer[2]
1. Ouagadougou, Burkina Faso	1986	13-14 Jan	2	2	1
2. Ouagadougou, Burkina Faso	1987	10-11 March	2	3	1
3. Ouagadougou, Burkina Faso	1987	15-17 Dec	3	4*	1
4. Maroua, Cameroon	1988	24 Sept	1	6*	2
5. Bamako, Mali	1989	9-11 May	3	4*	0
6. Ouagadougou, Burkina Faso	1989	14-17 Nov	4	5*	1
7. Niamey, Niger	1990	2-4 May	3	6*	1
8. Bamako, Mali	1990	3-4 Dec	2	3*	0
9. Niamey, Niger	1991	13-14 March	2	5	0
10. Ouagadougou, Burkina Faso	1991	12-14 Nov	3	5	1
11. Bamako, Mali	1992	8-9 June	2	6	7

1. An asterik indicates members includes individuals from outside the region, but with NARS on special projects as follows: 1987 = 1; 1988 = 3; 1989, May = 2; 1989, Nov = 2; 1990, May = 2; 1990, Dec = 1.

2. Observers = individuals from NARS. Observers from International and regional organizations not included.

Table 37. Significant results on a yearly basis from WECASORN's research projects.

Project	Country	Year Project started	Significant results	
			Cropping season	Results
1. Anthracnose	Burkina Faso	1989	1989	1. Identified 74 out of 80 lines screened as resistant to foliar infection.
				2. Grain of 30 lines were free of the fungus. Grain contamination was higher in introduced varieties.
			1990	1. The resistance to foliar infection observed in 1989 was confirmed in 70 lines.
				2. A total of 44 lines, all local varieties, were resistant to leaf, stem and grain infection.
				3. Disease progress more rapid in introduced varieties.
			1991	1. Identified 19 local varieties and three introduced varieties with rate reducing-like resistance to leaf infection.
2. Long smut	Niger		1990	1. Eleven out of 75 varieties screened were highly resistant.
				2. Late maturing varieties were more susceptible.

Table 37 continued.

Project	Country	Year project started	Significant results	
			Cropping season	Results
			1991	1. New sets of 24 varieties identified as resistant at two locations.
				2. Longevity of teliospores of the long smut fungus was increased when stored dry.
				3. Infection was higher when plants were ino-culated with sporidia than with teliospores
3. Head bugs	Mali	1989	1989	1. Population of the head bug insect was high at the end of September and October.
				2. Early planting resulted in no attack, whereas two generations developed in late planted sorghums.
				3. Twenty-five out of 100 lines were resistant.
			1990	Results obtained in 1989 were confirmed.
			1991	1. Identified 21 new sources of resistance out of 51 lines screened in a preliminary nursery.
				2. The resistance of nine varieties identified in 1989 and 1990 were confirmed by artificial inoculation.

Table 37 continued.

Project	Country	Year project started	Significant results	
			Cropping season	Results
4. *Striga*	Cameroon	1990	1990	The project multiplied eight varieties and two germplasm lines resistant to *Striga*, for entries in regional *Striga* trial.
			1991	1. Fourteen lines with low *Striga* counts identified.
				2. All 12 entries in the *Striga* regional trial came from the project.
5. Wheat-sorghum flour[a]	Nigeria	1989		1. Local Farafara variety identified as most suitable sorghum variety for the composite flour.
				2. Upto to 50% substitution of sorghum for bread and upto 60% for confectionery.
				3. Addition of 0.5% Cassava starch flour to the composite flour produced more spongy bread, closer textured and less crumbling, but shelf life was shortened.
				4. Wheat-sorghum composite flour bread more popular among low income group because it was more filling than pure wheat bread.

a. Work was not carried out according to cropping season.

Table 38. The top four yielding varieties and hybrids in the regional trials of WECASORN, 1986 to 1991.

