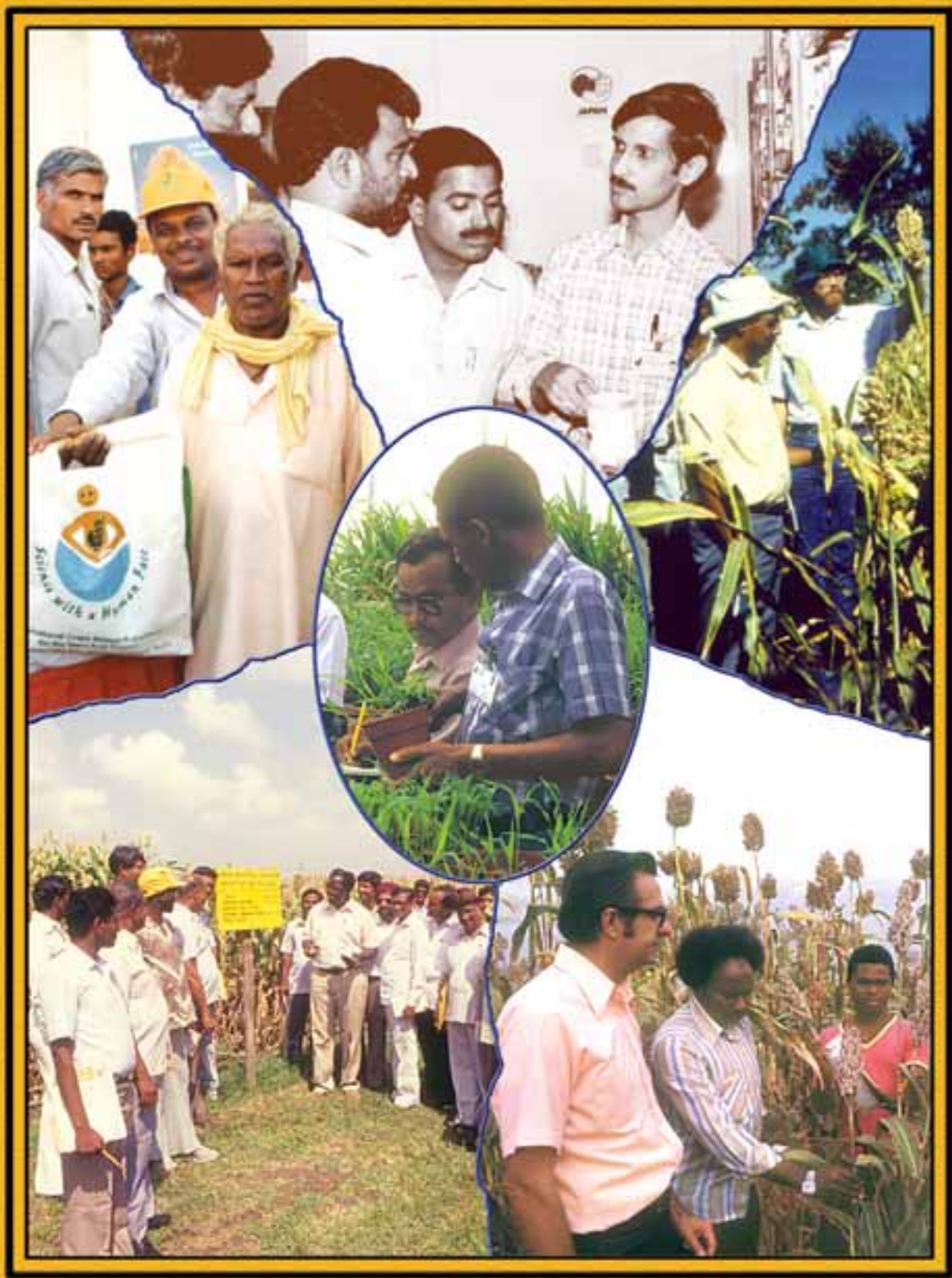


Research Partnership and Technology Exchange

BVS Reddy, AB Obilana, CLL Gowda, B Ramaiah and I Akintayo



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7.1. Introduction

Sorghum is cultivated over wide geographic areas in the Americas, Africa and Asia. Though ICRISAT's research centers are located at Patancheru in Asia and Bulawayo, Nairobi, Bamako and Niamey in Africa, and there are several special programs at Cali, Colombia in Latin America and with ASARECA to cater to Eastern and Central Africa, it is difficult to serve several areas that need specific agroecological zonal adaptations to varying agroclimates and cropping systems. Research collaborations and partnerships among national, regional and international programs are the best means of meeting developmental needs. Research partnerships are crucial to successful technology exchange. Partnerships could be formal or informal and involve scientists, extension staff and farmers in public institutions, private sector organizations and NGOs. Collaboration and partnership among stakeholders avoid duplication of efforts and bring together comparative advantages to address and solve priority production constraints at relatively low cost. Such associations encourage interaction and exchange of information, knowledge and technologies. This chapter documents ICRISAT's partnership with public sector institutions, private sector organizations, NGOs and other stakeholders.

7.2. Collaboration and Partnerships

ICRISAT was able to develop and maintain stable, dynamic and broad-based partnerships among different stakeholders. The partnership mode followed at ICRISAT for research and technology exchange was a combination of both formal and informal links depending on the need and situation. ICRISAT has collaboration and partnership with:

- Nodal or apex agricultural research institutions or councils (such as ICAR in India)
- Regional bodies or forums (SADC)
- Regional networks (WCASRN and CLAN)
- Advanced Research Institutions (CIRAD and INTSORMIL)
- Bilateral or multilateral ties with NARS.

ICRISAT has tie-ups in the following research areas:

- ICAR: Improvement of seed parents for grain mold, shoot fly and stem borer resistance through formal, inter-institutional projects.
- SADC: SMIP/ICRISAT has a formal regional collaboration with several Southern African countries to improve sorghum for the region.

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- WCASRN and CLAN: Breeding nurseries at Cinzana, Longorola, Farako Bâ, Samaru, Minjibar, N'Dali and Maradi in West and Central Africa through WCASRN; regional and national trials conducted by various NARS in Asia; and exchange of breeding materials in various international and regional nurseries/trials through CLAN. The objective is to identify materials for local adaptation.
- CIRAD and INTSORMIL: Collaborative agreement with ICRISAT in Mali with the goal of improving sorghum for the Sudano-Guinean zone (Production Systems 15 and 16). CIRAD scientists based at Montpellier, France, are engaged in basic research on the molecular basis of head bug resistance and the role of temperature/photoperiod in adaptation and grain quality. All ICRISAT's regional programs collaborate and exchange seed and information with INTSORMIL and advanced institutions in developed countries.
- ICRISAT is engaged with Purdue University, Texas A&M University, etc, in the sphere of biotechnology.

7.3. Developmental Activities

Breeding materials developed at various ICRISAT locations are shared with national programs and farmers through Scientists' field days, Farmers' field days, on-farm testing and participatory varietal selection (PVS) and participatory plant breeding (PPB).

Sorghum scientists' field days provide an opportunity for national breeders to evaluate and select materials developed at ICRISAT locations, and to get feedback on the relevance of ICRISAT's research to NARS. Field demonstrations of elite materials are organized to display the range of high-yielding varieties available to farmers. On-farm testing of promising materials developed by the centers provides an opportunity to interact with farmers and identify the strengths and weaknesses of the materials that will help in modifying breeding programs. PVS and PPB have been used more recently to involve farmers in the early stages of breeding so that the material selected meets their needs. In both India and a few countries in Africa, breeder seeds of ICRISAT-derived varieties and parents of hybrids are multiplied by ICRISAT to meet national demand.

7.4. International Trials and Nurseries

International trials and nurseries have been major vehicles for channelling breeding material developed by ICRISAT to scientists in national programs at different locations. Sets of materials in the form of international trials and nurseries have been distributed to cooperators around the world based on requests. The trials and nurseries contain either lines bred for specific traits/and or adaptation, or germplasm lines screened for a specific trait. The objectives of trials and nurseries are to:

- Make value-added materials available to partners
- Provide collaborators with a mechanism of exchange of enhanced germplasm
- Obtain feedback on the performance or value of the materials to their programs.

The trials or nurseries can be grouped under:

- Yield and adaptation trials
 - Varieties and hybrids
 - Populations and converted lines
 - Early generation lines

More than 150 trials and nurseries have been organized from all ICRISAT centers since 1976.

Details of the types of nurseries or trials (Fig. 7.1) for cooperators, collated from ICRISAT's Annual Reports, are summarized in Table 7.1.

- Trait-based nurseries of seed parents and/or restorers
 - Grain and food quality
 - Disease resistance
 - Pest resistance
 - *Striga* resistance
 - Drought tolerance (stay-green lines)
 - Forage and sweet sorghums.

ICRISAT-Patancheru-based Nurseries and Trials. Nearly 157 trials or nurseries were organized by ICRISAT from 1976 to 1999, mostly targeting grain yield and adaptation (62) followed by resistance to diseases (35), pests (33), *Striga* (5) or other traits such as large grain (5), earliness (5), terminal drought (2), drought resistance (1), milo/non-milo (2), food quality (1) and sweet stalk (1) apart from five other trials (Fig. 7.1). They were mostly targeted globally. International Sorghum Preliminary Yield Trials (ISPYT) consisting of S_1/S_2 progenies derived from populations were initiated in 1977 for yield and adaptation, followed by other trials such as the Sorghum Elite Progeny Observation Nursery (SEPON) which consisted of pure lines derived from grain quality progenies. SEPON had considerable impact on breeding programs in many countries. Up to 1982, scientists at ICRISAT-Patancheru (and other ICRISAT centers) used to organize the trials at the project level. The projects were mostly theme based. Since collaborators complained of overburdening with too many materials, the international trials – one for hybrids and another for varieties – were organized by pooling the best materials across projects in the sorghum improvement program from 1982. From 1988 to 1995, trials for hybrids and varieties were clubbed into the International Sorghum Variety and Hybrid Adaptation Trial (ISVHAT). In the meantime, recognizing specific regional demands, two trials – the Asian Regional Sorghum Varietal Adaptation Trial (ARSVAT) and the Asian Regional Sorghum Hybrids Adaptation Trial (ARSHAT) – were organized exclusively for Asia.

