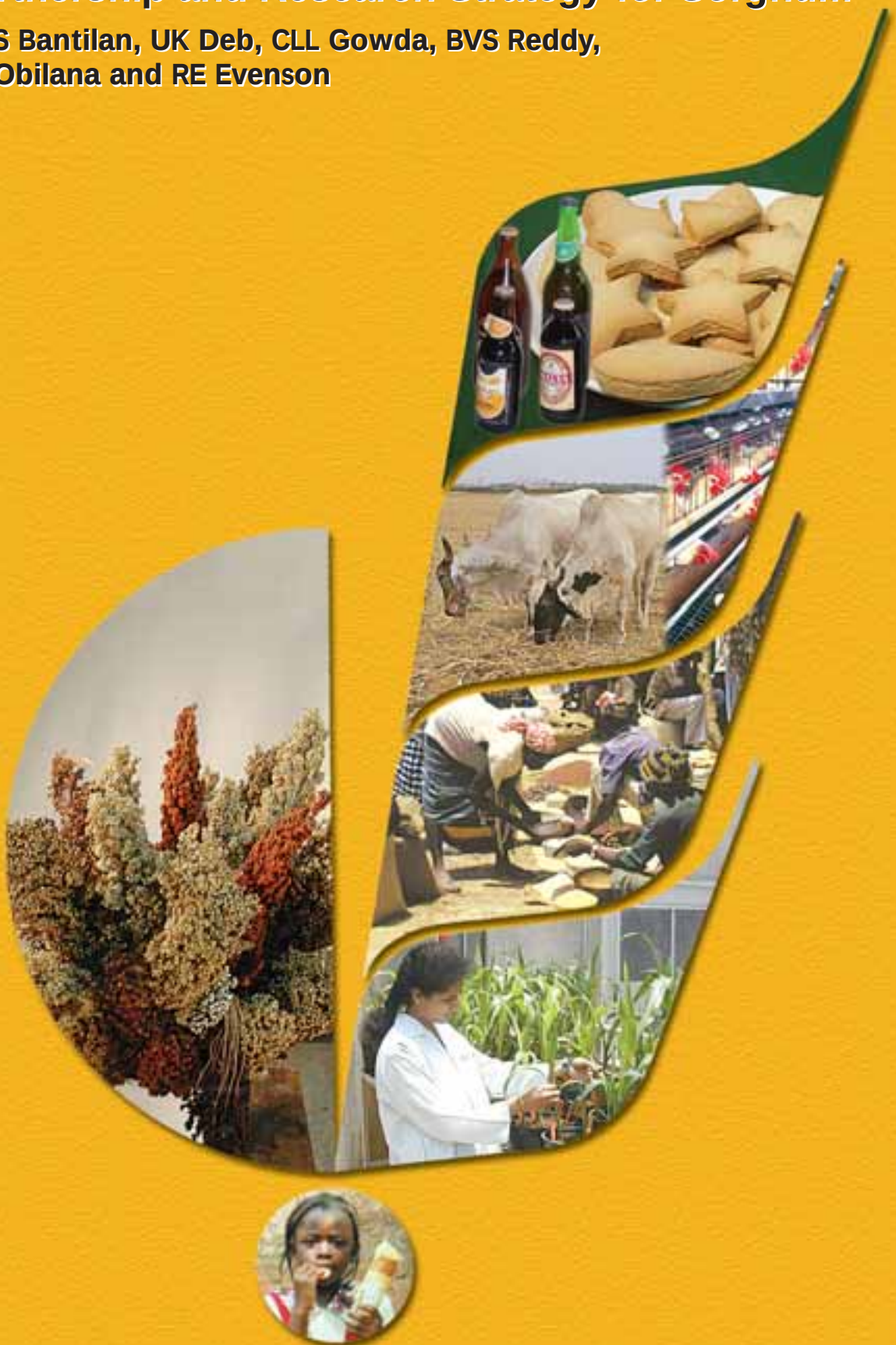
Future Directions for Food Security and Diversity: Partnership and Research Strategy for Sorghum

12

MCS Bantilan, UK Deb, CLL Gowda, BVS Reddy,
AB Obilana and RE Evenson



Future Directions for Food Security and Diversity: Partnership and Research Strategy for Sorghum

MCS Bantilan[1], UK Deb[2], CLL Gowda[1], BVS Reddy[1], AB Obilana[3] and RE Evenson[4]

12.1. Introduction

Future demand for sorghum is going to be different from the demand pattern observed at present and in the past. The demand for sorghum grain as food is expected to decline in the future while its demand as poultry feed, flour, ethanol (biofuel) and alcoholic beverages is going to increase. The demand for sorghum – both green and dry plants – as livestock feed will also go up. It is also expected that the demand for sorghum grain and stalk for industrial end use in nutrition and health products would increase. Thus, sorghum will essentially enhance the performance of integrated crop-livestock systems and improve options for commercialization in semi-arid agriculture. Therefore, any strategy to promote sorghum must be designed from this perspective.

In addition to the shifts in demand for sorghum grain and stalk, the vast developments in science and scientific tools can be used for germplasm evaluation, selection, screening and development of new cultivars and their utilization. The progress in Information and Communication Technology (ICT) can lead to the dissemination of knowledge and technology and the management and coordination of networks and partnerships. Visible changes have occurred in seed policies and seed delivery systems in countries where ICRISAT is operating. The new millennium has led to a new vision and strategies of the donor community. At present, agricultural research is viewed as a mechanism to alleviate poverty and hunger, ensure food security and sustain the livelihoods of poor communities around the world rather than just a means of increasing productivity. Considering these factors and the findings reported in previous chapters, there is a need to devise future strategies for sorghum breeding and partnership, formulate technology exchange policies and pave pathways for promoting diversity in sorghum cultivation.

12.2. Future Breeding Strategy

The strengths of NARS in Asia and Africa vary. There are a greater number of scientists working in Asia, particularly in India and China, than in Africa (see Chapter 1 for details). It has also been observed that national systems in Asia (India and China) mostly benefited from improved parental lines and breeding materials developed by ICRISAT. On the other hand, African countries were the beneficiaries of semi-finished and finished products like breeding lines, varieties and hybrids. Varieties developed by ICRISAT based in India, Zimbabwe and Mali generated spillover benefits across different African countries (see Chapters 4 and 11). Overall, priorities in sorghum breeding research must be identified considering both direct and spillover benefits.

[1.] International Crops Research Institute for the Semi-Arid Tropics, Patancheru 502 324, Andhra Pradesh, India.
[2.] Centre for Policy Dialogue, House 40/C, Road no. 11, Dhanmondi, Dhaka 1209, Bangladesh.
[3.] International Crops Research Institute for the Semi-Arid Tropics, PO Box 39063, Nairobi, Kenya.
[4.] Yale University, New Haven, Connecticut, USA.

Bantilan MCS, Deb UK, Gowda CLL, Reddy BVS, Obilana AB and Evenson RE. 2004. Future directions for food security and diversity: Partnership and research strategy for sorghum. Pages 263-268 *in* Sorghum genetic enhancement: research process, dissemination and impacts (Bantilan MCS, Deb UK, Gowda CLL, Reddy BVS, Obilana AB and Evenson RE, eds.). Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics.

Strategies for Asia, Africa and Latin America must vary. In order to benefit farmers of Asia, the development of parental and enhanced breeding materials is important. So are broader partnerships with research institutes in the public and private sectors. On the other hand, ICRISAT should concentrate on developing breeding lines, varieties and hybrids using indigenous cultivars for African farmers, in partnership with national research programs in Africa. In breeding and improvement, the focus should be on end-use qualities, increased productivity and input efficiency for impact. Regional breeding involving strategic partnerships in varietal testing that has begun in Southern Africa, should be continued and modified across regions. It would be rewarding to have an integrated strategy for sorghum development among the key players in Africa (ICRISAT, ECARSAM, SMINET, West Africa Sorghum and Millet Network and ARIs including INTSORMIL), so that all stakeholders work together to achieve the critical effort and investments required to tackle important problems. Thinly spread out resources would not bring out the desired effect.

Setting up centers for regional variety testing, release and seed production systems particularly in Africa, would provide high payoffs. Such procedures will to a great extent augment the shortage of human and financial resources, reduce the time spent on variety development and release and speed up and enhance the dissemination of knowledge and technologies. Thus, regional efforts are expected to be highly efficient and effective in sorghum research and development in Africa. Efforts in this direction have already begun in Southern Africa through SMINET and SMIP. Further progress is required with the participation of the nascent private seed sector in Africa. A similar strategy for Western and Central Africa as well as for Eastern Africa would pay high dividends. In the case of Latin America, an integrated strategy among key players including ICRISAT, INTSORMIL, CIAT, national systems and private seed companies would be essential.

Biotechnology, including plant genomics, has ushered in new scope for germplasm mapping, identification of novel and marker genes and the development of improved cultivars with desirable traits. Using tools of biotechnology has enhanced the efficiency, effectiveness, speed and precision of plant breeding across the globe. Now the development of cultivars with near-complete grain mold resistance, shoot fly resistance, *Striga* resistance or drought resistance in sorghum cultivars is achievable. There has been some progress in this area in recent years. Biotechnology-assisted germplasm enhancement activities need to be deployed along with conventional breeding methods at ICRISAT to solve such complex problems. The focus of biotechnology research in sorghum at ICRISAT must be such that appropriate policies and strategic partnerships enhance expected efficiency.