WASVAT-Early		WASVAT-Medium		WASHAT	
Variety	t ha^{-1}	Variety	t ha^{-1}	Hybrid	t ha^{-1}
		1986			
ICSV 1078 BF	3.66	ICSV 1063 BF	2.55	ICSH 230	3.36
ICSV 1054 BF	3.52	IS 915	2.40	ICSH 229	3.34
ICSV 1055 BF	3.37	ICSV 1074 BF	2.37	ICSH 208	3.26
ICSV 1065 BF	3.28	PM 11344	2.35	ICSH 134	3.24
		1987			
Nagawhite	2.80	ICSV 1063 BF	2.58	ICSH 336	2.80
ICSV 111 IN	2.57	ICSV 1089 BF	2.56	ICSH 232	2.75
ICSV 1083 BF	2.50	M 24581	2.48	ICSH 643	2.72
CE 180-33	2.38	Malisor 84-1	2.48	ICSH 642	2.64
		1988			
Nagawhite	3.53	ICSV 1063 BF	3.34	ICSH 507	3.32
ICSV 210 IN	3.41	Malisor 84-1	3.08	ICSH 330	3.09
ICSV 111 IN	3.27	ICSV 1089 BF	3.01	ICSH 88042	3.03
S-35	3.23	BF 80-7-7-2-1	2.97	ICSH 88040	2.92
		1989			
ICSV 1079 BF	2.74	ICSV 1171 BF	2.37	ICSH 507	3.66
CS 61	2.65	F2-20	2.34	ICSH 780	3.60
ICSV 111 IN	2.55	CS-95	2.32	TX623XMR 732	3.58
ICSV 1172 BF	2.47	ICSV 1089 BF	2.29	ICSH 89002	3.57
		1990			
CE 196-7-2-1	2.53	CS 85	2.09	ICSH 89002	3.71
ICSV 1174 BF	2.26	SEPON 82	1.96	ICSH 89008	3.68
ICSV 401 IN	2.22	F2-20	1.94	IS 6928	3.56
ICSV 1172 BF	2.14	IS 6928	1.90	ICSH 89007	3.54
		1991			
90 W 186	2.47	S 219	2.33	ICSH 89009 NG	3.65
SSV-2	2.37	BF 83-3/3-1-1	2.25	ICSH 780	3.53
CE 145-66 TRANS 2	2.26	BF 83-3/42-2-1	2.10	ICSH 950005	3.44
CE 314-18	2.08	Kadaga	2.09	ICSH 507	3.41

1. Values in t ha^{-1} are means from several locations. Prefixes: all ICSV, IS, PM and ICSH are from ICRISAT; nagawhite from Ghana; CE and F2 from Senegal; CS and S from Cameroon; Malisor from Mali; BF from Burkina Faso; Sepon and Tx from Niger.

Table 39. Resistant or moderately resistant to leaf anthracnose and gray leaf spot tested in the West African Sorghum Disease Resistant Nursery between 1988 and 1991.

Leaf anthrcnose	Gray leaf spot
1987 and 1988	
IS 9928	IS 9928
IS 21658	IS 22380
84 S 82	
1989 and 1990	
IS 9225*	84 W 852
84 S 109	ICSV 1002 BF
IS 956*	ICSV 85 BF
IS 3443	ICSV 2 IN
ICSV 1023 BF*	84 S 85
IS 3555*	84 W 848
IS 6991*	84 S 103-2
ICSV 1034 BF*	84 S 115
84 W 838*	84 S 130
84 S 157*	84 S 130-1
84 S 126*	ICSV 1011 BF
1991	
F2-20*	BF 82-7/18-2-1
	58581
	BF 83-3/3-2-2
	BF 83-3/32-1-1
	E 35-1
	BF 83-3/48-2-1
	BF 83-3/3-1-1
	BF 83-3/52-1-1
	SPV 386
	84 W 849
	84 W 966

1. Resistant = mean disease severity score for several locations (MDSL) ≤ 3.0, and moderately resistant = MDSL of 3.5 on a scale of 1-6. Sooty stripe incidence and severity were very low in most locations. An asterik indicates that the variety is also resistant or moderately resistant to gray leaf spot.