From 1976 to 1999, several international sorghum nurseries (14) were organized, mainly comprising lines identified as resistant to grain mold (ISGMN), leaf diseases (ISLDN), charcoal rot (ISCRN) and downy mildew (ISDMN). An International Anthracnose Virulence Nursery initiated in 1980 continued up to 1998. Various international nurseries comprising lines resistant to shoot fly (ISSFN), stem borer (ISSBN) and midge (ISMN) were organized; so were those for resistance to *Striga* or to assess food quality.

All these nurseries and trials were provided to cooperators in response to specific requests. After 1993, there was a major shift from routine trials to demand-driven ones. Consequently, several trait-based nurseries comprising B-lines or R-lines were organized. For example, the Sorghum Durra Large grain Red B-lines Observation Nursery (SDLBON) contains red, bold grain B-lines and R-lines; the Early Generation Bold grain Observation Nursery (EGBON) contains early generation B-lines; the Sorghum Leaf Blight B-lines Observation Nursery (SLBBON) consisted of leaf blight resistant B-lines, etc. The availability of these nurseries was announced in advance, and cooperators were sent nurseries based on specific requests. These B-line or R-line nurseries had profound impact on national breeding programs. For instance, many of the shoot fly-, leaf blight-

and anthracnose-resistant B-lines were utilized either directly or indirectly as parents in the national program.

From 1987 onwards, in addition to ICRISAT-bred lines, national program materials too were included in ISVHAT trials, thus providing a basis for ownership and global exchange of materials and their testing. Some of these materials, such as IRAT 204, CSH 9 and GPR 148, have done well.

ICRISAT-Regional Centers-based Nurseries and Trials. ICRISAT centers based in West Africa (Kano in Nigeria and Ougadougou in Burkina Faso) organized regional network trials consisting of hybrids and varieties for testing within the region, primarily to assess them for grain yield and adaptation. Similarly, variety and hybrid trials were organized by other regional centers in Bulawayo (Zimbabwe) in Southern Africa (SMIP for the SADC region) from 1988 to 1994; in Nairobi (Kenya) for Eastern Africa from 1985 to 1993 and in Mexico City (Mexico) for Mesoamerica from 1987 to 1989. During 1997-99, the IADB-funded project based at CIAT too organized regional nurseries and trials for testing in Brazil, Colombia, Honduras and Venezuela (for details see Chapter 6).

7.5. Exchange of Breeding Material

Based on specific requests, seed samples of various parental lines, restorers, varieties and populations were supplied to cooperators worldwide. A total of 155, 420 seed samples of breeding lines were supplied from ICRISAT-Patancheru to over 102 countries during 1986 to 1999. These included 38 countries in Africa, 34 in Asia, 21 in America and 9 in Europe. Asia tops the list in the receipt of seed material (69%), followed by Africa (21%) and the Americas (9%). Table 7.2 shows the countrywise distribution of seed materials. The countries which received more than 1% of the seed samples over the years were India (53%), Thailand (2.6%), Pakistan (2.4%), China (2%), Myanmar (1.6%), Indonesia (1.2%) and Iran (1.1%) in Asia; Kenya (5.3%), Sudan (2.7%), Burkina Faso (2.3%), Mali (2.1%), Egypt (1.9%), Nigeria (1.3%) and Zimbabwe (1.2%) in Africa; and Brazil (2.8%), Mexico (2.8%) and Colombia (1.1%) in the Americas.

Types of sorghum seed samples supplied to different countries from ICRISAT-Patancheru during 1986-99 are summarized in Table 7.3. Among the different types of seed samples supplied, partially converted lines were the highest (17.9% of the total supply) followed by varieties (9.8%), pest-resistant lines (9.5%), populations (8.0%), restorers (7.5%) and maintainer lines (6.6%). Table 7.3. reveals that the demand for intermediate products (populations, male sterile lines, maintainers, restorers, etc) has increased over time compared to that for finished products (varieties and hybrids).

The number and types of seed samples supplied to different public research institutes and private seed companies based on requests are listed in Table 7.4. It is evident that the demand for ICRISAT materials from both the public and private sectors in India has increased over time. The demand from public institutions increased from 2105 in 1986 to 4588 in 1999, while that from private seed companies increased from 316 in 1986 to 1376 in 1999. The number of recipients has also increased substantially. It may be mentioned here that multinational private seed companies share their ICRISAT-procured materials among their various branches; hence there is a much wider dissemination of material.

In the Southern African (SADC) and East African (EARCAL and ECARSAM) programs, more than 250, 000 samples of varieties, breeding lines, hybrids and hybrid parents (mainly from

SMIP in SADC) were distributed to NARS, NGOs, collaborators and private seed companies in Zimbabwe and South Africa.

7.6. Participation in AICSIP Trials

AICSIP has been conducting coordinated yield trials at multiple locations since 1972 with a view to identify improved sorghum varieties or hybrids for cultivation in more than one state. ICRISAT-bred varieties/hybrids and those derived from ICRISAT materials by national breeders have been tested in AICSIP trials since 1979-80. Sixty-eight varieties and 74 hybrids were entered into advanced trials directly by ICRISAT and 167 varieties and 74 hybrids developed from ICRISAT materials were entered by national breeders. The names of the varieties and hybrids entered into the AICSIP advanced trials from ICRISAT parent materials are given in Table 7.5. Their number has increased over time and several materials were found promising for rainy-season cultivation.

7.7. Cultivars Released

Several NARS have evaluated hybrids/varieties developed in partnership with ICRISAT in network or regional trials to select for local adaptation. As of December 2002, a total of 194 cultivars (varieties and hybrids) were released for cultivation in 43 countries -- 6 in Asia, 27 in Africa, and 10 in the Americas (Table 7.6). The private sector too is marketing several hybrids based on ICRISAT-developed parental materials in India. Details of the names of the cultivars and the countries of their release are given in Table 7.7. Out of the 193 sorghum cultivars released, 110 were in Africa, 50 in Asia and 34 were in the Americas. Among the 50 cultivars released in Asia, 22 were in India.

7.8. Training and Capacity Enhancement of NARS

Capacity building of NARS by providing minimum facilities for research and providing essential supplies and minor equipment has helped to strengthen NARS breeding programs in many countries.

Various training courses, both in-country or at ICRISAT centers, were organized (Tables 7.8, 7.9 and 7.10) to provide basic and practical training in sorghum crop improvement. Individual, tailor-made training was also provided. NARS staff in-service trainees, research fellows, visiting scholars and students were provided facilities for research leading to M.S or Ph.D. degrees.

7.9. Conclusion

Research collaboration, partnerships and developmental activities for the dissemination of sorghum breeding products (mostly finished varieties and hybrids) to national programs, particularly public sector research organizations, through international and/or regional trials and/or nurseries and by directly supplying improved finished materials based on specific request have enhanced NARS capacity in sorghum breeding and had an impact on production and productivity globally.

The last decade has witnessed the private sector playing a key role in making available improved products to farmers in several countries in Asia and Latin America, while such an exercise has yet to take off in Africa. However, several improved products did not reach farmers in many countries due to lack of linkages among farmers, researchers, industries (alternative uses) and

market channels. It may also be noted that of late, there has been a growing awareness about health foods in both developing and developed countries.

New innovative partnerships are essential with both public and private sector organizations, and partner involvement right from the early stages of research for development and extension. Issues related to the development of alternative uses of sorghum (apart from food use), growing awareness about health foods and micro-nutrients, building coalitions/forums amongst farmers, industries, researchers and market channels for the effective uptake of improved products by farmers and consumers in order to enhance impact in improving their livelihoods are required.

7.10. References

ICRISAT Seed Distribution Registers.

ICRISAT Annual reports.

AICSIP Annual reports.

ICRISAT Sorghum Varieties and Hybrids Database.

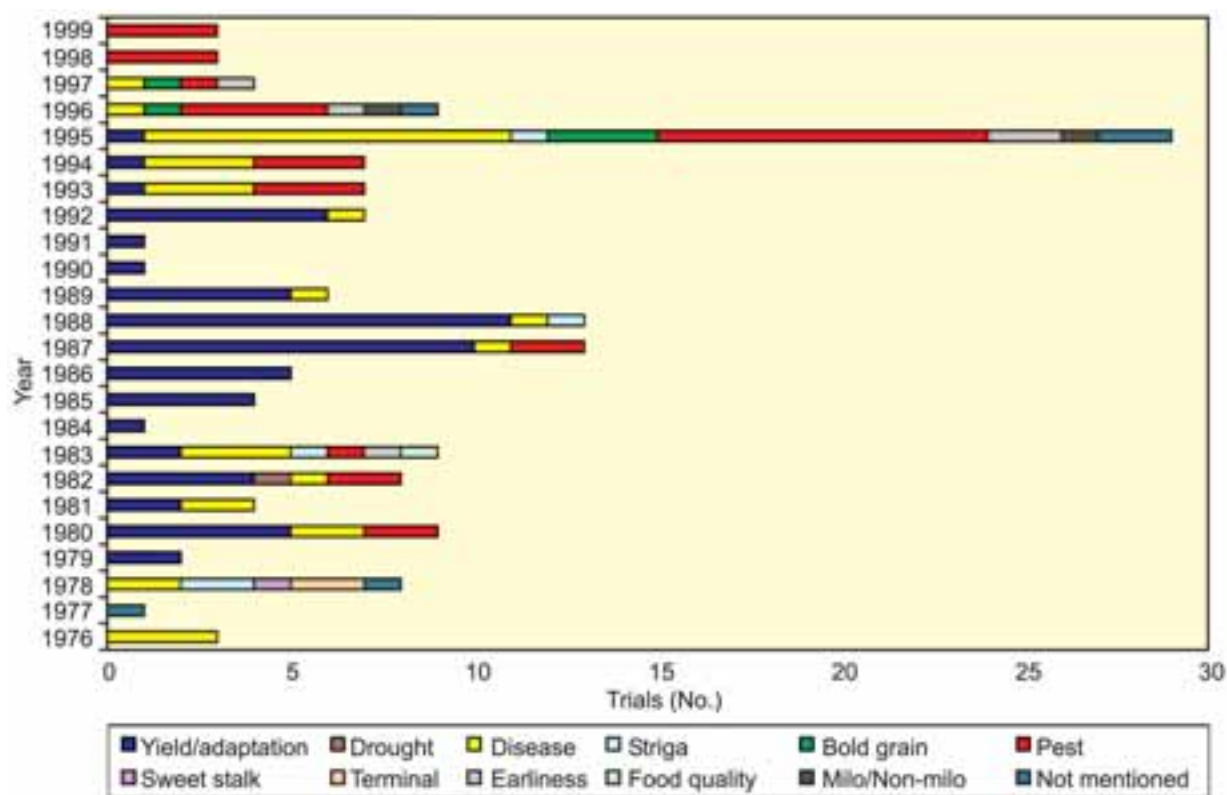


Figure 7.1. Number of international trials conducted by ICRISAT-NARS for different target traits, 1976-99.