12.3. Private-public Partnership

Adoption studies conducted in Asia show that the private sector flourished in Asia in the 1990s in the areas of development and marketing of sorghum seed. The same cannot be said of African countries, where the private sector is yet to make large investments in these areas. Studies on seed systems in Africa reveal that optimal seed multiplication and distribution strategies involving community-level cooperation are viable options in addressing binding seed constraints. Partnerships among advanced laboratories, international research organizations, national institutes, private companies, NGOs and civil society organizations are alternative strategies. Without effective partnerships, no single institute would be able to achieve lasting results in technology generation and dissemination. ICRISAT has already proven its ability to build and sustain partnerships in using conventional and advanced breeding technologies for the improvement of

sorghum. The Institute must continue and strengthen broadbased partnerships. It may be noted that a number of private seed companies have come together with ICRISAT to form a hybrid parents' research consortium for sorghum. So far, 16 private seed companies operating in India partially support sorghum improvement research at ICRISAT through this consortium. This is an indication of the growing support to partnerships for the development and dissemination of appropriate sorghum cultivars to farmers.

Partnerships with the private sector should be strengthened in Africa and Asia for greater impacts in the farmers' field and agroprocessing industries. Technologies transferred to farmers during the 1990s mostly came from the private sector which used improved parental materials from ICRISAT and other public research institutes. Africa has witnessed two-way, public-private research for development (R4D) partnerships for processing and developing food and beverage products. According to a recent study by Reddy (2000), the private sector in Asia depends substantially on breeding materials from ICRISAT. The study also states that companies having partnerships with ICRISAT lasting one or two years feel the need to strengthen such ties. Researchers at ICRISAT should take note of this and ensure broadened partnerships. Obilana (2003) has highlighted some instances of knowledge transfer that have worked for rural farmers in Africa. Such cases need to be collated in order to broaden options.

In the African SAT, sorghum (together with millets) constitutes a major source of dietary energy and protein for nearly 1 billion people. In addition to being nutritionally vital, the proteins and micronutrients are potential sources for value-added products for vitamin deficiency (as in yellow endosperm sorghums containing beta-carotene) and diabetes (due to low/slow digestibility of sorghum protein), and biodegradable films in fruit and vegetable preservation. Knowledge of these and other unique traits of sorghum need to be developed and shared widely in Africa, Europe and the Americas, so that a useful and broad database can be developed for use in collaborative R4D ventures.

ICRISAT can provide complementary support to the private sector by developing parental lines, standard protocols, gene discovery and transformation. This will create greater impacts in farmers' fields and the industry. A biotechnology-assisted plant-breeding consortium to cater to such needs would substantially benefit smaller companies that can't afford the large investment that goes into setting up a biotech research facility. The high costs would render them uncompetitive in the market since they won't be able to face the transition from conventional to biotechnology-assisted breeding. As a result, there is the danger of cultivar development being concentrated in the hands of a few companies in the private sector. ICRISAT must take the initiative in establishing such a consortium with the goal of achieving greater impacts, encouraging competition and ensuring the availability of affordable and improved quality of seeds. Private sector companies in India would also require support from international and public institutes to train their personnel in the tools of applied biotechnology and to use enhanced germplasm materials developed through marker-assisted techniques.

12.4. Technology Exchange Policy

- The adoption of cultivars is related to the presence of farmers' preferred traits in new cultivars
- Adoption level is related to the access to cultivars or options available of cultivars that can be grown
- The speed of adoption depends on the availability of seeds and the profits from the cultivation of new cultivars.

These findings have important implications for policies on technology exchange and seed delivery systems. Seed availability should be ensured through the participation of public and private sector companies, community-level seed producers or farmer groups. It has been observed that private companies to a great extent participate in the marketing of hybrid seeds. Therefore, promoting sorghum hybrids in Asian and later in African countries may be possible through broader and enhanced partnerships with the private sector. On the other hand, promoting OPVs may require greater involvement of public companies, NGOs, progressive seed farmers/farmer groups and community-level seed producers. Availability of source seed (breeder's seed) is a necessary precondition for the development of foundation and certified seeds. It is essential that ICRISAT and its partners concentrate on a sustained supply of breeder's seed to public and private seed companies and community-level seed producers.

Broadbased partnerships among international and national research institutions, advanced laboratories, the private sector, civil society and farmer's organizations are essential to develop and transfer cutting-edge technology. ICRISAT can promote existing partnerships among these players through its recently established Technology Innovation Centre and two other initiatives in progress, namely the Agri-Business Incubator and the Agri-Biotech Park, part of the Andhra Pradesh Government's Genome Valley Project. The Virtual Academy for the Semi-Arid Tropics (VASAT) can serve as a platform for linking partners in sorghum development and technology exchange.

Transmitting knowledge on the appropriate technology of improved sorghum varieties and hybrids to rural farmers (and even industry) is easier said than done. What works and what does not depends on several interwoven issues in a mesh of theories, methodologies and actual practice. In practice, technology exchange is participatory, slow, time consuming and depends on the appropriateness of the improved varieties/hybrids and the commitment of partners and stakeholders. Technology exchange cannot succeed without enabling factors such as the availability of and access to improved seeds; wide dissemination of information about them; effective partnerships among stakeholders; appropriate, supportive and effective policies; an enabling environment including service providers, expertise and skill; and those who play the roles of bridge, catalyst, broker and promoter. These factors are more or less in place for ICRISAT and some partners in Asia, but need to be further developed in Africa.

12.5. Pathways for Promoting Biodiversity

There is a growing concern that the adoption of improved cultivars of different crops is decreasing the diversity of varieties grown by farmers. The analyses reported in Chapter 10 reveals that the number of improved sorghum cultivars and their rate of adoption in India, China, Pakistan, Iran, Myanmar, Thailand, Indonesia and Nigeria have increased over time. The genetic diversity of improved sorghum cultivars in India has increased, indicating that sorghum breeders in India have used diverse parental materials to develop new cultivars rather than relying on a few. Improved sorghum cultivars with preferred traits and high profit potential are expected to expand further in farmers' fields. Therefore, promoting diversity in farmers' fields will essentially depend on the availability of a large number of cultivars improved for various specific adaptations and end uses having different genetic backgrounds.

A close look at the research focus of private seed companies in India reveals their interest in making greater investments in the development of hybrids, mostly from parental materials available in the public domain, developed either by ICRISAT or public research institutes. This is

obvious considering the investment needed, risks and returns. The implications of such a focus are as follows:

- Public and international institutes must develop a large number of parental materials improved for various specific adaptation and end uses with diverse genetic backgrounds
- Closer links with private companies and community-level seed producers is essential to build awareness about the materials currently available and those likely to be available in the future
- Timely and cost-effective dissemination of materials to companies
- Intellectual Property Rights (IPR)/participatory plant breeding (PPB) regimes "friendly" to plant varietal selection and development.

12.6. Implications for Research Investment

Investments by the public and private sectors are correlated. It was observed that countries with higher levels of public investment experienced comparatively higher levels of investment by the private sector. Public investment in agricultural research promotes private sector investment in the following ways:

- By ensuring the availability of scientific manpower for research
- Technologies generated and disseminated through the public sector create markets for new technologies and reduce risks
- By increasing the probability of access to appropriate germplasm resources with traits preferred by farmers.

Though some major multinational companies had invested heavily in upstream research in biotechnology in the 1990s, they have backtracked in recent years. In their assessment, biotechnology research for Asian and African countries is no longer economically profitable because of the predominance of small and marginal farmers, high cost of the technology in relation to profits and time scale and the high transaction costs of enforcing Intellectual Property Rights under weak judicial systems. It is for this reason that public investment in sorghum research should be sustained and increased. Without public investment, the possibility of investment by the private sector becomes bleak.

12.7. Conclusions

The future strategy for sorghum at ICRISAT must be in harmony with the changing needs of end users (eg, ethanol, poultry feed); recent developments in new sciences (biotechnology, bioinformatics, geographic information systems and ICT); the trading environment (regionalization and globalization of agricultural ventures and WTO); IPR; indigenous farmer knowledge and private sector investment in crop improvement. There are visible shifts in the demand for sorghum and suppliers of sorghum technologies. Today's problems and concerns differ from those in the past, indicating that old prescriptions can't solve present day and future problems. ICRISAT and its partners must take the initiative to implement these suggestions in order to attain and sustain food and health security in the SAT. Capitalizing on synergies will ultimately benefit both farmers and consumers.

12.8. References

Obilana AB. 2003. From science to production – Transferring knowledge to the rural African farmers: what works and what doesn't. Presented at the Conference and Workshop on Science & technology and food security in Africa, 10-15 Nov 2003, Maseru, Lesotho. Lesotho: African Technology Policy Studies (ATPS) Network and Ministry of Communications, Science & Technology (MCST).

Reddy BVS. 2000. Report on sorghum Scientists' Field Day 2000.

Appendixes

Appendix I. List of improved sorghum cultivars (varieties and hybrids) in different countries of the world.