Table 40. Promising varieties with relatively low *Striga* counts in the West Africa Sorghum *Striga* trial between 1988 and 1991.

1988	1989	1990	1991
IS 9830	ICSV 1001 BF[1]	ICSV 1001 BF	CS 54 X Djigari
ICSV 1007 BF	ICSV 1007 BF	ICSV 1078 BF	CS 141
	ICSV 1164 BF	ICSV 1098 BF	CS 95
	IS 9830	ICSV 1115 BF	CS 54
		ICSV 1112 BF	IS 15823
		ICSV 1079 BF	S 35
			IS 1260

1. ICSV 1001 BF is Framida.

Table 41. Thirty-five varieties tested in the regional trials and nurseries of WECASORN between 1986 and 1992 that are at various levels in the research programs of seven NARS[1].

From NARS			From ICRISAT	
Variety	Country of origin	used by (country)	Variety	used by (country)
1. CSM 388	Mali	GC	1. ICSV 16-5 BF	GC, GH
2. Malisor 84-1	Mali	GC, CI, TO	2. 84 W 848	GC
3. Malisor 84-5	Mali	GC	3. IS 3443	GC
4. BF 83-3/48-2-1	Burkina Faso	GC	4. Framida (ICSV 1001 BF)	GC, CI, TO
5. F2-20	Senegal	SE	5. 90 W 190	GC
6. CE 180-83	Senegal	SE,TO	6. ICSV 1171 BF	SE
7. CE 196-7-2-1	Senegal	SE	7. ICSV 1089 BF	SE, MA, TO
8. CS 95	Cameroon	SE,TO	8. ICSV 1163 BF	SE
9. SEPON 82	Niger	SE,TO	9. ICSV 111 IN	SE,TO, GH
10. CS 54	Cameroon	SE,TO	10. ICSV 1063 BF	CI, MA,TO
11. Nagawhite[2]	Ghana	MU	11. ICSV 401 IN	MA
12. S 34	Cameroon	TO	12. ICSV 1079 BF	MA,TO
13. S 35	Cameroon	TO	13. ICSV 1078 BF	MA,TO
14. CS 61	Cameroon	TO	14. ICSV 1002 BF	MA,TO
15. CS 95	Cameroon	TO	15. E 35-1	TO
16. CE 315-14-1-1	Senegal	SE	16. ICSV 1049 BF	TO
17. S 219	Côte d'Ivoire	GH	17. ICSV 1007 BF	TO
			18. ICSV 1083 BF	TO

1. GC = Guinea (Conakry). GH = Ghana. CI = Côte d'Ivoire. TO = Togo. SE = Sénegal. MA = Mali. MU = Mauritania.

2. Released in Ghana in 1971 before WECASORN's regional trials started.

Table 42. Utilization by NARS of germplasm tested in regional trials and nurseries of WECASORN between 1986 and 1992[1]

Country/variety	Level of use	Year	Total ha
1. Guinea (Conakry)			
ICSV 16-5 BF	FF	91-92	0.7
84 W 848	FF	91-92	0.7
IS 3443	FF	91-92	0.7
CSM 388	PR	92	55
Malisor 84-1	ST	90-92	0.2
Malisor 84-5	ST	90-92	0.2
Framida	ML	90-92	1.5
BF 83/48-2-1	FF	92	0.7
90 W 190	FF	92	0.7
2. Senegal			
F2-20	R	89	-
CE 180-33	PR	92	5
CE 196-7-2-1	FF	90	-
ICSV 1171 BF	FF	91	-
CE 315-14-1-1	FF	92	-
ICSV 1089	FF	91	-
CS 95	FF	92	-
Sepon 82	CR	91	-
ICSV 1163 BF	CR	90	-
ICSV 111 IN	CR	91	-
CS 54	CR	92	-
3. Côte d'Ivoire			
Framida	DM	88	0.25
Malisor 84-1	PR	91	0.5
ICSV 1063 BF	PR	91	0.5
ICSH 507	ST	90	0.25
4. Mali			
ICSV 401 IN	PR		-
ICSV 1063 BF	PR	-	-
ICSV 1079 BF	CR	-	-
ICSV 1089 BF	CR	-	-
ICSV 1078 BF	CR	-	-
ICSV 1002 BF	CR	-	-
		-	-
5. Mauritanie			
Nagawhite	CR	90	-