Table 7.1. International trials/nurseries distributed from ICRISAT's various centers.

Trial ¹	Year	Origin of trial	Entries	Trials sent	Data received	Top entries/remarks	Target trait
RSAVT-1	88	B	23	4 (SA)	4	IS 23586-2	Yield/adaptation
SDAHT	88	B	23	9 (SA)	8	SDSH 4	Yield/adaptation
SDEHT	88	B	18	4 (SA)	4	SDSH 38	Yield/adaptation
WASHAT ¹	86	BF	36	7 (WA)			Yield/adaptation
WASVAT-1	86	BF	20	11 (WA)		ICSV 16-5 BF	Yield/adaptation
WASVAT-2	86	BF	20	11 (WA)			Yield/adaptation
WASVAT ¹ -E	87	BF	20	10 (WA)			Yield/adaptation
WASVAT-M	87	BF	20	10 (WA)			Yield/adaptation
WASHAT ¹	87	BF	25	15 (WA)	10	ICSH 336	Yield/adaptation
LASDTYT	82	M		7 (MA)		Different lines	Drought
LASEVYT	82	M		7 (MA)		Different lines	Yield/adaptation
MYTLACM	85	M	16	5 (MA)	5	ATX623 × Poor tiller, ICSV 112	Yield/adaptation
CMMHVT	87	M				Sepon 77 Bulk	Yield/adaptation
MASVYT	88	M	21	7 (MA)	7	ICSV-LM-86523	Yield/adaptation
MHYT	88	M	28	11 (MA)	11	ICSH-LM-89504	Yield/adaptation
MASVYT	89	M	25	14 (MA)	9	ICSV-LM-86523	Yield/adaptation
MHYT	89	M	25	14 (MA)	9	ICSH-LM-89504	Yield/adaptation
EVAC	92	M		-		ICSV-LM-90502	Yield/adaptation
VOLPHIC	92	M	40	3 (MA)	3	B 155, BT × 623, ICSV-LM-90522	Yield/adaptation
EACSSN	85	N	Many	3 (EA)	3	(SC 108-3 × CS 3541)-19-1	Yield/adaptation
EALLT	87	N				SAR 24 (Ethiopia)	Yield/adaptation
ISTN	87	N	36	14 (Asia)	14	Different entries in different countries	Yield/adaptation
EESYT-I	88	N	16	9 (EA)	2	Seredo	Yield/adaptation
EESYT ¹ -L	88	N	25	14 (EA)	2	ICSV 112	Yield/adaptation
EESYT-I	89	N	16	7 (EA)	7	IS 9302 and Seredo	Yield/adaptation
EESYT-L	89	N	25	14 (EA)	12	ICSVs 112 and 335	Yield/adaptation
EPSYT-1	92	N	49	5 (EA)	3	PGRC/E#64420	Yield/adaptation
EPSYT-2	92	N	49	13 (EA)	6	3227	Yield/adaptation
EPSYT-3	92	N	36	9 (EA)	4	Cyatanobe	Yield/adaptation
WASDRN	88	Ng	36	6 (WA)	6	84S82	Disease
WASSN	88	Ng	11	6 (WA)	3	IS 9830, ICSV 1007 BF	<i>Striga</i>
WARVHAT ¹	88	Ng	20	10 (WA)	10	Naga white, ICSV 210 IN	Yield/adaptation
WASHAT	88	Ng	20	7 (WA)	7	ICSH 507	Yield/adaptation
WASVAT	88	Ng	20	10 (WA)	10	ICSV 1063 BF	Yield/adaptation
SDLBON	95	P	Variable	24 (global)	10		Bold grain
SDLRON	95	P	Variable	30 (global)	8		Bold grain
SDRRON	95	P	Variable	16 (global)	4		Bold grain
SDLRON	96	P	212	5 (India)			Bold grain
SDLRON	97	P	20	8 (global)			Bold grain
ISDMN	76	P	0	3 (global)	3	Two are free from mold	Disease
ISGMN	76	P	50	12 (global)	6	E 35-1	Disease
ISLDN	76	P	28	9 (global)	4	QL-3, SC 120-14	Disease
ISCRN	78	P	30	7 (global)	7	(SC 108-4-8 × CSV 4)-64	Disease
ISLDN	78	P	23	12 (global)	12	IS 7254	Disease
ISGMN	80	P	20	8 (global)	7	E 35-1, IS 14332, IS 2328	Disease
ISLDN	80	P	23	6 (global)	6	E 35-1, IS 115	Disease
ISDMN	81	P		12 (global)	5	QL-3, QL-3-2-7	Disease

...continued

Table 7.1. Continued

Trial	Year	Origin of trial	Entries	Trials sent	Data received	Top entries/remarks	Target trait
ISLDN	81	P		9 (global)		E 35-1, IS 8283	Disease
ISLDN	82	P	28	17 (global)		ISs 115, 8307	Disease
ISDMN	83	P	19	20 (global)	7	QL-3, NANDYAL-DMRS-ICHA, IS 3442	Disease
ISGMN	83	P	27	17 (global)	8	IS 14375, IS 14384	Disease
ISLDN	83	P	23	9 (global)	9	E 35-1, SPV 351	Disease
ISAVN	92	P	15	16 (global)	12	IS 18758, SC 414-12E	Disease
SANRON	93	P	20	16 (global)			Disease
SLBRON	93	P	21	16 (global)			Disease
SRURON	93	P	7	14 (global)			Disease
SANRON	94	P	18	8 (global)			Disease
SLBRON	94	P	19	9 (global)			Disease
SRURON	94	P	5	5 (global)			Disease
ISRBGMN	95	P	25	23 (global)	5		Disease
ISWBGMN	95	P	17	28 (global)	7		Disease
SANBON	95	P	Variable	27 (global)	8		Disease
SANRON	95	P	18	2 (SA)	1		Disease
SDMBON	95	P	Variable	11 (global)	4		Disease
SGMBON	95	P	Variable	28 (global)			Disease
SGMRON	95	P	Variable	56 (global)			Disease
SLBBON	95	P	Variable	25 (global)	8		Disease
SLBRON	95	P	30	2 (SA)	1		Disease
SRUBON	95	P	Variable	2 (global)	2		Disease
SRURON	95	P	20	5 (global)	2		Disease
SGMRON	96	P	Variable	19 (global)			Disease
SGMRON	97	P	Variable	2 (Asia)			Disease
ISAVN	87/89	P	17	7 (global)	7	A 2267-2, IS 8283	Disease
SEGBON	95	P	Variable	32 (global)	10		Early
SEGRON	95	P	Variable	9 (global)			Early
SEGRON	96	P	30	1 (India)			Early
SEGRON	97	P	Variable	4 (global)			Early
ISFQT	83	P	12	6 (global)	2		Food quality
SA ₁ andA ₂ RON	95	P	31	32 (global)	4		Milo/non-milo
SA ₁ andA ₂ BON	96	P	198	5 (India)			Milo/non-milo
ISMN	80	P	13	12 (global)	12	IS 2816, AF 28, DJ 6514	Pest
ISSFN	80	P	20	12 (global)	5	IS-2162, IS 2263	Pest
ISSBN	82	P				PB 8294, PB 8258	Pest
ISSFN	82	P	15	25 (India)		PS 14093, PS 14413	Pest
ISSFN	83	P	23	20 (global)	11	IS 2146, IS 5470	Pest
ISSBN	87	P	25	5 (SA)	2	IS 4776	Pest
ISSFN	87	P		3 (SA)	3	PS 28062	Pest
SMRON	93	P	25	17 (global)			Pest
SSBRON	93	P	25	21 (global)			Pest
SSFRON	93	P	25	19 (global)			Pest
SMRON	94	P	20	5 (global)			Pest
SSBRON	94	P	19	7 (global)			Pest
SSFRON	94	P	19	7 (global)			Pest
ISSBN	95	P	20	33 (global)	7		Pest