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
1	W. Africa	Benin	ICSV 111	ICSV 111	[(SPV 35 X E 35-1) X (CSV4)-8-1	1999			ICRISAT bred						
2	S. Africa	Botswana	SDS 3220	Phofu	(Syn: Macia, SDS 3220, M91057, F3A-115-2)	1994			ICRISAT bred						Originated in Zimbabwe
3	S. Africa	Botswana	(SDS 2583) IS 3923	Mahube (SDS 2583)	IS 3923	1994			ICRISAT network						Originated in Zimbabwe
4	S. Africa	Botswana	SDSH 48	BSH 1 (SDSH 48)	SDSH 48 F1 Hybrid	1994			ICRISAT bred					Hybrid	Originated in Zimbabwe
5	S. Africa	Botswana		Nmabaitse (Bot 79)		1994			ICRISAT bred						
6	S. Africa	Botswana		Radar		1960s			Others						
7	S. Africa	Botswana		8 D		1960s			Others						
8	S. Africa	Botswana		Kanye Standadrd		1960s			Others						
9	S. Africa	Botswana		Marupaantse		1960s			Others						
10	S. Africa	Botswana		Segaolane		1970s			Others						
11	S. Africa	Botswana		Town		1970s			Others						
12	S. Africa	Botswana		65 D		1970s			Others						
13	W. Africa	Burkina Faso		E-35-A		1975			ICRISAT network						
14	W. Africa	Burkina Faso		IRAT 204		1980			ICRISAT network						
15	W. Africa	Burkina Faso	IS 18758	E 35-1		1983			ICRISAT network						
16	W. Africa	Burkina Faso	ICSV 1001 BF	Framida		1986			ICRISAT bred						Originated in Burkina Faso
17	W. Africa	Burkina Faso	ICSV 1049	ICSV 1049		1989			ICRISAT bred						Originated in Burkina Faso
18	W. Africa	Burkina Faso	SARIAGO-B	Sariago B (BF 83-48-2-1)	BF 83-48-2-1	1992			ICRISAT network						Originated in Burkina Faso
19	E. Africa	Burkina Faso		Sariabo 13		2000			ICRISAT network						
20	E. Africa	Burkina Faso		Sariabo 14		2000			ICRISAT network						
21	E. Africa	Burundi		5Dx160 sorghum		1989			ICRISAT network						

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
22	E. Africa	Burundi	E 35-1	Gambella 1107	IS 18758	1990			ICRISAT network						Originated in Ethiopia Sorghum
23	C. Africa	Cameroon	ICSV 111	S 35	S 35	1987			ICRISAT bred						Originated in India/Nigeria
24	C. Africa	Chad	ICSV 111	S 35	S 35	1989			ICRISAT bred						Originated in India/Nigeria
25	Asia	China		Jin Za No. 1	TX 3197	1973			Others						
26	Asia	China		Xin Za No. 52	TX 3197	1973			Others						
27	Asia	China		Jin Za No. 4	TX 3197	1973			Others						
28	Asia	China		Jin Za No. 5	TX 3197	1973			Others						
29	Asia	China		Ji Za No. 11	TX 3197	1978			Others						
30	Asia	China		Ji Za No. 26	TX 3197	1978			Others						
31	Asia	China		Tie Za No. 6	TX 3197	1980			Others						
32	Asia	China	A 3681	Yuan 1-98		1982			ICRISAT parent						
33	Asia	China	A 3872	Yuan 1-28		1982			ICRISAT parent						
34	Asia	China	A 3895	Yuan 1-505		1982			ICRISAT parent						
35	Asia	China	A 6072	Yuan 1-54		1982			ICRISAT parent						
36	Asia	China		Liao Za No. 1	TX 622	1983			Others						
37	Asia	China		Liao Za No. 2	TX 622	1983			Others						
38	Asia	China		Jin Za No. 83	TX 622	1983			Others						
39	Asia	China		Shen Za No. 4	TX 622	1983			Others						
40	Asia	China		Tie Za No. 7	TX 622	1983			Others						
41	Asia	China		Shen Za No. 5	TX 622	1986			Others						
42	Asia	China		Qiao Za No. 2	TX 622	1987			Others						
43	Asia	China	SPL 132 A parent	Liao Za No. 4	SPL 132	1988			ICRISAT parent						
44	Asia	China		Jin Za No. 94	SPL 132	1996			ICRISAT parent						
45	Asia	China		Long Si Za No. 1	MR 741	1997			ICRISAT parent						
46	Asia	China		Jin Za No. 12	V4	1997			ICRISAT parent						
47	Asia	China		Tie Za No. 10	TX 622	1994									
48	Asia	China		Liao Za No. 5	TX 622	1996			ICRISAT parent						
49	Asia	China		Long Za No. 3	TX 623										1995

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
50	Asia	China		Liao Za No. 6	SPL 132	1996			ICRISAT parent						
51	Asia	China		Liao Za No. 7	SPL 132	1996			ICRISAT parent						
52	Asia	China		Liao Za No. 10	SPL 132	1997			ICRISAT parent						
53	Asia	China		Gileza 80	A_2 hybrid IC A line converted to A_2 and was used as female parent	1997			ICRISAT parent						
54	Asia	China	D-71278-4	Jin XA 4	Converted to 3197 A_2	1992			ICRISAT parent						
55	S. America	Colombia	A 3895	ICA Yanuba		1992			ICRISAT parent						
56	S. America	Colombia		Sorghica PH 302		1992			ICRISAT network						
57	S. America	Colombia		HE 241					ICRISAT network (early 1990s)						
58	C. America	Costa Rica		Escameka		1991			ICRISAT network						
59	W. Africa	Cote'd Ivoire	ICSV 1001 BF	Framida		1986			ICRISAT bred						Orginated in Burkina Faso
60	W. Africa	Cote'd Ivoire	ICSV 1063 BF	ICSV 1063		2000			ICRISAT bred						Orginated in Burkina Faso
61	L. America	Dominican Republic	ICSV-LM 90501	Surena-1		1993			ICRISAT bred						
		Ecuador	-	INIAP 201 [(GPR148 x E 35-1)-4-1-x CSV 4 desi]-1-1		1987									
62		Egypt		Giza 114	Selection from Local	1962									
63		Egypt		Giza 15	Two local lines	1978									
64		Egypt		Dorado	Dorado	1993									
65		Egypt		Giza 113	Local x Exotic	1994									
66		Egypt		Hybrid 1	Dorado x ICSA 1	1996								Hybrid	
67		Egypt		Hybrid 2	Dorado x ICSA 37	1996								Hybrid	

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
68		Egypt		Hybrid 3	Dorado x ATX 631	1996								Hybrid	
69	C. America	El Salvador		Centa S-2		1976			ICRISAT network						
70	C. America	El Salvador		Centa SS-41		1978			ICRISAT network						
71	C. America	El Salvador	M 91057 * M 90950 (Breeding line)	ISIAP Dorado		1981			ICRISAT bred						
72	C. America	El Salvador	M 90361	Centa Orintal		1987									
73	C. America	El Salvador	M 90362 (Male Parent)	AGROCONSA 1		1987			ICRISAT network						
74	C. America	El Salvador	ICSV LM 90502 (M 3628)	SOBERANO		1996									
75	C. America	El Salvador	ICSV LM 90503 (M 3558)	RCV		1996									
76	C. America	El Salvador	ICSV LM 90508 (PP 290)	Jocoro		1997									
77	E. Africa	Eritrea	ICSV 210	Bushuka		2000									
78	E. Africa	Eritrea	PP 290 (Intsormil)	Shambuko		2000									
79	E. Africa	Eritrea	89 MW 5003	Shieb		2000									
80	E. Africa	Eritrea	89 MW 5056	Laba		2000									
81	E. Africa	Eritrea	IS 29415	Shiketi		2000									
82	E. Africa	Ethiopia	Melkamesh	Melkamesh	Diallel Pop. 7-682	1988			ICRISAT network						Originated in Ethiopia
83	E. Africa	Ethiopia	IS 9302	ESIP 11		1984			ICRISAT network						
84	E. Africa	Ethiopia	IS 9323	ESIP 12		1984			ICRISAT network						
85	E. Africa	Ethiopia	ICSV 1	Dinkmash	SC 108 - 3 x CSV 4	1988			ICRISAT network						
86	E. Africa	Ethiopia		Seredo		1990			ICRISAT network						
87	E. Africa	Ethiopia	ICSV 1	SPV 351		1996			ICRISAT bred (1996)						
88	E. Africa	Ethiopia	E 35-1	Gambella 1107		1980									
89	E. Africa	Ethiopia	76 TI #23	76 TI #23		1980									
90	E. Africa	Ethiopia	M 36121	M 36121		1980									
91	E. Africa	Ethiopia	IS 9302	IS 9302		1980									
92	W. Africa	Ghana	ICSV 1001 BF	Framida		1986			ICRISAT bred						Originated in S.Africa