Table 42. Continued

Country/variety	Level of use	Year	Total ha
6. Togo - 1			
ICSV 1079 BF	CR	89	-
ICSV 1078 BF	CR	89	-
Sepon 82	CR	89	-
S-34	CR	90	-
S-35	CR	90	-
Framida	CR	90	-
E 35-1	CR	90	-
CS 54	CR	90	-
CS 61	CR	90	-
CS 95	CR	90	-
Malisor 84-1	CR	92	-
ICSV 1049 BF	CR	91	-
ICSV 1063 BF	CR	91	-
ICSV 1007 BF	CR	91	-
ICSV 1002 BF	CR	91	-
7. Togo - 2			
ICSV 1089 BF	ST	91-92	-
CE 180-33	ST	91-92	-
ICSV 1063 BF	ST	91-92	-
ICSV 1083 BF	FF	91-92	-
ICSV 111 BF	ST	91-92	-
Malisor 84-1	FF	91-92	-
Framida	FF	87	-
8. Ghana			
ICSV 111 IN	PR	90	60
ICSV 16-5 BF	PR	90	-
S 219	ST	91	-

1. Based on responses from a questionnaire. FF = Farmer's fields; PR = Pre-release; ST = On-Station; ML = Multilocation; R = Released; CR = in crosses; DM = Demonstration; ICRISAT varieties with prefixes ICSV, 84 or 90. E 35-1, Framida, IS 3443 contributed by ICRISAT. All others from NARS.

Table 43. Sorghum genotypes resistant to grain molds after two years of screening with sprinkler irrigation, Farako-Bâ, Burkina Faso, rainy season 1988 and Cinzana, Mali, rainy season 1989.

		TGMR[3]	
		1988	1989
Genotype[1]	Grain color[2]	Mean 10 plants	Mean 5 plants
ICSV 1001 BF (C) (Framida)	R	2.0	2.0
IS 14375 (G)	R	2.0	2.0
B 58714	W/R	2.0	2.0
IS 14384 (G/B)	R	2.0	2.0
Kadaga (G)	W/R	2.0	2.0
NSV-1 (G)	W/R	2.0	2.0
CSM 388 (G)	W/R	2.0	2.0
S-9 (G)	R	2.7	2.0
IS 25105 (C/K)	R	2.8	2.0
IS 1388 (K)	R	3.0	2.0
ICSV 16-5 BF (C)	W	3.6	2.7
Susceptible controls			
SPV 386 (C)	W	5.0	-
Malisor 84-1 (G)	W	-	4.5
SE		±0.3	±0.7
Trial mean (37 entries, 46 entries 1989)		3.7	3.2
CV (%)		8	24

1. B = Bicolor, C = Caudatum, G = Guineense, K = Kafir
2. R = Red, W/R = white with red blotches, W = white
3. TGMR = Threshed grain mold rating, 1-5 scale, means of two replications; 4m rows, randomized block design. Three-row plots (1988), 2-row plots (1989)

Table 44. Sorghum genotypes resistant to grain molds after two years of screening with sprinkler irrigation, Cinzana, Mali, rainy season 1990.