...continued

Table 7.1. Continued

Trial	Year	Origin of trial	Entries	Trials sent	Data received	Top entries/remarks	Target trait
ISSFN	95	P	36	28 (global)	7		Pest
ISSPSFN	95	P	25	39 (global)	9		Pest
SMBON	95	P	Variable	14 (global)	3		Pest
SMRON	95	P	Variable	10 (global)	1		Pest
SSBBON	95	P	35	2 (global)			Pest
SSBRON	95	P	20	33 (global)			Pest
SSFBON	95	P	Variable	33 (global)	10		Pest
SSFRON	95	P	Variable	68 (global)			Pest
SHBRON	96	P	20	5 (India)			Pest
SMRON	96	P	56	5 (global)			Pest
SSBRON	96	P	Variable	2 (Asia)			Pest
SSFRON	96	P	Variable	19 (Asia)			Pest
SMRON	97	P	20	1 (Indonesia)			Pest
ISRN-1	78	P	59	10 (global)	8	SRN 4841, N13	<i>Striga</i>
ISRN-2	78	P					<i>Striga</i>
ISSN	83	P	7	(WA)		ICSV 1007-HV	<i>Striga</i>
SSBON	95	P	Variable	10 (global)	2		<i>Striga</i>
SSSBON	95	P	Variable	2 (global)			
ISTDN	95	P	22	15 (global)	5		
ISTDN	96	P	22	4 (global)			
ISPYT-1	77	P	56	18 (global)	8	FLR-53	
ISPYT-1	78	P	30	28 (global)	17	Diallel-pop-7	
ISPYT-2	78	P	60	28 (global)	20	Ind-syn-1253	Sweet stalk
SEPON	78	P	46	21 (global)	18	E#15 and17	Terminal drought
ISPYT-1	79	P	30	38 (global)	16	FLR-1379-1	Terminal drought
ISPYT-2	79	P	60	38 (global)	15	(FLR141 × CS 3541)-2-1-5	Yield/adaptation
SEPON	79	P	60	32 (global)	14	(SC 108-3 × CS 3541)-88	Yield/adaptation
ISPYT-1	80	P	20	46 (global)	21	Ind-syn-323-1-3	Yield/adaptation
ISPYT-2	80	P	43	46 (global)	16	E 35-1 × RS/B-394-1-1-2	Yield/adaptation
SEPON-E	80	P	39	40 (global)	10	(SC 108 × CS 3541) × SPV 386	Yield/adaptation
SEPON-L	80	P	39	40 (global)	10	(SC 108 × CS 3541) × SPV 386	Yield/adaptation
SEPON-M	80	P	60	40 (global)	10	(SC 108 × CS 3541) × SPV 386	Yield/adaptation
	81	P	24	37 (global)	16	A 6259, A 6298	Yield/adaptation
	81	P	48	50 (global)	20	M 36197, M 36168	Yield/adaptation
	82	P	23	30 (global)		ICSHs 110, 120	Yield/adaptation
	82	P	24	37 (global)	16	A 6149	Yield/adaptation
	82	P	23	47 (global)		ICSVs 110, 111	Yield/adaptation
	83	P	24	25 (global)	12	ICSH 110-IN	Yield/adaptation
	83	P	24	50 (global)	16	ICSV 120-IN	Yield/adaptation
	84	P	40	(global)	12	ICSVs 112, 162	Yield/adaptation
	85	P	25	40 (global)	22	ICSHs 109, 159	Yield/adaptation
	85	P	25	77 (global)	32	ICSVs 112,110	Yield/adaptation
	86	P	25	86 (Asia)	12	ICSH 110	Yield/adaptation
	86	P	25	86 (Asia)	14	ICSV 219	Yield/adaptation
	87	P	20	8 (India)	8	ICSH 281	Yield/adaptation
	87	P	20	8 (outside India)	8	ICSH 110	Yield/adaptation
	87	P	22	9 (India)	9	ICSV 112	Yield/adaptation

...continued

Table 7.1. Continued

Trial	Year	Origin of trial	Entries	Trials sent	Data received	Top entries/remarks	Target trait
	87	P	22	8 (outside India)	8	ICSV 381	Yield/adaptation
	88	P	20	20 (global)	8	ICSH 310, ICSV 233	Yield/adaptation
	89	P	36	37 (global)	24	ICSH 566, ICSH 88058	Yield/adaptation
	90	P	25	48 (global))	20	ICSH 566	Yield/adaptation
	91	P	26	57 (global)	23	ICSH 871001	Yield/adaptation
	92	P	26	47 (global)	29	ICSH 871001	Yield/adaptation
	93	P	26	35 (global)	27	ICSV 112, ICSH 110, ICSH 89123	Yield/adaptation
	94	P	27	34 (global)	10	ICSH 90061	Yield/adaptation
	95	P	30	30 (global)	-	-	Yield/adaptation
Shoot fly Nursery	98	748	748	3 (India)	3	-	Shootfly screening
Shoot fly Nursery	99	1237	1237	3 (India)	3	-	Shootfly screening

1= National program materials are also included, B = Bulawayo, Zimbabwe; BF = Burkina Faso, Western Africa; EA = Eastern Africa, M = Mexico, Central America; MA = Meso America; N = Nairobi, Kenya; Ng = Nigeria, Western Africa; P = Patancheru, India; and SA = Southern Africa.
 RSAVT-1- Regional Sorghum Advanced Varietal Trial; SDAHT- SADCC Advanced Hybrids Trials; SDEHT-SADCC Elite Hybrids Trials; WASHAT-West African Sorghum Hybrids Adaptation Trial; WASVAT-1,2- West African Sorghum Varieties Trial (E=Early; M=Medium); LASDTYT-Latin American Sorghum Drought Tolerant Yield Trial; LAEVSYT- Latin American Sorghum Elite Variety Yield Trial; MYTLACM -Multilocal Yield Trial for the Lowland Areas of Central America; CMMHYT - Central American and Mexico Multilocal Hybrid and Variety Trial; MASVYT -Meso American Sorghum Variety Yield Trial; MHYT - Mesoamerican Hybrid Yield trial; EVAC - CLAIS Advanced Variety Trial; VOLPHIC - CLAIS Hybrid Parental Lines Observation Nursery; EACSSN -East African Cooperative Sorghum Screening Nursery; EALLT - EARSAM Lowland Yield Trial; ISTN - International Sorghum Trial Nurseries; EESYT - 1- EARSAM Elite Sorghum Yield Trial (L = Late); EPSYT - 1,2,3 - Elite Progenies Sorghum Yield Trial; WASDRN - West African Sorghum Disease Resistance Nursery; WASSN - West African Sorghum Striga Nursery; WARVHAT - West African Regional Varieties and Hybrids Adaptation Trial; WASHAT - West African Sorghum Hybrids Adaptation Trial; WASVAT - West African Sorghum Varieties Adaptation Trial; SDLBON - Sorghum Durra Large grain red B-lines Observation Nursery; SDLRON -Sorghum Durra Large grain red R-lines Observation Nursery; SDRRON - Sorghum Durra Red Grain Restorers Observation Nursery; SDLRON - Sorghum Durra Large Grain Restorers Observation Nursery ; ISDMN - International Sorghum Downy Mildew Nursery; ISGMN - International Sorghum Grain Mold Nursery; ISLDN -International Sorghum Leaf Diseases Nursery; ISCRN - International Sorghum Charcoal Rot Nursery; ISAVN - International Sorghum Anthracnose Virulence Nursery; SANRON - Sorghum Anthracnose R-lines Observation Nursery; SLBRON - Sorghum Leaf Blight R-lines Observation Nursery; SRURON - Sorghum Rust R-lines Observation Nursery; ISRBGMN - International Sorghum Red B-lines Grain Mold Nursery; ISWBGMN - International Sorghum White B-lines Grain Mold Nursery; SANBON - Sorghum Anthracnose B- lines Observation Nursery; SANRON - Sorghum Anthracnose R- lines Observation Nursery; SDMBON - Sorghum Downy Mildew B- lines Observation Nursery ; SGMBOB - Sorghum Grain Mold B- lines Observation Nursery; SGMRON - Sorghum Grain Mold R-lines Observation Nursery; SLBBON - Sorghum Leaf Blight B- lines Observation Nursery; SLBRON - Sorghum Leaf Blight R-lines Observation Nursery; SRUBON -Sorghum Rust B-lines Observation Nursery; SRURON - Sorghum Rust R-lines Observation Nursery; ISAVN - International Sorghum Anthracnose Virulence Nursery; SEGBON - Sorghum Early Generation B-lines Observation Nursery; SEGRON - Sorghum Early Generation R-lines Observation Nursery; ISFQT- International Sorghum Fodder Quality Trial; SA1and A2RON - Sorghum A1 and A2 R-lines Observation Nursery; SA1and A2BON - Sorghum A1 and A2 B-lines Observation Nursery; ISMN - International Sorghum Midge Nursery; ISSFN - International Sorghum Shoot fly Nursery; ISSBN - International Sorghum Stem Borer Nursery; SMRON - Sorghum Midge R-lines Observation Nursery; SSBRON - Sorghum Stem Borer R-lines Observation Nursery; SSFRON - Sorghum Shoot fly R-lines Observation Nursery; ISSPSFN - International Sorghum Short Pest Shoot fly Nursery; SMBON - Sorghum Midge B-line Observation Nursery; SSBON - Sorghum Stem Borer B-lines Observation Nursery; SSFBON -Sorghum Shoot fly B-lines Observation Nursery; SHBRON - Sorghum Head Bug R-lines Observation Nursery; SMRON - Sorghum Midge R-lines Observation Nursery; ISRN-1,2 - International Striga Resistance Nursery; ISSN - International Sorghum Striga Nursery; SSSBON - Sorghum Sweet Stalk B-lines Observation Nursery; ISTDN - International Sorghum Terminal Drought Nursery; ISPYT-1,2 - International Sorghum Preliminary Yield Trials; SEPON - Sorghum Elite Progeny Observation Nursery (E = Early, L = Late, M = Medium).

Source: ICRISAT Annual Report (various years).

Table 7.2. Sorghum seed samples supplied to various countries from the sorghum breeding unit, ICRISAT, Patancheru, 1986-99.