...continued

Appendix I. *Continued*

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
93	W. Africa	Ghana	ICSV 111	Kaapala	[(SPV 35 x E 35-1) x (CSV 4)-8-1	1997									
94	C. America	Guate-mala	M 90975	ICTA Mitlan	GPR 168 x 85 (ICTA C-21)	1985 SC 170			ICRISAT					bred	
95	C. America	Honduras	CS 3541	Tortillero 1	IS 18484	1984			ICRISAT network						
96	C. America	Honduras	AT x 623 x Tortiller	Catracho		1984			ICRISAT bred						
97	C. America	Honduras	M 62650	Sureno	(SC 423 x	1985 CS 3541) x E35-1			ICRISAT bred						
98	Asia	India		CSH-1	MSCK 60A x IS 84	1964	4045/24.9.69, 786/2.2.76		ICRISAT parent	Rainy	3.0-3.5			Hybrid	
99	Asia	India		CSH-2	MSCK 60A x IS 3691	1965	4045/24.9.69		ICRISAT parent	Rainy	3.0-3.5			Hybrid	
100	Asia	India		Swarna (CSV-1)	Selection from IS 3924	1968	4045/24.9.69		ICRISAT network		3.0-3.5				
101	Asia	India		Muguthijola (5-4-1)	Coto-2 x M 35-1	1969	786/2.2.76			Postrainy	2.0-2.5				
102	Asia	India		Gujarat Jowar-108 (GJ-108)	Surat-1 x Nursery-108	1969	19(E)/14.1.82			Rainy	2.0-2.5				
103	Asia	India		M 35-1	Selection from local Mandandi Jowar released in 1930.	1969	596(E)/13.8.84								
104	Asia	India		Annigeri-1 (A-1)	M 35-1 x CS 560-1-1	1969	—				2.0-2.5				
105	Asia	India		CSH-3	2219A x IS 3691	1970	566(E)/21.9.74		ICRISAT parent		3.5-3.8			Hybrid	
106	Asia	India		Kovilpatti Tall	2219A x IS 3541	1970	786/2.2.76			Rainy	2.5-3.0				
107	Asia	India		JS-20		1973	361(E)/ 30.6.73,786/ 2.2.76				(Rain) 5.0-6.0 (Irrig.)				
108	Asia	India		JS-263		1973	361(E)/30.6.73								
109	Asia	India		JS-29/1		1973	361(E)/30.6.73								

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC-name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
110	Asia	India		CSH-4 (PSH-2)	MSCK 1036A x IS 3924 (Swarna)	1973	440(E)/21.8.75		ICRISAT parent	Rainy and postrainy	3.5-3.8			Hybrid	
111	Asia	India		Jaya	Selection from Aispuri Jowar	1974	566(E)/21.9.74								
112	Asia	India		302 (CSV-2)	IS 3922 x Karad Local	1974	440(E)/ 21.8.75,786/ 2.2.76, 13/ 19.12.78		ICRISAT parent	Early rainy	3.0-3.5				
113	Asia	India		CSH-5	2077A x CS 3541	1974	786(E)/ 2.2.76,13/ 19.12.78				3.8-4.0			Hybrid	
114	Asia	India		CSV-3 (370)	IS 2954 x B.P. 53	1974	786(E)/ 2.2.76,13/ 19.12.78		ICRISAT parent	Rainy	3.5-4.0				
115	Asia	India		CSV-4 (CS-3541)	IS 3675 x IS 3541	1974	786/ 2.2.76,13/ 19.12.78		ICRISAT parent	Rainy	3.0-3.5				
116	Asia	India		148/168 (CSV-5)	IS 3687 x Aispuri	1974	13/19.12.78		ICRISAT parent	Rainy	3.0-3.5				
117	Asia	India		604 (CSV-6)	IS 3922 x Aispuri	1974	—-		ICRISAT parent		3.2-3.5				
118	Asia	India		CSV-7R (R-16)	IS 2950 x M 35-1	1974	—-		ICRISAT parent	Rainy	2.0-2.5				
119	Asia	India		SL-44		1975	440(E)/21.8.75, 786/2.2.76								
120	Asia	India		MSH 33	SMS-35 x SL 292	1975	—-				2.0-2.5				
121	Asia	India		RSH-1	M 35-1 x ISR-1	1976	786/2.2.76			Postrainy					
122	Asia	India		Vidisha 60-1	Selection from local material of Shankarpur Village, Ujjain district, Madhya Pradesh	1976	786/2.2.76, *563(E)/30.8.91			Rainy	2.0-2.3				
123	Asia	India		Haryana Chari		1976	786/2.2.76						Forage		
124	Asia	India		MSH 37	SMS-307 x SL 292	1976	—-				2.5-3.0				
125	Asia	India		CSH-6	MSCK 2219A x CS 3541	1977	1004/23.3.78			Rainy	3.5-3.8			Hybrid	

...continued

Appendix I. *Continued*

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
126	Asia	India		CSH-7R (SPH-6)	MS 36A x 168	1977	1004/23.3.78			Postrainy	2.5-3.0			Hybrid	
127	Asia	India		Mau Type-1	Selection from local material in Uttar Pradesh	1977	13/19.12.78			Rainy					
128	Asia	India		CO-21 (SPV 80) (USV 1)	Induced mutant from 148 (699)	1977	540(E)/24.7.85				2.0 (rain) 4.2 (irrig)				
129	Asia	India		CSH-8R (SPH 18)	MS 36A x PD 3-1-11	1978	1004/23.3.78, 19 (E)/14.1.82			Postrainy	2.5-3.0			Hybrid	
130	Asia	India		Mau Type-2	Selection from local material in Uttar Pradesh	1978	13/19.12.78			Rainy					
131	Asia	India		Moti (SPV 141)	Induced mutant line from IS 6928	1978	13/19.12.78		ICRISAT network	Rainy (Maghi)	2.0-2.5				
132	Asia	India		MP Chari		1978	13/19.12.78						Forage		
133	Asia	India		MSH-8	SMS 35 x SL-254	1978	13/19.12.78				4.5-6.0				
134	Asia	India		MSH-21	SMS 149 x SL-249	1978	13/19.12.78				5.0-6.0				
135	Asia	India		SDM-9	An outdated variety	1978	13/19.12.78								
136	Asia	India		Vasant-1 (V-1)	NMS 8A x (IS 84 x Sel. 1-22)	1978	13/19.12.78	Nimkar Seeds	ICRISAT parent	Rainy and postrainy				Hybrid	
137	Asia	India		Kovilpatti-6 (K-6)	Pure line selection from Usilampatti local Sen Cholam	1978	19(E)/14.1.82, *563(E)/30.8.91				2.8-2.9				
138	Asia	India		CSV-8R	R 24 x R 16	1979	470/19.2.80								
139	Asia	India		SB-1079	Shallu x CS 3541	1979	19(E)/14.1.82			Rainy and postrainy	2.5-3.0				
140	Asia	India		SB-1066 (SPV-35)	Selection from an introduction from Purdue base No. 954	1979	295(E)/9.4.85			Rainy	2.0-2.5				
141	Asia	India		CO-23 (USV 3) (SPV 136)	Multiple cross involving four elite lines 2077A, 2947A, CS 3678, CS 3687	1979	19(E)/14.1.82				2.7 (rain) 5.0 (irrig)				
142	Asia	India		Pusa Chari-6		1980	470/19.2.80						Forage		
143	Asia	India		CO-24 (USV 5) (SPV 138)	CK 60A x SPR 1341	1980	19(E)/14.1.82				2.8				

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
144	Asia	India	IS 30468	NTJ 2 (IS 30468) (E 1966)	IS 30468 Zera Zera Landrace	1980		Nuzuveedu Seeds	ICRISAT network	Rainy				Hybrid	Origi-nated in Ethiopia
145	Asia	India		CSH-9 (SPH-61)	296A x CS 3541	1981	19(E)/14.1.82			Rainy	4.0-4.2			Hybrid	
146	Asia	India		COH 3 (USH 1)	2077A x 699 Tall	1981	832(E)/18.11.85				3.0			Hybrid	
147	Asia	India		Jowahar Jowar-E144235 (SPV 235) (I-781)	(IS 2954 x CS 3541) 11 x 1	1981	—-				2.5-3.0				
148	Asia	India		Jowahar Jowar-236 (SPV 236)	(Vidisha 60-1 x CS 3687) 5 x (Swarna x CS 3687) 596-2-3-3	1981	—-				2.9-3.0				
149	Asia	India		Jawahar Chari-6		1982	19(E)/14.1.82						Forage		
150	Asia	India		Jawahar Chari-69		1982	19(E)/14.1.82						Forage		
151	Asia	India		K-7		1982	19(E)/14.1.82								
152	Asia	India		HC-136		1982	19(E)/14.1.82								
153	Asia	India		SPV-245 (SV 14)	SB 1066 x CS 3541	1982	540(E)/24.7.85				3.8-4.0				
154	Asia	India		MSH 51		1983		Mahyco			7.5-8.0			Hybrid	
155	Asia	India		UP Chari-1 (IS-4776)	IS 4776	1983	499(E)/8.7.83		ICRISAT network						
156	Asia	India		SPV-126 (CSV-9)	Natural mutant isolated from CS 3542 (CSV-4)	1983	499(E)/3.7.83			Rainy	3.0-3.2				
157	Asia	India		CSV-10 (SPV-346)	SB 1066 x CS 3541	1983	295(E)/3.7.83			Rainy	3.0-3.5				
158	Asia	India		Gujarat Sorghum-35 (GJ 35) (SPV 565)	(2077A x M25) x Malvan	1983	295(E)/9.4.85			Rainy	3.5-4.0				
159	Asia	India		Gujarat Sorghum HY-1 (GSH 1)	2077A x NSV-13	1983	295(E)/9.4.85			Rainy	3.2-3.5				
160	Asia	India		Varsha	T22 x 5742-1A	1983	540(E)/24.7.85			Rainy	2.5-3.0				
161	Asia	India		SPV-297	CS 3541 x IS 3924	1984	540(E)/24.7.85		ICRISAT	Rainy	3.7-4.0				
162	Asia	India		Swati (SPV-504) (RSV-9R)	SPV 86 x M 35-1	1984	540(E)/24.7.85		parent	Postrainy	2.5-3.0				