Genotype[1]	Grain color[2]	TGMR[3] 1988 Mean 10 plants	TGMR[3] 1989 Mean 5 plants
ICSV 1001 BF (C) (Framida)	R	2.0	2.0
CSM 388 (G)	W/R	2.0	2.0
IS 8763 (C)	R	2.0	2.0
IS 2867 (C)	R	2.0	2.0
IS 3413 (C)	R	2.0	2.0
IS 8219 (C)	R	2.0	2.0
IS 2263 (C)	W/GL	2.1	2.6
IS 3547 (C)	B	2.0	2.0
IS 9225 (G)	W/R	2.0	2.0
89 W 838 (C)	W/R	2.0	2.8
Susceptible controls			
IS 3661 (C)	W		
CE 151 (C)	W	5.0	5.0
		4.7	5.0
SE (1990)		±0.47	-
LDS (≤ 0.01) (1991)		2.9	1.2
Trial mean (37 entries, 46 entries 1989)			
CV (%)		16	12
Efficiency (%) (1991)		-	102

1. C = Caudatum, G = Guineense
2. R = Red, W/R = white with red blotches, W = white, W/GL = White with glumes covering more than 50% of grain.
3. TGMR = Threshed grain mold rating, 1-5 scale, means of 5 plants, 2 replications; 4m, single row plots, randomized block (1990), simple lattice (1991).

Table 45. Resistant and moderately resistant sorghum genotypes to leaf anthracnose screened at Longorola and Samanko using the composite spreader row technique, Mali, rainy season 1990 and 1991.

Genotype[1]	Disease severity (1-6 scale)[1]		
		1990	1991
	Samanko	Longorola	Longorola
CSM 388	2.5	1.0	3.0
IS 8283	2.5	2.5	2.5
ICSB 38	2.0	2.5	3.0
ICSB 39	2.0	2.0	3.0
84 S 82	2.0	2.5	3.0
Susceptible			
MR 856	6.0	5.5	6.0
SE (1990)	±0.70	±0.67	
LDS ($P \leq 0.01$) (1991)	-	-	1.38
Trial mean (98 entries 1990, 100 entries 1991)	4.6	3.8	3.9
CV (%)	15	17	13
Efficiency (%) (1991)			105

1. Disease severities are means of two replications from plot scores; single 4m row plots, randomized block (1990), simple lattice (1991).

Table 46. Disease severity of leaf anthracnose (*Colletotrichum graminicola*) on 11 local sorghum genotypes with rate reducing-like resistance, at Samanko and Longorola in Mali, rainy season 1989, 1990 and 1991[1]

Genotype	1989		1990		1991[2]		Origin/ Program
	Samanko	Longorola	Samanko	Longorola	Samanko	Longorola	
Boper R3	1.5	1.0	1.5	1.0	2.2	1.1	Burkina Faso
Boper R4	1.0	1.0	2.0	1.0	2.4	1.4	Burkina Faso
Boper R5	2.0	1.0	2.0	2.0	2.1	1.2	Burkina Faso
Kampti GLM	1.5	1.0	2.0	1.0	2.1	1.5	Burkina Faso
Blanc-Karimana	2.5	1.0	3.0	1.0	2.0	1.2	Benin
NSV-1	2.0	1.0	3.5	1.0	2.1	1.0	Ghana
Mankangara	1.0	1.0	1.5	1.0	2.0	1.3	Ghana
Local 29	1.0	1.0	2.5	1.0	2.4	1.3	Ghana
NSV 68	2.0	1.0	1.5	1.5	2.2	1.1	Togo
NSV 74-1	1.0	1.0	1.5	1.0	2.2	1.2	Togo
NSV 83	2.5	1.0	2.0	1.0	2.0	1.2	Togo
Susceptible control IS 18696	6.0	5.0	6.0	6.0	3.3	5.0	
SE	±0.52	±0.33	±0.55	±0.66	±0.15	±0.15	
Trial mean[3]	1.7	1.5	2.2	1.6	1.2	1.2	
CV (%)	44	20	25	42	10	10	

1. Disease severities are plot scores (1989, 1990) and mean of 10 plants (19891) at 30 days after 50% flowering based on a 1-6 scale where 1= no symptoms and 6= more tahn 75% leaf area infected. Means of two replications.