Region/ country	Year														Total	% of total
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999		
Africa																
Botswana								27							27	0.02
Burkina Faso	1855	1448	44		25	52	56	26							3506	2.26
Burundi	12	14			103	29									158	0.10
Cameroon	133	99	38		37	38	26	38	50	29					488	0.31
Central African Rep.							30								30	0.02
Chad	72	3		6	12		8								101	0.06
Benin		14			12		26								52	0.03
Egypt	106			25	162	38	887	381	407	443	195		157	193	2994	1.93
Ethiopia	17			66	81	488	15	96	216	133		87			1199	0.77
Gambia		3	31		5										39	0.03
Ghana	11	5	19		1	2								25	63	0.04
Granada			24	24											48	0.03
Guinea		36	6		43										85	0.05
Ivory Coast	66	144	38	14											262	0.17
Kenya	482	171	3444	98	706	192	200	315	178	1137	733		625		8281	5.33
Liberia		4													4	0.00
Malawi			3												3	0.00
Mali	575	96	44	492	147	102	114	115		33	724	643	224		3309	2.13
Mauritania		35													35	0.02
Morocco	4		144												148	0.10
Mozambique		24													24	0.02
Niger	33	108	135	70	257	168	26	80		116	62	4		88	1147	0.74
Nigeria	66		145	75			475	50	120	998			25		1954	1.26
Rwanda	30	9	24		41		26	136			204				470	0.30
South Africa								70		45					115	0.07
S. Islands					118										118	0.08
Senegal	16						1								17	0.01
Sierra Leone										26					26	0.02
Somalia	24	48	37		123	49									281	0.18
Sudan	50	46	118	25	300	58	603	537	851	402	21	962	109	37	4119	2.65
Swaziland		14													14	0.01
Tanzania					66										66	0.04
Togo	33	24	19												76	0.05
Uganda								28		400	11				439	0.28
W. Africa					3			5				10			18	0.01
Zaire		246					26								272	0.18
Zambia	186	2				94									282	0.18
Zimbabwe	761	470	42	194	120	76	76	76						44	1859	1.20
Total	4532	3063	4355	1089	2362	1386	2595	1953	1849	3762	1950	1706	1140	387	32129	20.67

...continued

Table 7.2. Continued

Region/ country	Year														Total	% of total
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999		
Asia																
Bangladesh			24				10							101	135	0.09
Bhutan	55	10	24									124			213	0.14
Burma	24	225	68	48	54	114	114	130	455	692	14	449	110	42	2539	1.63
China	65	360	731	48	43	91	225	131	102	670	43	557		6	3072	1.98
India	2421	2279	2033	2442	2154	3618	4548	6888	3362	14900	9776	14857	7726	5964	82968	53.38
Indonesia			96	125	141	89	82	410	161	292	120	355		63	1934	1.24
Iran				280	50	508	137	78	224	321	48				1646	1.06
Iraq					25			101				29	21		176	0.11
Japan													16		16	0.01
Jordan			24												24	0.02
Korea						200				980					1180	0.76
Kuwait		3													3	0.00
Laos PDR									26	29					55	0.04
Lebanon													10		10	0.01
Libya	24			25	25	52	52	52							230	0.15
Malaysia			30										18		48	0.03
Maldives			1												1	0.00
Nepal			2		29	60	26	52							169	0.11
Oman			3	6											9	0.01
Pakistan	346	436	81	127	488	100	102	258	466	1229	21			22	3676	2.37
Philippines	265	194	218	127	135	16	39	1		110	1			12	1118	0.72
Russia														2	2	0.00
Saudi Arabia					50	52	32	52	52	29					267	0.17
Singapore												2			2	0.00
Sri Lanka	59	24	3							11	8	10			115	0.07
Syria	55				110	23	290	12	133	93					716	0.46
Thailand	139	102	117	75	166	108	375	407	274	1599	198	468	5		4033	2.59
Turkey											26				26	0.02
UAE													2	107	109	0.07
USSR (former)		41				275	212								528	0.34
Vietnam		24	24	30	25	127	26	26	63	659				34	1038	0.67
Yemen		7			132	163	52	76	154	304	50		443		1381	0.89
Zernograd								338			46				384	0.25
Total	3453	3705	3479	3333	3627	5596	6312	9022	5472	21918	10351	16851	8351	6353	107823	69.38

...continued

Table 7.2. Continued

Region/ country	Year														Total	% of total
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999		
Americas																
Argentina	123	20	10		20	40		6		29	4	25	275		552	0.36
Beltsville						2									2	0.00
Bolivia											65	345			410	0.26
Brazil	4008				37	82		26		255					4408	2.84
Colombia					54		290			1163	93		78		1678	1.08
Costa Rica						82									82	0.05
Cuba			12												12	0.01
Denmark	7	6	5											4	22	0.01
Dominican Rep									24		3				27	0.02
Ecuador						26									26	0.02
El Salvador	56										25				81	0.05
Guyana					30										30	0.02
Guatemala	113					38	12	12							175	0.11
Mexico	110	117	294	60	325	3297	38	38						5	4284	2.76
Nebraska								91							91	0.06
Nicaragua	10			100		38		12							160	0.10
Paraguay						26			6						32	0.02
Peru						46	54		91						191	0.12
USA	952	96	99	1	9	201	28	59		39	43				1527	0.98
Venezuela	140	1			36						268	14		6	465	0.30
Virginia						23									23	0.01
Total	5519	240	420	161	511	3901	422	244	121	1486	501	384	353	15	14278	9.19
Europe																
Australia	56	49				2	8	15		1	132	4	55		322	0.21
Belgium								42	1						43	0.03
Canada								3				168			171	0.11
France		5				63								2	70	0.05
Germany	1	2				2	11			5	6	3			30	0.02
Italy	100	52		4	44	12	25	8	16	11			4		276	0.18
Switzerland							4					10			14	0.01
UK	19	1		8	1	1	32	43	3		24	7			139	0.09
West Indies		103					12					9			124	0.08
Total	176	212	0	12	45	80	92	111	20	17	162	201	59	2	1189	0.77
Grand total	13680	7220	8254	4595	6545	10963	9421	11330	7462	27183	12964	19142	9903	6757	155419	

Table 7.3. Types of sorghum seed samples supplied from the sorghum breeding unit, ICRISAT, Patancheru, 1986-99.

Type of material	Year														Total	% of total
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999		
Varieties	1725	1867	875	1046	1196	843	676	1496	1038	1172	1103	1404	468	329	15238	9.80
Hybrids	3080	1956	1245	631	581	801	1298	1153	359	747	143	199	54	20	12267	7.89
Male steriles	354	302	564	588	793	991	1478	1109	456	758	424	846	304	982	9949	6.40
Maintainer lines	266	331	810	610	935	1082	1476	1036	478	767	415	820	299	987	10312	6.63
Restorers	297	146	537	860	923	1534	1833	942	427	1077	686	1462	628	259	11611	7.47
Bulk seed	881	114													995	0.64
Converted lines	141	2				9	7								159	0.10
Disease resistant	369	57	54	44	40	62	216	851	546	1554	1131	1922	471		7317	4.71
Drought resistant	228	4			9	3	4			386	112			4	750	0.48
Populations	634	27	72	14	11	285	519	109	1143	5353	1037	2137	1030	59	12430	8.00
Pest resistant	455	436	91	179	125	108	43	1527	855	2881	1087	2655	584	3712	14738	9.48
Striga resistant	42	81	119	43	24	9	43		5	177	1096	643	3		2285	1.47
Stay-green lines														67	67	0.04
Early generations	7		1387	110	256	126	38	835	249	396	45	1232	498	37	5216	3.36
Partially converted lines	25		65	230		6	10	1449	1530	11325	4035	5430	3736		27841	17.91
Sweet stalk lines					5	42									47	0.03
Tillering lines						7									7	0.00
Others	734	1154	2043	195	1482	4650	1266	291	154	539	1393	336	79	2	14318	9.21
Ethiopian collections	53	25				2									80	0.05
Forage sorghums						25	22	357					1741	298	2443	1.57
Genetic stocks	8	29					1								38	0.02
Landraces	3190	129	392	45	165	378	491	175	222	51	257	56	8	1	5560	3.58
Named cultivars	7	4													11	0.01
Spontaneous collections	1184	556													1740	1.12
Total	13680	7220	8254	4595	6545	10963	9421	11330	7462	27183	12964	19142	9903	6757	155419	

Source: Sorghum Seed Distribution Register, Sorghum Breeding Unit, ICRISAT.

Table 7.4. Sorghum seed samples supplied to various agencies from the sorghum breeding unit, ICRISAT, Patancheru, 1986-99.

Agencies	Year													Total	% of total		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998			1999	
ICRISAT sister centers																	
ICRISAT Outstation segregating material	3620	1871	3889	416	582		461	337	220	606	1498	643	870	32	15045	9.68	
ICRISAT Outstation nurseries	60	288		138	96	80				1534	21				2217	1.43	
ICRISAT Outstation trials	158		171	498	517	356	406	299	78	144					2627	1.69	
NARS (excluding India)																	
International Public sector-nurseries	279	530		194	397	222	240	1028	1325	6972	284	997		652	13120	8.44	
International Public sector-on request	6218	1028	1372	482	1382	5052	2796	1770	1827	2021	1385	2558	1307		29198	18.79	
International Public sector-trials	738	1200	790	350	1400	1434	887	1008	650	806		87			9350	6.02	
International Private sector-nurseries				1	17		83			200				109	410	0.26	
International Private sector-on request	75	24													99	0.06	
International Private sector-trials	111			74											185	0.12	
India																	
Public-Central Govt.-on request	164	14	185	273	240	326	359	398	157	872	348	365	1263	418	5382	3.46	
Public-Central Govt.-nurseries										1038	1188				2226	1.43	
Public-Central Govt.-trials									26						26	0.02	
Public-State Govt.-on request	1597	1023	453	147	756	1952	957	1685	1125	1268	2435	5066	2905	459	21828	14.04	
Public-State Govt.-nurseries	99			25						9283	2333			3711	15451	9.94	
Public-State Govt.-trials	245	288	290	25	25	99	26	317		29	124				1468	0.94	
Private seed companies-on request	241	657	985	1816	1010	1067	2914	3102	1657	2064	2986	8882	3370	1208	31959	20.56	
Private seed companies-nurseries				50	24	40		1123			97				1334	0.86	
Private seed companies-trials	55	240	24		50	89	78	78	172	218					1004	0.65	
Farmers/ICRISAT Staff	16	55	55	94	46	238	203	270	225	128	260	544	186	127	2357	0.40	
NGOs	4	2	40	2	3	8	11	15			5		2	41	133	0.09	
Total	13680	7220	8254	4595	6545	10963	9421	11330	7462	27183	12964	19142	9903	6757	155419		

Source: Sorghum Seed Distribution Register, Sorghum Breeding Unit, ICRISAT.