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
163	Asia	India		Gujarat Jowar-36 (GJ36) (M-74) (SPV 596)	(2219A x BP 53) x BP 53	1984	258(E)/14.5.86			Rainy	3.2-4.0				
164	Asia	India		DSH 1 (SPH-196)	296A x SB 1085	1984	—				4.0				
165	Asia	India		Rajasthan Chari-1 (SU-52)		1985	295(E)/9.4.85						Forage		
166	Asia	India		Pusa Chari-9 (PC-9)		1985	295(E)/9.4.85						Forage		
167	Asia	India		UP Chari-2		1985	295(E)/9.4.85						Forage		
168	Asia	India		Pusa Chari-23 (PC-23)		1985	295(E)/9.4.85						Forage		
169	Asia	India	ICSV 1	CSV-11 (SPV-351)	SC 108-3 x CS 3541	1982	295(E)/9.4.85		ICRISAT bred	Rainy	3.0-3.5				
170	Asia	India		SB 905 (SPV 247)	Selection from an outcross in Kalagonda	1985	540(E)/24.7.85				2.5-3.0				
171	Asia	India		SPV-96	148 x 512	1985	540(E)/24.7.85			Rainy	2.0				
172	Asia	India		CO-22 (SPV 81) (USV 2)	Multiple cross involving 2077A, 3660A, 2219A	1985	540(E)/24.7.85			Rainy	2.3 (rain) 4.5 (irrig)				
173	Asia	India		Rajasthan Chari-2 (SU-45)		1985	832(E)/18.11.85						Forage		
174	Asia	India		Gujarat Jowar-9	Selection from local Rabi type	1985	832(E)/18.11.85			Postrainy	1.5-1.8				
175	Asia	India		CO-25 (SPV 542) (TNS 27)	IS 4283 x 699 tall	1985	832(E)/18.11.85		ICRISAT parent		2.8-3.0 (rain) 5.0-6.0 (irrig)				
176	Asia	India		COH-3		1985	832(E)/18.11.85							Hybrid	
177	Asia	India		K-4 (Kovil Patti-4)		1986	258(E)/14.5.86								
178	Asia	India		SPH-201	296A x PVR 10	1986	867(E)/26.11.86								
179	Asia	India		SPV-462	MS 8271 x IS 3691	1986	867(E)/26.11.86		ICRISAT parent						
180	Asia	India		CSH-10 (DSH-1)	296A x SB 1085	1986	867(E)/26.11.86							Hybrid	
181	Asia	India	ICSH 153	CSH-11 (SPH-221)	296A x MR 750	1986	867(E)/26.11.86		ICRISAT bred		4.0-4.2 (rain)			Hybrid	
182	Asia	India		CSH-12R (KD RSH-1)	296A x M 148-138	1986	867(E)/26.11.86							Hybrid	

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
183	Asia	India		Gujarat Jowar-37	2077A x M 28 (Gundri)	1987	165(E)/6.3.87				3.5	88	Dual purpose		
184	Asia	India		Haryana Chari-171 (HC-171)		1987	834(E)/18.9.87						Forage		
185	Asia	India		Haryana Chari-260 (HC-260)		1987	834(E)/18.9.87						Forage		
186	Asia	India		Pro-Agro 8320		1988		Pro-Agro						Hybrid	
187	Asia	India	ICSV 112	CSV-13	(IS 12622 x 555) x IS 3612 x 2219B x E 35-1	1988	471(E)/5.5.88				3.5-4.0 (rain)				
188	Asia	India	ICSV 145	SAR-1	555 x GPR 148	1988	471(E)/5.5.88		ICRISAT bred					Variety	
189	Asia	India		K-8		1989	915(E)/6.11.89		-do-						
190	Asia	India		MFSH-3 (Forage Sorghum)		1990	386(E)/15.5.90	MAHYCO				500-600	Forage	Hybrid	
191	Asia	India		SPH-468 (AKSH-14-150)	AKMS 14A x R 150	1990	386(E)/15.5.90								
192	Asia	India		SPH-388 (AKSH-73)	296A x R 73	1990	386(E)/15.5.90								
193	Asia	India		SPV-669 (AKSV-37)	SPV 97 x SPV 29	1990	386(E)/15.5.90								
194	Asia	India		DSV-1		1990	639(E)/17.8.90								
195	Asia	India		GFS-4	GJ 37 x Sudan	1990	639(E)/17.8.90					350-400	Forage		
196	Asia	India		Nandyala Tella Jonna-2		1990	639(E)/17.8.90								
197	Asia	India		N-14 (Yellow Sorghum)		1990	639(E)/17.8.90								
198	Asia	India		Ajeet 999		1991		Ajeet Seeds		Rainy	5.5-6.0			Hybrid	
199	Asia	India		CSH-13R (SPH-504)	296A x RS 29	1991	527(E)/16.8.91							Hybrid	
200	Asia	India		Pro-Agro Chari (SSG-988)		1991	527(E)/16.8.91						Forage		
201	Asia	India		Pant Chari-3		1991	527(E)/16.8.91						Forage		
202	Asia	India		Jawahar Jowar-741		1991	527(E)/16.8.91								
203	Asia	India		Pro-Agro 8340		1992		Pro-Agro						Hybrid	

...continued

Appendix I. *Continued*

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
204	Asia	India		SSV-84		1992	814(E)/4.11.92								
205	Asia	India		CSV-14 (R) (SPV 839)	M 35-1 x (CS 2947 x CS 2644) x M 35-1	1992	814(E)/4.11.92								
206	Asia	India	Parent Source	JKSH 22		1999		JK Seeds	ICRISAT parent					Hybrid	
207	Asia	India	Parent Source	PJH 55		1993		Hindustan Lever	ICRISAT parent	Rainy	3.0-3.5			Hybrid	
208	Asia	India	Parent Source	PJH 58		1993		Hindustan Lever	ICRISAT parent	Rainy	3.3-3.6			Hybrid	
209	Asia	India	Parent Source	PSH 8340		1993		Pro-Agro	ICRISAT parent					Hybrid	
210	Asia	India		Gujarat Forage Sorghum-1		1993	615(E)/17.8.93						Forage		
211	Asia	India		K-9 (Kovil Patti-9)		1993	615(E)/17.8.93								
212	Asia	India		COH-4		1993	615(E)/17.8.93							Hybrid	
213	Asia	India	PVK 400	PVK-400		1999									
214	Asia	India	SPH 468	CSH 14	AKMS 14A x AKR 150	1993			ICRISAT parent					Hybrid	
215	Asia	India	ICSV 745	DSV 3	ICSV 197 x A 6250	1993			ICRISAT bred					Hybrid	
216	Asia	India		PKH 400		1993			ICRISAT parent						
217	Asia	India	ICSV 197	ICSV 197	ICSV 197	1993			ICRISAT bred						
218	Asia	India	Parent Source	MLSH 36		1994		Mahendra Hybrid Seeds Co.	ICRISAT parent					Hybrid	
219	Asia	India		JKSH 45		1994		JK Seeds	ICRISAT parent					Hybrid	
220	Asia	India		HES-4		1994	836(E)/2.9.94								
221	Asia	India		Speed Feed		1994	837(E)/2.9.94						Forage		
222	Asia	India		Jambo		1994	837(E)/2.9.94								
223	Asia	India		CSH-13	296A x RS 29	1994								Hybrid	
224	Asia	India		Harasona (855F)		1995	408(E)/4.5.95								
225	Asia	India		Punjab sudex (Chari-1)		1995	408(E)/4.5.95						Forage		

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
226	Asia	India		GJ-38		1995	408(E)/4.5.95								
227	Asia	India		GJ-39		1995	408(E)/4.5.95								
228	Asia	India		MBSH 7		1996		Maharashtra State Seed Corporation (MSSC)					Substitute for CSH 14	Hybrid	
229	Asia	India		Jawahar Jowar-938		1996	1(E)/1.1.96								
230	Asia	India		CSH-15R (SPH-677)	104 A x RS 585	1996	1(E)/1.1.96							Hybrid	
231	Asia	India		Selection-3		1996	1(E)/1.1.96								
232	Asia	India		ICSV-745 (SPV-949)	(PM 11344 x A 6250)-4-1-1-1	1996	1(E)/1.1.96								
233	Asia	India	Parent source	CSV-15 (SPV 946)	SPV 475 x SPV 462	1994	349(E)/10.2.96		ICRISAT parent						
234	Asia	India		Pro-Agro 8560		1997		Pro-Agro						Hybrid	
235	Asia	India		SUNZO 261		1997		Navartis India Ltd.		Rainy				Hybrid	
236	Asia	India		Pusa Chari Hybrid-106 (PCH-106)	2219 x PC-23	1997	360(E)/1.5.97						Forage		
237	Asia	India	ICSV 239	BSR-1		1989	360(E)/1.5.97		ICRISAT bred						
238	Asia	India		GJ-40		1997	360(E)/1.5.97								
239	Asia	India		Pant Chari 4		1997	360(E)/1.5.97						Forage		
240	Asia	India		MLSH-296 (MLSH-14)		1997	647(E)/9.9.97	Mahendra Hybrid Seeds Co.						Hybrid	
241	Asia	India		CSH-16 (SPH 723)	27 A x C 43	1997	647(E)/9.9.97							Hybrid	
242	Asia	India		DSV-5 (GRS-1)		1997	647(E)/9.9.97								
243	Asia	India		APK-1		1997	662(E)/17.9.97								
244	Asia	India		CSH-17		1997	647(E)/9.9.97							Hybrid	
245	Asia	India		JKSH 273		1998		JK Seeds						Hybrid	
246	Asia	India		C 71		1998		Cargill						Hybrid	
247	Asia	India		Pro-Agro 8562		1998		Pro-Agro						Hybrid	
248	Asia	India		ASH 1	ICSA 91001 x ICSR 90017	1997			Adilabad	Rainy	4.8-5.0		purpose	Dual Hybrid	
249	Asia	India	ICSH 86686	PSH 1		1999									