2. Grown with composite spreader row (a mixture of susceptible varieties) after every test entry.

3. Number of entries: 41 Samanko; 39 Longorola (1989); 42 and 11 both locations (1990 and 1991, respectively.

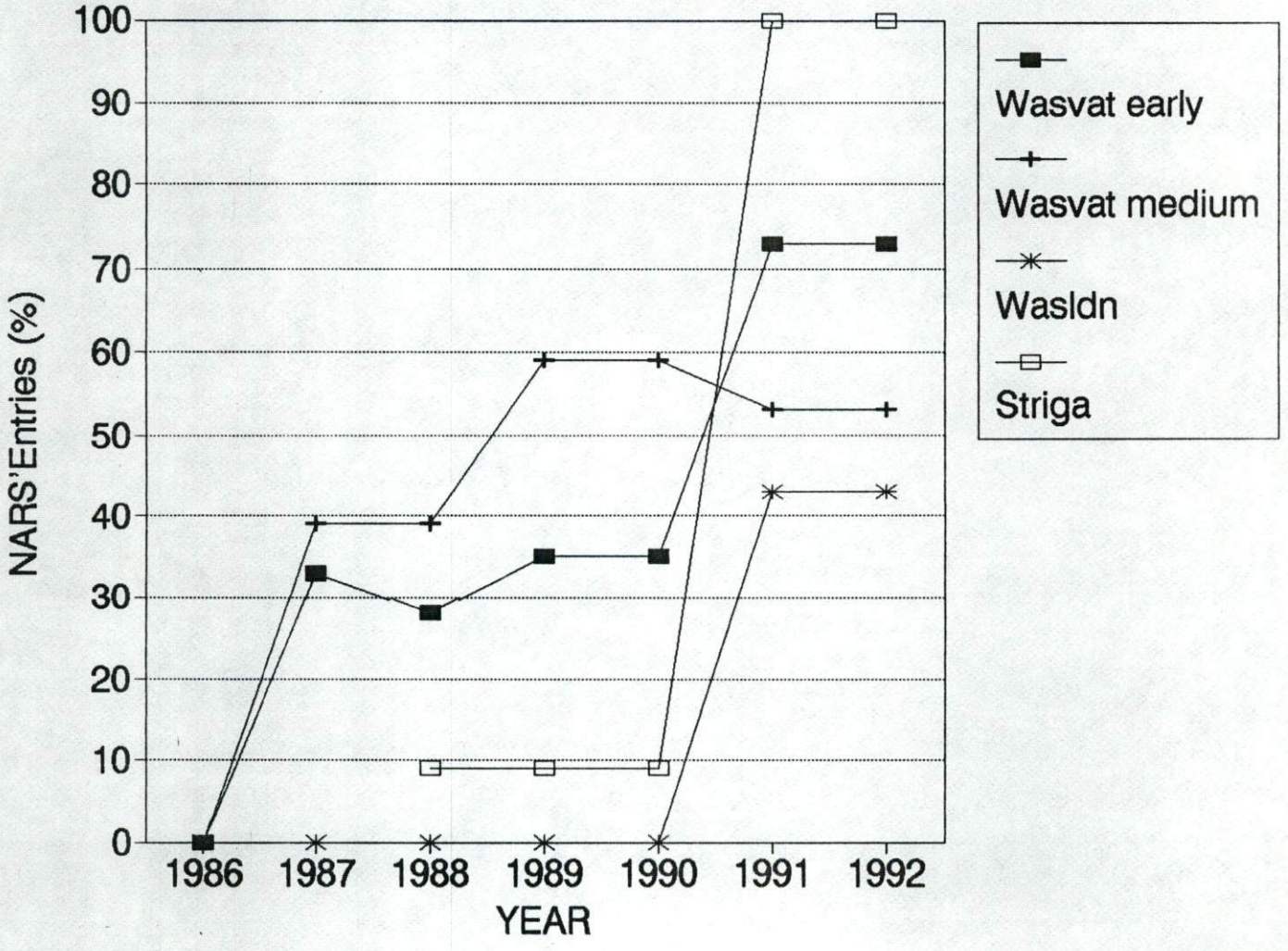

Figure 1 : Test entries from NARS in regional trials .