Table 7.5. List of varieties/hybrids entered in the AICSIP advanced trials from ICRISAT parent materials, 1979/80 to 1997/98.

Contributed directly by ICRISAT

Year of first entry	Varieties (SPV)	Hybrids (SPH)
1979/80	SPV 350, 351, 352, 353, 354, 355	
1980/81	SPV 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 422, 423, 424	SPH 183, 184, 185, 186, 187, 188, 189, 190, 191
1981/82	SPV 471, 472, 473, 475, 476, 494	SPH 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 232, 233, 256, 257
1982/83	SPV 548, 549, 578, 579, 580, 581	SPH 263, 264, 265, 266, 280
1983/84	SPV 615, 616, 617, 641, 642, 643, 644, 645, 646	SPH 295, 296, 297, 298, 320, 321, 322
1984/85	SPV 691, 692, 693, 694, 695	SPH 345, 346, 347, 348, 349
1985/86	SPV 752, 753, 754, 755, 756	SPH 361, 362, 363, 364, 365
1986/87	SPV 818, 819, 820, 821	SPH 416, 417, 418
1987/88	SPV 865, 866, 876, 878, 879	SPH 478, 479, 480
1988/89	None	SPH 530, 531, 532, 533
1989/90	None	None
1990/91	SPV 947, 948, 949, 969	SPH 576, 577, 594, 595, 596, 597, 598
1991/92	SPV 1010, 1011	SPH 613, 614, 615, 616, 628, 629
1992/93	SPV 1071, 1072	SPH 663, 664, 665, 666, 703, 704

Contributed by NARS

Year of first entry	Contributing research stations and varieties (SPVs)	Contributing research stations and hybrids (SPHs)
1985/86	Hyderabad (SPV 746), Pantnagar (SPV 749), Udaipur (SPV 772, 773), Hyderabad (SPV 775, 788, 824)	Parbhani (SPH 334, 392), NRCS (SPH 379)
1986/87	Hyderabad (SPV 825, 829)	Parbhani (SPH 424), Hyderabad (SPH 430)
1987/88	Akola (SPV 859), Parbhani (SPV 860), Hyderabad (SPV 881)	Hyderabad (SPH 488, 489, 491)
1988/89	Nandyal (SPV 913), Hyderabad (SPV 921)	SPH 536
1989/90	Indore (SPV 938, 939), Palem (SPV 940), Hyderabad (SPV 944, 945, 946, 970, 973, 993), Parbhani (SPV 953, 954, 955, 956, 957, 998, 1005)	Parbhani (SPH 543, 544, 545, 547, 562)
1990/91	Udaipur (SPV 1012), Kanpur (SPV 1017), Indore (SPV 1020, 1022, 1041, 1042, 1043, 1044), Hyderabad (SPV 1025, 1034, 1049), Parbhani (SPV 1029, 1030, 1031, 1032, 1055), Surat (SPV 1035)	Dharwad (SPH 567), Parbhani (SPH 575, 578)
1991/92	Parbhani (SPV 1079, 1080, 1081), Hyderabad (SPV 1084)	Parbhani (SPH 610, 619, 620)
1992/93	Indore (SPV 1117, 1118, 1119), Udaipur (SPV 1126, 1127), Bhavanisagar (SPV 1132, 1133), Parbhani (SPV 1140, 1141, 1142, 1143, 1144), Rahuri (SPV 1148), Coimbatore (SPV 1150, 1153), Hyderabad (SPV 1178, 1179)	Hyderabad (SPH 638, 662), Dharwad (SPH 653), Parbhani (SPH 667, 672, 673, 674, 684)
1993/94	Indore (SPV 1185), Udaipur (SPV 1186), Surat (SPV 1191), Parbhani (SPV 1201, 1209), CRIDA (SPV 1205, 1206), Palem (SPV 1212)	Surat (SPH 720), Hyderabad (SPH 721, 773, 774, 775), Parbhani (SPH 727, 729, 778, 779, 780), Akola (SPH 743, 792) Coimbatore (SPH 783)

...continued

Table 7.5. Continued

Year of first entry	Contributing research stations and varieties (SPVs)	Contributing research stations and hybrids (SPHs)
1994/95	Kanpur (SPV 1227, 1228), Mauranipur (SPV 1229), Parbhani (SPV 1232, 1234), Hyderabad (SPV 1235, 1236, 1237, 1238, 1244, 1245, 1255, 1256, 1258, 1264, 1265), Indore (SPV 1251, 1252), Udaipur (SPV 1253, 1254), CRIDA (SPV 1274, 1275)	Hyderabad (SPH 806, 825), Parbhani (SPH 818, 820), Coimbatore (SPH 823), Dharwad (SPH 835, 836)
1995/96	Hyderabad (SPV 1280, 1288, 1289, 1303, 1304, 1307, 1308, 1319, 1321), Deesa (SPV 1284), Indore (SPV 1285, 1286), Surat (SPV 1292), Palem (SPV 1293, 1295), Coimbatore (SPV 1301), Udaipur (SPV 1297)	Akola (SPH 877, 890, 891, 913, 927), Dharwad (SPH 881), Coimbatore (SPH 889), Parbhani (SPH 892, 893, 915, 952), Hyderabad (SPH 954)
1996/97	NRCS (SPV 1325, 1326, 1327, 1338, 1339, 1340, 1351, 1378), Indore (SPV 1329, 1330), Palem (SPV 1331, 1332), Kanpur (SPV 1336, 1337, 1348), Parbhani (SPV 1333, 1334), Surat (SPV 1342, 1346), Deesa (SPV 1347), Rahuri (SPV 1352), Udaipur (SPV 1354), Solapur (SPV 1375)	Palem (SPH 971, 972, 973), Coimbatore (SPH 977, 978), NRCS (SPH 999), Rahuri (SPH 1030), Dharwad (SPH 1034), Vikki (SPH 969), HLL (SPH 982)
1997/98	Indore (SPV 1330), Parbhani (SPV 1333, 1389), Palem (SPV 1381, 1382, 1383), Indore (SPV 1384, 1385), Mauranipur (SPV 1388), Hyderabad (SPV 1400, 1401, 1404, 1406, 1428), Dharwad (SPV 1403)	Indore (SPH 1047)
1998/99	Indore (SPV 1022, 1443, 1444), Parbhani (SPV 1333, 1389), Palem (SPV 1293, 1432, 1454, 1455), Surat (SPV 1437, 1438), Udaipur (SPV 1455), Nandyal (SPV 1453), Hyderabad (SPV 1463)	Akola (SPH 792), Parbhani (SPH 1120, 1140)
1999/2000	Indore (SPV 1022, 1477, 1478), NRCS (SPV 1155, 1422, 1463, 1479, 1490, 1493, 1498), Parbhani (SPV 1333, 1390, 1411, 1474, 1475, 1495), Surat (SPV 1481, 1482, 1483, 1484), Deesa (SPV 1485, 1486), Palem (SPV 1468, 1469), Udaipur (SPV 1473, 1489), Mauranipur (SPV 1388, 1470), Bijapur (SPV 1380), Dharwad (SPV 1476), Coimbatore (SPV 1488)	Akola (SPH 840, SPH 1120), Indore (SPH 960, SPH 1210), NRCS (SPH 1217), Bijapur (SPH 1224), HLL (SPH 1194)
2000/01	Parbhani (SPV 1411, 1474, 1475, 1512, 1551), Surat (SPV 1481, 1482, 1530, 1531, 1532, 1533, 1557, 1558, 1560), NRCS (SPV 1479, 1515, 1516, 1554), Rahuri (SPV 1521, 1522, 1523), Indore (SPV 1534, 1535, 1536), Akola (SPV 1520, 1549), TNAU (SPV 1524, 1525), Udaipur (SPV 1489, 1527), Bijapur (SPV 1380), Nandyal (SPV 1500), Palem (SPV 1513, 1518), Mauranipur (SPV 1528)	NRCS (SPH 1314, 1317, 1318) Ganga Kaveri (SPH 1282) Monsanto (SPH 1273)
2001/02	Udaipur (SPV 1489, 1579, 1580), Palem (SPV 1513, 1518, 1567), Akola (SPV 1549, 1581), Parbhani (SPV 1474, 1562), Surat (SPV 1481, 1532), NRCS (SPV 1155, 1597)	Akola (SPH 1120), Mahendra (SPH 1342), Ganga Kaveri (SPH 1375)

Source: AICSIP Report (various years).

Table 7.6. Countries where ICRISAT and NARS sorghum materials using ICRISAT germplasm have been released.