...continued

Appendix I. *Continued*

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
250	Asia	India	Parent Source	SPH 840		2000									
251	Asia	India	GD 34553	PVK 801		2000									
252	Asia	India	GD 31-4-2-3	Parbhani Moti (SPV 1411)		2002									
253	Asia	India		MSH 50				MAHYCO			5.5-6.2			Hybrid	
254	Asia	India		MSH 55				MAHYCO			5.0-6.2			Hybrid	
255	Asia	India		MSH 61				MAHYCO			6.0-6.4			Hybrid	
256	Asia	India		MSH 65				MAHYCO			6.0-6.5			Hybrid	
257	Asia	India		MSH 66				MAHYCO			6.0-6.5			Hybrid	
258	Asia	India		MSH 70				MAHYCO			6.4-6.6			Hybrid	
259	Asia	India		MSH 83				MAHYCO						Hybrid	
260	Asia	India		MSH 92				MAHYCO						Hybrid	
261	Asia	India		MSH 109R				MAHYCO		Postrainy	4.5-5.0			Hybrid	
262	Asia	India		MFSH 4				MAHYCO				580-640	Forage	Hybrid	
263	Asia	India		MFSH 5				MAHYCO				610-640	Forage	Hybrid	
264	Asia	India		MLSH 13				Mahendra Hybrid Seeds Co.						Hybrid	
265	Asia	India		MLSH 32				Mahendra Hybrid Seeds Co.						Hybrid	
266	Asia	India		Research 351				Maharaja Hybrid Seeds						Hybrid	
267	Asia	India		JKSH 188				JK Seeds						Hybrid	
268	Asia	India		JKSH 267				JK Seeds						Hybrid	
269	Asia	India		PJH 53				Hindustan Lever		Rainy	2.8-3.3			Hybrid	
270	Asia	India		PJH 62				Hindustan Lever		Rainy	3.0-3.5			Hybrid	
271	Asia	India		PAC 501				ITC Zeneca	ICRISAT parent	Rainy	3.5-4.5			Hybrid	
272	Asia	India		PAC 505				ITC Zeneca	ICRISAT parent	Rainy	3.5-4.5			Hybrid	
273	Asia	India		PAC 537				ITC Zeneca	ICRISAT parent	Rainy	4.0-5.0			Hybrid	
274	Asia	India		PSH 63				Prabhat Agro-biotec (Pvt.) Ltd		Rainy	3.2-3.5			Hybrid	
275	Asia	India		PSH 65				Prabhat Agro-biotec (Pvt.) Ltd		Rainy	3.0-3.2			Hybrid	
276	Asia	India		PSH 68				Prabhat Agro-biotec (Pvt.) Ltd		Rainy	3.5-3.8			Hybrid	

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
277	Asia	India		Amarnath 251				Nath Seeds		Rainy	2.5-2.8			Hybrid	
278	Asia	India		PO 8201				Pioneer Seeds		Rainy				Hybrid	
279	Asia	India		KSH 24				Kalyani Seeds, Pune						Hybrid	
280	Asia	India						Nath Seeds						Hybrid	
281	Asia	India						Birla Seeds						Hybrid	
282	Asia	India						Ankur Seeds						Hybrid	
283	Asia	India						Pioneer						Hybrid	
284	Asia	India						Nimkar Seeds						Hybrid	
285	Asia	India		Haryana Chari -308									Forage		
286	Asia	India		SAR 2					ICRISAT parent						
287	Asia	India		GFS 3 (Gujarat Forage Sorghum 3) (IS 5026)	Raj 69 x R 23158 (Gundri)				GAU	Rainy		431	Fodder		
288	Asia	Indonesia		No. 46	Introduction	1967					4.0				
289	Asia	Indonesia		No. 6C	Selection from Local	1969					4.5				
290	Asia	Indonesia		UPCA-S2	Introduction	1972					4.5				
291	Asia	Indonesia		UPCA-S1	Introduction	1972					4.0				
292	Asia	Indonesia		KD4	Introduction	1973					4.0				
293	Asia	Indonesia		Keris	Introduction	1973					3.0				
294	Asia	Indonesia		Badik	Introduction	1983					3.0				
295	Asia	Indonesia		Hegari genjah	Selection from Local	1985					3.7				
296	Asia	Indonesia		Mandau	Introduction	1991					4.5				
297	Asia	Indonesia		Sangkur	Introduction	1991					3.8				
298	Asia	Indonesia		Cempaka	Introduction	Before 1960					3.5				
299	Asia	Indonesia		Birdroof	Introduction	Before 1960					3.5				
300	Asia	Indonesia		Katengu	Introduction	Before 1960					3.5				
301	Asia	Iran		Speed Feed	Introduced from Australia	1990									
302	Asia	Iran		Lumbo	Introduced from Australia	1992									

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
303	Asia	Iran		Sugar graze	Introduced from Australia	1992									
304	Asia	Iran		Payam	Cross selected	1997									
305	Asia	Iran		Kimiya	Cross selected	1997									
306	Asia	Iran		Sepeeden	Cross selected	1997									
307	E. Africa	Kenya		Serena		1972			Others						
308	E. Africa	Kenya		E 6518		1978			Others						
309	E. Africa	Kenya		E 1291		1978			Others						
310	E. Africa	Kenya		Seredo		1982			ICRISAT network						
311	E. Africa	Kenya		2KX17		1983			ICRISAT network						
312	E. Africa	Kenya		E 525HR		1984			ICRISAT network						
313	E. Africa	Kenya	IS 76T1#23	IS 76		2001			ICRISAT network						
314	E. Africa	Kenya	ICSV 112	CSV 13		1988			ICRISAT bred						
315	E. Africa	Kenya		IS 8193		1993			ICRISAT network						
316	E. Africa	Kenya	KAT 83/369	KARI/MTAMA 1 (KAT 369)		1994			ICRISAT bred						
317	E. Africa	Kenya	PGRC/E16740	KARI/MTAMA 3		2001									
318	E. Africa	Kenya	IS 8193	KARI/MTAMA 2		2001			ICRISAT network						
319	E. Africa	Kenya		Dobb Bora					Others (1960s)						
320	S. Africa	Malawi		PN 3		1983			USA						
321	S. Africa	Malawi	ICSV 1	Pirira 1 (Syn: SPV 351, ICSV 1)	(SC 108-3 x CS 3541) 19-1	1993			ICRISAT bred						
322	S. Africa	Malawi	ICSV 112	Pirira 2 (Syn: SPV 475, ICSV 112, SV1)	[(IS 12622C x 555) x (IS 3612C x 2219B)-1 x E 35-1] 5-2	1993			ICRISAT bred						Originated in India
323	W. Africa	Mali	Malisor - 1	Malisor - 1		1987									
324	W. Africa	Mali	Malisor - 4	Malisor - 4		1987									
325	W. Africa	Mali	Malisor - 5	Malisor - 5		1987									
326	W. Africa	Mali	Malisor - 7	Malisor - 7		1987									
327	W. Africa	Mali	ICSV 1079	ICSV 1079 BF		1993									
328	W. Africa	Mali		ICSV 1063		1991									
329	W. Africa	Mali		ICSV 1095		1991									

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
330	W. Africa	Mali	ICSV 1063 BF	ICSV 1063 BF		1993									Originated in Burkina Faso
331	W. Africa	Mali	ICSV 401	ICSV 401		1994									
332	W. Africa	Mali	CSM 335	Tieble		2001									
333	W. Africa	Mali	CSM 485	Kossa		2001									
334	W. Africa	Mali	CSM 660	Ngolofing		2001									
335	W. Africa	Mali	Nazongola Anthocyane	Nazomble		2001									
336	W. Africa	Mali	Nazongola Tan	Nazondje		2001									
337	W. Africa	Mali	IS 15401	Soumalemba		2001									
338	W. Africa	Mali	(Pedigree : 87-38 * 57-)	Marakanio		2001									
339	W. Africa	Mali	CIRAD 406	Soumba		2001									
340	W. Africa	Mali	ICSV 1079 BF	Yagare		2001									Originated in Burkina Faso
341	N.America	Mexico	ICSV 112	UANL-1-187		1987			ICRISAT bred						
342	N.America	Mexico	M 90362	UANL-1-287		1987			ICRISAT bred						
343	N.America	Mexico	M 62641	COSTENO 201	(SC 108-3 x CS 3541) x E15 - 5	1989			ICRISAT network						
344	N.America	Mexico	ICSV 112	PACIFICO 301		1990			ICRISAT network						
345	N.America	Mexico	M 91057	ISTMENO (ICTA C-25)	(GPR 148 x E 35 - 1)	1991			ICRISAT bred						
346	N. America	Mexico	Valles Altos			1978									
347	N.America	Mexico	PP 290	Perlita		1991			ICRISAT network						
348	N.America	Mexico		VARIADAD 110		1998			ICRISAT bred						
349	N.America	Mexico	ICSV LM 89510	BLANCO 86		1986			ICRISAT network						
350	N.America	Mexico	M 90812	Tropical 401	IS 12611 x (BULK 'Y' x GPR 165)	1991			ICRISAT bred						
351	N.America	Mexico		Valles Altos 110		1978									