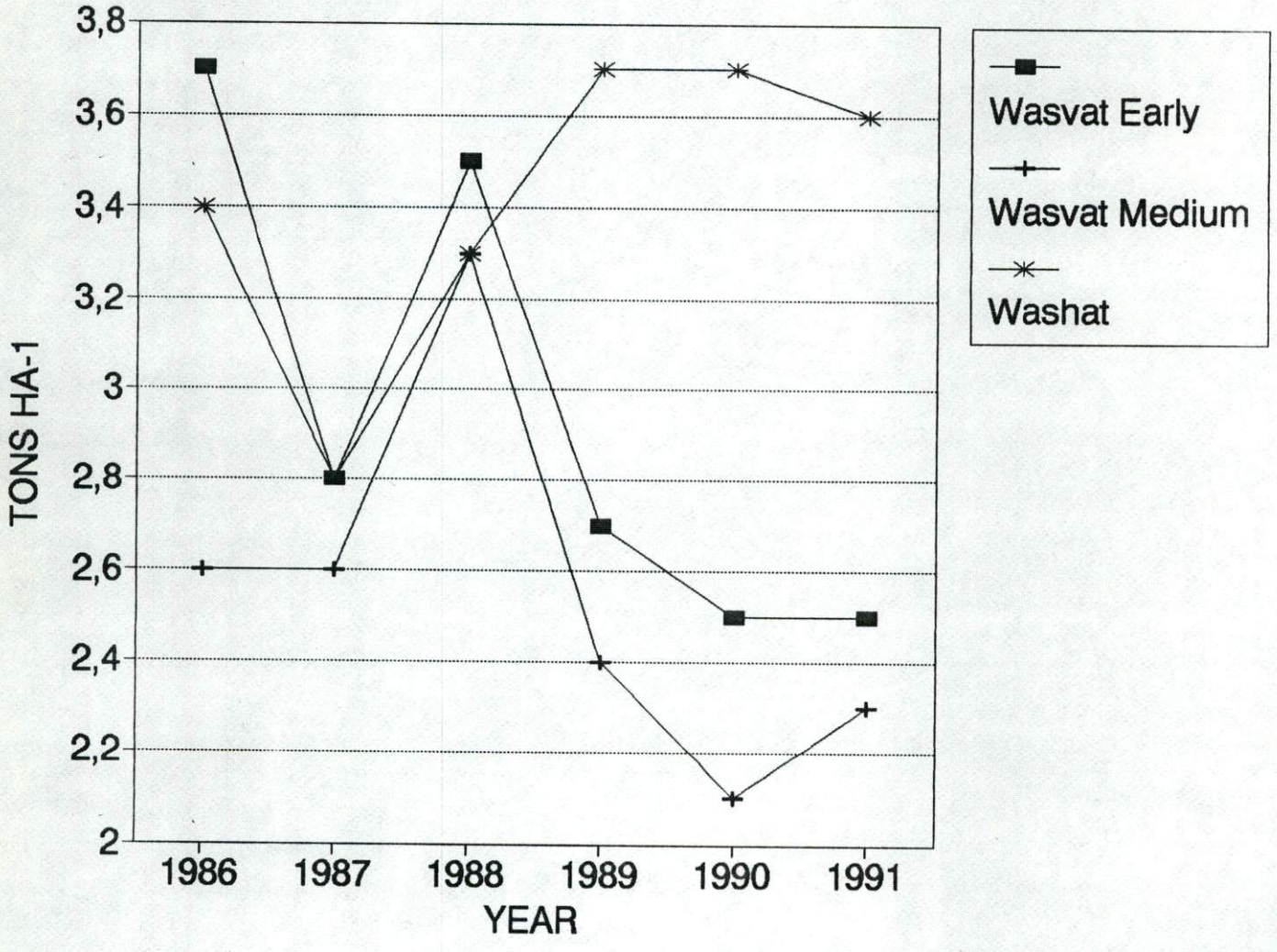

Figure 2 : Yield of best varieties in regional trials.

1992-10

SYNTHESIS OF PRIMARY DATA (WECASORN)

AU-SAFGRAD

AU-SAFGRAD