Country	1975-80	1981-85	1986-90	1991-95	1996-00	2001-02	Total
Africa							
Benin	0	0	0	0	1	0	1
Botswana	0	0	0	4	0	0	4
Burkina Faso	1	1	2	1	2	0	7
Burundi	0	0	2	0	0	0	2
Cameroon	0	0	1	0	0	0	1
Chad	0	0	1	0	0	0	1
Ethiopia	4	1	3	0	0	0	8
Eritrea	0	0	0	0	5	0	5
Ghana	0	0	1	0	1	0	2
Ivory Coast	0	0	1	0	1	0	2
Kenya	0	0	1	1	0	3	5
Malawi	0	0	0	4	0	0	2
Mali	0	0	4	6	0	9	17
Mozambique	0	0	2	1	0	0	3
Namibia	0	0	0	0	1	0	1
Niger	0	0	0	2	0	0	2
Nigeria	0	0	0	3	5	0	8
Rwanda	2	0	0	0	0	3	5
Somalia	0	0	0	0	0	3	3
Senegal	1	0	0	0	0	0	1
Sudan	0	1	0	4	1	0	6
Swaziland	0	0	2	1	0	0	3
Tanzania	0	0	1	1	1	0	3
Togo	0	0	1	0	2	0	3
Uganda	1	0	0	1	0	0	2
Zambia	0	1	5	1	0	0	7
Zimbabwe	0	1	1	1	3	0	6
Americas							
Colombia	0	0	0	3	0	0	3
Costa Rica	0	0	0	1	0	0	1
Dominican Rep	0	0	0	1	0	0	1
Equador	0	0	1	0	0	0	1
El Salvador	2	1	2	0	3	0	8
Guatemala	0	1	0	0	0	0	1
Honduras	0	3	0	0	0	0	3
Mexico	2	0	5	3	1	0	11
Nicaragua	0	1	1	0	0	0	2
Panama	0	0	0	1	0	0	1
Paraguay	0	0	0	1	0	0	1
Asia							
China	0	4	1	1	8	0	14
India	1	1	4	9	6	1	22
Myanmar	1	5	0	0	3	0	9
Pakistan	0	0	0	2	0	0	2
Philippines	0	0	0	2	0	0	2
Thailand	0	0	0	0	1	0	1
Total	15	22	42	51	45	19	193

Table 7.7. ICRISAT and NARS sorghum materials released using ICRISAT germplasm.

Origin	Released name	Country	Region	Year
ICSV 111		Benin	W. Africa	1999
SDS 3220	Phofu/Macia	Botswana	S. Africa	1994
IS 3923 (SDS 2583)	Mahube	Botswana	S. Africa	1994
SDSH 48	BSH 1	Botswana	S. Africa	1994
-	Mmabaitse (BOT 79)	Botswana	S. Africa	1994
-	IRAT 204	Burkina Faso	W. Africa	1980
IS 18758	E 35-1	Burkina Faso	W. Africa	1983
ICSV 1001 BF	Framida	Burkina Faso	W. Africa	1986
ICSV 1049	ICSV 1049	Burkina Faso	W. Africa	1989
SARIAGO-B	BF 83-48-2-1	Burkina Faso	W. Africa	1992
Sariabo 13		Burkina Faso	W. Africa	2000
Sariabo 14		Burkina Faso	W. Africa	2000
-	5D × 160	Burundi	C. Africa	1989
-	GAMBELLA-1107	Burundi	C. Africa	1990
ICSV 111	S 35	Cameroon	W. Africa	1987
ICSV 111	S 35	Chad	W. Africa	1989
A 3681	Yuan 1-98	China	Asia	1982
A 3872	Yuan 1-28	China	Asia	1982
A 3895	Yuan 1-505	China	Asia	1982
A 6072	Yuan 1-54	China	Asia	1982
SPL 132A	Liao Za 4	China	Asia	1988
3197A ₂ × Jin Liang 5(D 71278-4 is converted to 3197A ₂)	Jin XA 4	China	Asia	1992
-	Liao Za 5	China	Asia	1996
-	Liao Za 6	China	Asia	1996
-	Liao Za 7	China	Asia	1996
-	Jin Za 94	China	Asia	1996
5(D 71278-4 is converted to 319 A ₂)	Jin XA 4	China	Asia	1992
MR 741 R-lines used as male parent (SPL 132B × TAM 428B) as female parent	Longsi-1	China	Asia	1997
	Liao Za 10	China	Asia	1997
IC-A line converted to A ₂ and used as its female parent	Jin Za 12	China	Asia	1997
IC-A line converted to A ₂ and used as its female parent	Gile Za 80	China	Asia	1997
A 3895	ICA YANUBA	Colombia	S. America	1992
-	Sorghica PH 302	Colombia	S. America	1992
-	HE 241	Colombia	S. America	
-	Escameka	Costa Rica	C. America	1991
ICSV 1001 BF	Framida	Ivory Coast	W. Africa	1986
ICSV 1063	ICSV 1063	Ivory Coast	W. Africa	2000
ICSV-LM 90501	Surena -1	Dominican Rep	West Indies	1993
-	INIAP 201	Ecuador	Latin America	1987
Selection from crosses from Chipango	Centa S 2	El Salvador	C. America	1976
AT × 623 × Sweet Sudan	Centa SS 41 (Forage)	El Salvador	C. America	1978
M 91057 × M 90950	Isiap Dorado (Balanco-86)	El Salvador	C. America	1985
M 90361	Centa Oriental	El Salvador	C. America	1987
M 90362 (Male parent)	AGROCONSA 1	El Salvador	C. America	1987

...continued

Table 7.7. Continued

Origin	Released name	Country	Region	Year
ICSV LM 90502 (M 36285 × 77 C3-1) bk-5-1-2-3-1-bk	Soberano	El Salvador	C. America	1996
ICSV LM 90503 (M 35585 × CS 3541) -31-bk-5-2-2-3-1-1-7-bk	RCV	El Salvador	C. America	1996
ICSV LM 90508 (PP 290 × 852-2235) bk-4-6-3-1-bk	Jocoro	El Salvador	C. America	1997
ICSV 210	Bushuka	Eritrea	E. Africa	2000
PP 290 (INTSORMIL)	Shambuko	Eritrea	E. Africa	2000
89 MW 5003	Shieb	Eritrea	E. Africa	2000
89 MW 5056	Laba	Eritrea	E. Africa	2000
IS 29415	Shiketi	Eritrea	E. Africa	2000
E 35-1	Gambella-1107	Ethiopia	E. Africa	1980
76 TI #23	76 TI #23	Ethiopia	E. Africa	1980
M 36121	M 36121	Ethiopia	E. Africa	1980
IS 9302	IS 9302	Ethiopia	E. Africa	1980
IS 9323	ESIP 12	Ethiopia	E. Africa	
1984ICSV 1	Dinkmash	Ethiopia	E. Africa	1988
Diallel Pop 7-682	Melkamash	Ethiopia	E. Africa	1988
-	Seredo	Ethiopia	E. Africa	1990
	Framida	Ghana	W. Africa	1986
ICSV 111	Kaapala	Ghana	W. Africa	1997
M 90975	ICTA MILTAN 85 (ICTA C-21)	Guatemala	C. America	1985
IS 18484 (CS 3541)	Tortillero 1	Honduras	C. America	1984
ATX 623 × Tortiller	Catracho	Honduras	C. America	1984
M 62650	Sureno	Honduras	C. America	1985
E 1966 (IS 30468)	NTJ 2	India	Asia	1980
ICSV 1	CSV 11	India	Asia	1982
ICSV 112	CSV 13	India	Asia	1984
ICSH 153	CSH 11	India	Asia	1986
ICSV 145	SAR 1	India	Asia	1988
ICSV 239	BSR 1	India	Asia	1989
ICSV 745	DSV 3	India	Asia	1993
ICSV 197	ICSV 197	India	Asia	1993
Parent source	CSH 14	India	Asia	1993
Parent source	PJH 55	India	Asia	1993
Parent source	PJH 58	India	Asia	1993
Parent source	PKH 400	India	Asia	1993
Parent source	PSH 8340	India	Asia	1993
Parent source	CSV 15	India	Asia	1994
Parent Source	MLSH 36	India	Asia	1994
ICSA 91001 × ICSR 90017	ASH 1	India	Asia	1997
Parent source	JKSH 22	India	Asia	1999
ICSH 86686	PSH 1	India	Asia	1999
PVK 400	PVK 400	India	Asia	1999
Parent source	SPH 840	India	Asia	2000
GD 34553	PVK 801	India	Asia	2000
GD 31-4-2-3	Parbhani Moti (SPV 1411)	India	Asia	2002

...continued

Table 7.7. Continued

Origin	Released name	Country	Region	Year
ICSV 112	CSV 13	Kenya	E. Africa	1988
KAT 83/369	Kari Mtama I	Kenya	E. Africa	1994
IS 8193	Kari Mtama 2	Kenya	E. Africa	2001
PGRC/E216740	Kari Mtama 3	Kenya	E. Africa	2001
IS 76 T1#23	IS 76	Kenya	E. Africa	2001
ICSV 1	Pirira 1	Malawi	E. Africa	1993
ICSV 112	Pirira 2	Malawi	E. Africa	1993
Malisor-1	Malisor-1	Mali	W. Africa	1987
Malisor-4	Malisor-4	Mali	W. Africa	1987
Malisor-5	Malisor-5	Mali	W. Africa	1987
Malisor-7	Malisor-7	Mali	W. Africa	1987
-	ICSV 1095 BF	Mali	W. Africa	1991
ICSV 1063 BF	ICSV 1063 BF	Mali	W. Africa	1993
ICSV 1079 BF	ICSV 1079 BF	Mali	W. Africa	1993
ICSV 401	ICSV 401	Mali	W. Africa	1994
CSM 335	Tieble	Mali	W. Africa	2001
CSM 485	Kossa	Mali	W. Africa	2001
CSM 660	Ngolofing	Mali	W. Africa	2001
Nazongola Anthocyan	Nazombe	Mali	W. Africa	2001
Nazongola Tan	Nazondje	Mali	W. Africa	2001
IS 15401	Soumalemba	Mali	W. Africa	2001
CGM 19/9-1-1	Marakanio	Mali	W. Africa	2001
(Pedigree: 87-38 × 57-26)				
CIRAD 406	Soumba	Mali	W. Africa	2001
ICSV 1079 (Framida × E 35-1)	Yagare	Mali	W. Africa	2001
Sel from crosses from E. Africa	Valles Altos 110	Mexico	N. America	1978
-	Variadad 110	Mexico	N. America	1978
ICSV LM 89510	Blanco 86	Mexico	N. America	1986
ICSV 112	UANL-1-187	Mexico	N. America	1987
M 90362	UANL-1-287	Mexico	N. America	1987
M 62641	Costeno 201	Mexico	N. America	1989
ICSV 112	Pacifico 301	Mexico	N. America	1990
M 91057	Istmeno	Mexico	N. America	1991
PP 290	Perlita	Mexico	N. America	1991
M 90812	Tropical 401	Mexico	N. America	1991
IS 9468	Maravilla, No. SOF-043-201092	Mexico	N. America	2000
SDS 3220	Macia	Mozambique	E. Africa	1989
IS 8571	Mamonhe	Mozambique	E. Africa	1989
ICSV 112	Chokwe	Mozambique	E. Africa	1993
IS 8965	Shwe ni 1	Myanmar	Asia	1980
IS 2940	Shwe ni 2	Myanmar	Asia	1981
M 90906	Yezin 1 (Schwe phyu 1)	Myanmar	Asia	1984
M 36335	Yezin 3 (Schwe phyu 3)	Myanmar	Asia	1984
M 36248	Yezin 2 (Schwe phyu 2)	Myanmar	Asia	1984
M 36172	Yezin 4 (Schwe phyu 4)	Myanmar	Asia	1984
ICSV 735	Yezin 6	Myanmar	Asia	1996
ICSV 758	Yezin 7	Myanmar	Asia	1996
ICSV 804	Yezin 5	Myanmar	Asia	1996