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
352	N.America	Mexico	IS 9468	Maravilla, No. SOF-043-201092		2000			ICRISAT bred						
353	E.Africa	Mozambique	SDS 3220	Macia	F3A-115-2 (Syn: M91057, SDS 3220)	1989			ICRISAT bred						Originated in Zimbabwe
354	E.Africa	Mozambique	IS 8571	Mamonhe		1989			ICRISAT network						Originated in Zimbabwe
355	E.Africa	Mozambique	ICSV 112	Chokwe	Selection from SV1 (Syn: SPV 475, ICSV 112)	1993			ICRISAT bred						Originated in India
356	Asia	Myanmar	IS 8965	Shwe Ni 1		1980			ICRISAT network						Originated in Kenya
357	Asia	Myanmar	IS 2940	Shwe Ni 2		1981			ICRISAT network						Originated in USA
358	Asia	Myanmar		Shwe Ni 3	CS 99	1979									
359	Asia	Myanmar		Shwe Ni 4	UPLB Scr 5	1979									
360	Asia	Myanmar		Shwe Ni 5	D-67-4	1979									
361	Asia	Myanmar		Shwe Ni 6	CS 102	1980									
362	Asia	Myanmar		Shwe Ni 7	CS 103	1980									
363	Asia	Myanmar		Shwe Ni 8	IS 5424	1980			ICRISAT network						
364	Asia	Myanmar		Shwe Ni 9	—	1980									
365	Asia	Myanmar		Shwe Ni 10	IS 302	1980			ICRISAT network						
366	Asia	Myanmar		Shwe Ni 11	CS 105	1982									
367	Asia	Myanmar		Shwe Ni 12	—	1982									
368	Asia	Myanmar		Shwe Ni 13	COSOK 3	1982									
369	Asia	Myanmar		Shwe Ni 14	498003	1982									
370	Asia	Myanmar	M 90906	Yezin White Grain 1	M 90906	1984			ICRISAT bred						
371	Asia	Myanmar	M 36248	Yezin White Grain 2	M 36248	1984			ICRISAT bred						
372	Asia	Myanmar	M 36335	Yezin White Grain 3	M 36335	1984			ICRISAT bred						
373	Asia	Myanmar	M 36172	Yezin White Grain 4	M 36172	1984			ICRISAT bred						

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
374	Asia	Myanmar	ICSV 804	Yezin White Grain 5	(ICSV 197 x SPV 351) -3-1-1-1-1	1996			ICRISAT bred						
375	Asia	Myanmar	ICSV 735	Yezin White Grain 6	(ICSV 197 x SPV 351) -9-1-1-2-6	1996			ICRISAT bred						
376	Asia	Myanmar	ICSV 758	Yezin White Grain 7	(ICSV 197 x A 13108) -1-2-1-1-1	1996			ICRISAT bred						
377	S.Africa	Namibia	SDS 3220	Macia	F3A-115-2 (Syn: M91057, SDS 3220)	1998			ICRISAT bred						
378	C.America	Nicaragua	Sepon 77	Nica-sor (T43)		1985			ICRISAT network						
379	C.America	Nicaragua	ICSV 112	Pinolero 1		1990			ICRISAT bred						
380	W. Africa	Niger	M 90038	Sepon 82		1993			ICRISAT bred						
381	W. Africa	Niger	ICSV 1007 BF	SRN 39		1993			ICRISAT bred						
382	W. Africa	Nigeria	ICSH 89002NG	ICSH 89002NG (ICSA38 x ICSV 247)		1995			ICRISAT bred						Originated in Nigeria
383	W. Africa	Nigeria	ICSH 89009NG	ICSH 89009NG (ICSA 39 x MR906)		1995			ICRISAT bred						Originated in Nigeria
384	W. Africa	Nigeria	ICSV 111	ICSV 111		1995			ICRISAT bred						
385	W. Africa	Nigeria	ICSV 400	ICSV 400		1997			ICRISAT bred (1995)						
386	W. Africa	Nigeria	NR 71176	NR 71176		1997			ICRISAT bred						
387	W. Africa	Nigeria	NR 71182	NR 71182		1997			ICRISAT bred						
388	W.Africa	Nigeria	NSSH 91001	NSSH 91001		1997			ICRISAT bred						
389	W.Africa	Nigeria	NSSH 91002	NSSH 91002		1997			ICRISAT bred (1995)						
390	Asia	Pakistan		D.G. Pearl	Local line	1967									
391	Asia	Pakistan		Red Janpur	Local pure line	1967									
392	Asia	Pakistan		DS 75	No. 954125, Purdue Univ., USA	1975									

...continued

Appendix I. *Continued*

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
393	Asia	Pakistan		Pak SS II	Entry No. 78447, Purdue Univ., USA	1976									
394	Asia	Pakistan		Sarokarthuho	Local pure line	1978									
395	Asia	Pakistan		Jowar 86	JS-1 x 7078 (BR 307)	1986									
396	Asia	Pakistan	ICSV 107	PARC-SS 1	(SC 108-3 x CSV 4)-19-1	1991									
397	Asia	Pakistan	IRAT 408	PARC-SS 2		1991									
398	Asia	Pakistan		Bagdar	Local pure line	—									
399	Asia	Pakistan		PARC SH 1	CSH 6	Candidate			ICRISAT network						
400	Asia	Pakistan		PARC SS 1	ICSV 107	Candidate			ICRISAT bred						
401	Asia	Pakistan		PARC SS 2	IRAT 204	Candidate			IDC						
402	Asia	Pakistan		PARC SV 1	ICSV 107 x Red Janpur	Candidate			ICRISAT parent						
403	C. America	Panama		Alanje Blanquito		1991			IDC						
404	S. America	Paraguay	ISIAP DORADO	DORADO					IDC						
405	Asia	Phillipines	ICSV 120	IES Sor 1	PSB SG 93-20	1993			ICRISAT bred						
406	Asia	Phillipines	PSB Sg 94-02	IES Sor 4		1994			ICRISAT network						
407	C. Africa	Rwanda		5Dx160		1980			ICRISAT network						
408	C. Africa	Rwanda		1Kinyamka		1980			ICRISAT network						
409	C. Africa	Rwanda	IS 25395			2001			ICRISAT network						
410	C. Africa	Rwanda	IS 21219			2001			ICRISAT network						
411	C. Africa	Rwanda	IS 8193			2001									
412	W. Africa	Senegal		IRAT 204		1980									
413	E. Africa	Somalia	IESV 92043 DL			2001									
414	E. Africa	Somalia	CR 35:5			2001									
415	E. Africa	Somalia	Gedam el Hammam			2001									
416	E. Africa	Sudan	HD1 (T * 623 A * K 1597 (Karper-1597))	Hageen Durra (HD-1)	AT x 623 x Karper - 1597	1983			ICRISAT bred						Originated in Sudan
417	E. Africa	Sudan	ICSV 1007 HV	Mugawim Buda 1 (SRN 39)		1991			ICRISAT bred						
418	E. Africa	Sudan	IS 9830	Mugawim Buda 2 (IS 9830)		1991			ICRISAT bred						

...continued

Appendix I. ***Continued***

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
419	E. Africa	Sudan	ICSV 1001 BF	Framida (SRN 39)		1991			ICRISAT bred						
420	E. Africa	Sudan	M 90393	INGAZI (M90393)	(GPR 148 x E35 - 1) x CS 3541	1992			ICRISAT bred						
421	E. Africa	Sudan	IS 13444	Arous el rimal		2000									
422	E. Africa	Sudan		F.W. Ahmed											
423	E. Africa	Sudan		Sheikan											
424	E. Africa	Sudan		Tabat											
425	E. Africa	Sudan		Rabbih											
426	S. Africa	Swaziland	SDSV 1513	MRS 13	IS 2391 (Syn: SDS 1513)	1989			ICRISAT bred						
427	S. Africa	Swaziland	SDSV 1594-1	MRS 94	IS 3693 (Syn: SDS 1594)	1989			ICRISAT bred						
428	S. Africa	Swaziland	ICSV 112	MRS 12	Selection from SV1 (Syn: SPV 475, ICSV 112)	1992			ICRISAT bred						
429	E. Africa	Tanzania		Lulu Tall		1971			Tanzania						
430	E. Africa	Tanzania		Lulu Dwarf		1971			Tanzania						
431	E. Africa	Tanzania		Serena		1976			Tanzania						
432	E. Africa	Tanzania	2KX 17/B/1	Tegemeo	2K x 17/B/1	1988			ICRISAT bred						
433	E. Africa	Tanzania	IS 23496 (syn: SDS 2293-6)	Pato	IS 23496 (Syn: SDS 2293-6	1995			ICRISAT network						
434	E. Africa	Tanzania	F3A-115-2 (Syn: M91057, SDS 3220)	Macia	SDS 3220	1999			ICRISAT bred						
435	E. Africa	Tanzania		Dobs Bora		1960s			Tanzania						
436	Asia	Thailand		Early Hegari	Introduced variety	1963					2.0-2.5		Grain		
437	Asia	Thailand		Late Hegari	Introduced variety	1963					1.2-3.7		Grain		
438	Asia	Thailand		U-Thong 1	Ce 151.262.A1P1A1	1982					3.0-4.0		Grain		
439	Asia	Thailand		Suphan Buri 60	U-Thong 1 x SW 240	1987					2.5-3.0		Grain		
440	Asia	Thailand		Suphan Buri 1	M 91019 x WAE	1996			ICRISAT parent		3.0	39	Dual		
441	Asia	Thailand		KU 9501	KU 9410A x KU 804	1994					4.6		Grain		
442	Asia	Thailand		KU 9502	KU 9402 x KU 630	1994					4.6		Grain		
443	W.Africa	Togo	ICSV 1001 BF	Framida		1986			ICRISAT bred						