...continued

Table 7.7. Continued

Origin	Released name	Country	Region	Year
SDS 3220	Macia	Namibia	S. Africa	1998
Sepon 77	NICA-SOR (T43)	Nicaragua	C. America	1985
ICSV 112	Pinollero 1	Nicaragua	C. America	1990
M 90038	Sepon 82	Niger	W. Africa	1993
ICSV 1007 BF	SRN 39	Niger	W. Africa	1993
ICSH 89002 (NG)	ICSH 89002(NG)	Nigeria	W. Africa	1995
ICSH 89009 (NG)	ICSH 89009(NG)	Nigeria	W. Africa	1995
ICSV 111	ICSV 111	Nigeria	W. Africa	1995
ICSV 400	ICSV 400	Nigeria	W. Africa	1997
NR 71176	NR 71176	Nigeria	W. Africa	1997
NR 71182	NR 71182	Nigeria	W. Africa	1997
NSSH 91001	NSSH 91001	Nigeria	W. Africa	1997
NSSH 91002	NSSH 91002	Nigeria	W. Africa	1997
ICSV 107	PARC-SS 1	Pakistan	Asia	1991
IRAT 408	PARC-SS 2	Pakistan	Asia	1991
-	Alanje Blanquito	Panama	C. America	1991
ISIAP DORADO	Dorado	Paraguay	S. America	-
ICSV 126 (PSB Sg 93-20)	IES Sor 1	Phillipines	Asia	1993
PSB Sg 94-02	IES Sor 4	Phillipines	Asia	1994
-	5D x 160	Rwanda	C. Africa	1980
-	1 Kinyamka	Rwanda	C. Africa	1980
IS 25395		Rwanda	C. Africa	2001
IS 21219		Rwanda	C. Africa	2001
IS 8193		Rwanda	C. Africa	2001
-	IRAT 204	Senegal	W. Africa	1980
IESV 92043 DL		Somalia	E. Africa	2001
CR 35:5		Somalia	E. Africa	2001
Gedam el Hammam		Somalia	E. Africa	2001
Tx 623 A x K 1597 (Karper-1597)	Hageen Durra	Sudan	E. Africa	1983
ICSV 1007 HV	Mugawim Buda 1	Sudan	E. Africa	1991
IS 9830	Mugawim Buda 2	Sudan	E. Africa	1991
ICSV 1001 BF	Framida (SRN 39)	Sudan	E. Africa	1991
M 90393	INGAZI(M 90393)	Sudan	E. Africa	1992
IS 13444	Aroos Elrimal	Sudan	E. Africa	2000
SDSV 1513	MRS 13	Swaziland	S. Africa	1989
SDSV 1594-1	MRS 94	Swaziland	S. Africa	1989
ICSV 112	MRS 12	Swaziland	S. Africa	1992
2K x 17	Tegemeo	Tanzania	E. Africa	1988
	Pato	Tanzania	E. Africa	1995
SDS 3220	Macia	Tanzania	E. Africa	1999
	Suphanburi-1	Thailand	Asia	1996
ICSV 1001 BF	Framida	Togo	W. Africa	1986
Sepon 82 x S 34	Sorvato 1	Togo	W. Africa	1998
Framida x S 34	Sorvato 28	Togo	W. Africa	1998
-	Seredo	Uganda	C. Africa	1980
	Epuripur (Tegemeo)	Uganda	C. Africa	1995

...continued

Table 7.7. Continued

Origin	Released name	Country	Region	Year
(GPR148 × E 35-1)-4-1 x CS3541	Isiap Dorado	Venezuela	C America	1985
ICSV 2	ZSV 1	Zambia	S. Africa	1983
-	WSH 287	Zambia	S. Africa	1987
WSV 387	KUYUMA (MR4/4606 T 11)	Zambia	S. Africa	1989
IS 23520	SIMA	Zambia	S. Africa	1989
ICSA 104 (SPL 177A)	MMSH 413	Zambia	S. Africa	1990
-	MMSH 375	Zambia	S. Africa	1990
	ZSV 12	Zambia	S. Africa	1995
ICSV 112	SV 1	Zimbabwe	S. Africa	1985
ICSV 88060	SV 2	Zimbabwe	S. Africa	1987
-	ZWSH 1	Zimbabwe	S. Africa	1992
SDS 3220	Macia	Zimbabwe	S. Africa	1998
	SV 3	Zimbabwe	S. Africa	1998
	SV 4	Zimbabwe	S. Africa	1998

Table 7.8. Details of formal training programs carried out at ICRISAT Patancheru, 1989-1998

Country	Number of participants as					Total
	Visiting Scholars	Research Scholars	Research Fellows	Apprentices	In-service trainees	
Brazil	2					2
China					1	1
Columbia	1					1
Egypt	4					4
Eritrea		2			1	3
Ethiopia	1					1
Germany		1		2		3
Holland				3		3
India	1	4				5
Iran					1	1
Ivory Coast			1			1
Kenya	1					1
Mali	1					1
Mexico	1					1
Myanmar	1					1
Namibia	2					2
Niger	1					1
Nigeria	1					1
Philippines	1					1
Spain				2		2
Sudan	2	2				4
Syria	4	1				5
Thailand	1					1
Venezuela	1					1
Yemen	5					5
Total	31	10	1	7	3	52

Table 7.9. Details of formal academic and informal (in-service) training programs carried out at Matopos (Zimbabwe), Patancheru (India) and USA/Brazil by SADC/ICRISAT SMIP and INTSORMIL, 1983-94.

Country	Academic training				In-service training			
	PhD	MS	BS	Total	Matopos	Regional locations	ICRISAT-Patancheru	Total
Angola	-	4	-	4	4	2	1	7
Botswana	4	5	2	11	8	14	14	36
Lesotho	2	6	2	10	11	6	-	17
Malawi	7	5	-	12	15	11	13	39
Mozambique	2	5	-	7	3	1	13	17
Namibia	-	-	-	0	4	2	3	9
Swaziland	4	2	-	6	12	10	6	28
Tanzania	6	10	2	18	29	9	25	63
Zambia	3	10	3	16	20	11	25	56
Zimbabwe	6	7	-	13	24	18	22	64
Total	34	54	9	97	130	84	122	336

Table 7.10. Details of special training courses organized on sorghum.

Title	Countries	Participants (no.)	Duration	Location
Grain and food quality evaluation of sorghum	Burundi, Ghana, Niger, Nigeria, Tanzania and Zambia	7	1 Jul 1988 to 30 Sep 1988	Patancheru
East Africa sorghum pathology (EARSAM)	Burundi, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania s and Uganda	15	16 Sep 1988 to 30 Sep 1989	Patancheru
Maintenance of male-sterile lines and open-pollinated varieties	Egypt, Kenya, Mali, Myanmar, Namibia, Niger, Nigeria, and Syria	8	6 Mar 1995 to 17 Mar 1995	Patancheru
Screening for host resistance to insects	Afghanistan, Egypt, Ethiopia, India, Iran, Kenya, Mali, Myanmar, Nigeria, Pakistan, Sudan, Syria, Tanzania, Thailand and Yemen	22	24 Oct 1995 to 3 Nov 1995	Patancheru
In-country training course on sorghum improvement and production techniques	All from Egypt	26	18 Sep 1995 to 30 Sep 1995	Egypt
In-country training course on insect, pest survey and management	Eritrea	9	29 Sep 1997 to 11 Oct 1997	Eritrea
In-country training course on sorghum seed parents and hybrid development and multiplication	Myanmar	7	30 Dec 1997 to 7 Jan 1998	Myanmar
Technology exchange and training workshop on advances in sorghum anthracnose research	India and Thailand	5	23 Sep 1998 to 25 Sep 1998	Patancheru
Training workshop in on-farm research	9 SADC countries	24	11 Jul 1984 to 15 Jul 1984	Maseru, Lesotho
Regional seed production training course	Botswana, Lesotho, Malawi, Namibia, Swaziland, Tanzania, Zambia and Zimbabwe	26	22 Sep 1994 to 24 Sep 1994	Muzarabani, Zimbabwe
On-farm research methodology training workshop for extension	9 SADC countries	49	28 Sep 1994 to 29 Sep 1994	Dodoma, Tanzania
Training in the design, implementation and analysis of informal diagnostic surveys	Mozambique	7	13 Feb 1995 to 21 Feb 1995	Tete
Training in pollination techniques and seed production	Botswana and Zimbabwe	8	Feb 1995	Aisleby, Zimbabwe