...continued

Appendix I. *Continued*

Sl. No.	Region	Country	IC name	Release name of the cultivar	Pedigree	Year of release	Notification No. and date	Company name	Classification	Season	Yield (t/ha)	Fodder yield (q ha-1)	Purpose of release	Type	Remarks
444	W. Africa	Togo	SEPON 82 x S 34	SORVATO 1		1998									
445	W. Africa	Togo	Framida x S 34	SORVATO 28		1998									
446	E. Africa	Uganda		Hibred		1966			Others						
447	E. Africa	Uganda		Hijack		1967			Others						
448	E. Africa	Uganda		Lulu D		1972			Others						
449	E. Africa	Uganda		Lulu T		1972			Others						
450	E. Africa	Uganda		Himidi		1972			Others						
451	E. Africa	Uganda		SEREDO		1980			ICRISAT Network			450			
452	E. Africa	Uganda		Sekedo		1995			Others						
453	E. Africa	Uganda	Tegemeo	Epuripur		1995			Others						
454	E. Africa	Uganda		Dobbs		1960s			Others						
455	E. Africa	Uganda		Serena		1966/67			Others						
456	S. Africa	Zambia	ICSV 2	ZSV 1 (SPV 386)	SC 108-4-8 x CSV 4	1983			ICRISAT bred						
457	S. Africa	Zambia	ICRISAT line	WSH 287	F1 Hybrid	1987			ICRISAT network						Hybrid
458	S. Africa	Zambia	WSV 387	KUYUMA (MR4/4606T11),	MR4/4606T11 (Syn: WSV387, SDS 3136-2)	1989			ICRISAT network						
460	S. Africa	Zambia	WSV 187	SIMA (IS 23520)		1989			ICRISAT network						
461	S. Africa	Zambia	ICRISAT line [ICSA 104 (SPL 177A)]	MMSH 413	F1 Hybrid	1990			ICRISAT network						
462	S. Africa	Zambia		MMSH 375	F1 Hybrid	1990			ICRISAT network						
463	S. Africa	Zambia	IPA-47-38-2-C8203 (Syn:SDS 3136-2)	ZSV 12	IPA-47-38-2-C8203	1995			ICRISAT bred						
464	S. Africa	Zambia		FSH 22		1995			Zambia						
465	S. Africa	Zambia		Framida		1960s			Others						
466	S.Africa	Zimbabwe	ICSV 112	SV 1	[(IS 12622 (x 555) x (IS 3612C x 2219B) 5-1 x E-35-1]5-2	1985			ICRISAT bred						
467	S.Africa	Zimbabwe	ICSV 88060	SV 2	(IS 24704 x IS 10558) -1-3-BWK-2-BK-BK (Syn: A6460, ICSV 88060)	1987			ICRISAT bred						
468	S.Africa	Zimbabwe		ZWSH 1	F1 Hybrid	1992			Zimbabwe						
469	S.Africa	Zimbabwe	SDS 3220	Macia (M91057/ SDS 3220)	F3A-115-2	1998			ICRISAT bred						
470	S.Africa	Zimbabwe		SV 3 (NL 499)	43-1-1-2 (Upper Volta) x 10 CR-2-2 (Syn: NL 499)	1998			ICRISAT bred						
471	S.Africa	Zimbabwe		SV 4 (NL 330)	9/97 x MR844-1-1 (Syn: NL 330)	1998			ICRISAT bred						

Appendix II. List of improved sorghum cultivars (varieties and hybrids) available in the USA in 2002.

Name of the cultivar	Company name	Remarks
2140	AgriPro Seeds	
2233	AgriPro Seeds	
2440	AgriPro Seeds	
2468	AgriPro Seeds	
2660	AgriPro Seeds	
2731	AgriPro Seeds	
2800	AgriPro Seeds	
2838	AgriPro Seeds	
2949	AgriPro Seeds	
9135	AgriPro Seeds	
9210	AgriPro Seeds	
9850	AgriPro Seeds	
Cherokee	AgriPro Seeds	
Honcho	AgriPro Seeds	
Wings	AgriPro Seeds	
A201	Asgrow	
A298	Asgrow	
A459	Asgrow	
A504	Asgrow	
A570	Asgrow	
A571	Asgrow	
A581	Asgrow	
A603	Asgrow	
A603(1)	Asgrow	
LASER	Asgrow	
MISSILE	Asgrow	
SANECA	Asgrow	
576	Cargill	
606	Cargill	
627	Cargill	
697	Cargill	
737	Cargill	
770Y	Cargill	
775Y	Cargill	
TR 440	CropLan Genetics	
380	Crosbyton Seed Co.	
1489	Crosbyton Seed Co.	
5050	Crosbyton Seed Co.	
5914	Crosbyton Seed Co.	
6035	Crosbyton Seed Co.	
6080	Crosbyton Seed Co.	
6092	Crosbyton Seed Co.	
7031	Crosbyton Seed Co.	
7050	Crosbyton Seed Co.	
8060	Crosbyton Seed Co.	
8080	Crosbyton Seed Co.	
9080	Crosbyton Seed Co.	
4 Row Y	Crosbyton Seed Co.	
6 Row GBT	Crosbyton Seed Co.	
6 Row R	Crosbyton Seed Co.	

...continued

Appendix II. *Continued*

Name of the cultivar	Company name	Remarks
6 Row Y	Crosbyton Seed Co.	
DK28E	DEKALB	
DK36	DEKALB	
DK38Y	DEKALB	
DK39Y	DEKALB	
DK40Y	DEKALB	
DK41Y	DEKALB	
DK43A	DEKALB	
DK44	DEKALB	
DK45	DEKALB	
DK47	DEKALB	
DK53	DEKALB	
DK54	DEKALB	
DK55	DEKALB	
DK56	DEKALB	
DK65	DEKALB	
DK66	DEKALB	
734	Douglass King	
765	Douglass King	
751B	Dyna-Grow	
762B	Dyna-Grow	
780B	Dyna-Grow	
F-200E	Frontier Hybrids	
F-227E	Frontier Hybrids	
F-270E	Frontier Hybrids	
F-303C	Frontier Hybrids	
F-457E	Frontier Hybrids	
F-501E	Frontier Hybrids	
F647E	Frontier Hybrids	
F-700	Frontier Hybrids	
SG-677	Garrison & Townsend	
SG-753	Garrison & Townsend	
SG-822	Garrison & Townsend	
SG-925	Garrison & Townsend	
SG-94249	Garrison & Townsend	
SG-95207	Garrison & Townsend	
SG-95392	Garrison & Townsend	
SG-95512	Garrison & Townsend	
SG-96258	Garrison & Townsend	
SG-96275	Garrison & Townsend	
SG-97157	Garrison & Townsend	
5319	Garst Seed	
5429	Garst Seed	
5440	Garst Seed	
5503	Garst Seed	
5515	Garst Seed	
5616	Garst Seed	
5664	Garst Seed	
5715	Garst Seed	

...continued

Appendix II. ***Continued***

Name of the cultivar	Company name	Remarks
5727	Garst Seed	
5522Y	Garst Seed	
5631Y	Garst Seed	
411	Golden Acres Genetics	Mycogen list included this
1482	Golden Acres Genetics	Mycogen list included this
1506	Golden Acres Genetics	Mycogen list included this
1552	Golden Acres Genetics	Mycogen list included this
3300	Golden Acres Genetics	
3595	Golden Acres Genetics	Mycogen list included this
3636	Golden Acres Genetics	Mycogen list included this
3694	Golden Acres Genetics	Mycogen list included this
3696	Golden Acres Genetics	Mycogen list included this
3700	Golden Acres Genetics	Mycogen list included this
1498E	Golden Acres Genetics	Mycogen list included this
444E	Golden Acres Genetics	Mycogen list included this
522 DR	Golden Acres Genetics	Mycogen list included this
M 3838	Golden Acres Genetics	Mycogen list included this
ORO ALPHA	Golden Acres Genetics	Mycogen list included this
ORO G XTRA	Golden Acres Genetics	Mycogen list included this
ORO XTRA	Golden Acres Genetics	Mycogen list included this
T-E PROSPER	Golden Acres Genetics	Mycogen list included this
T-E-EDEN	Golden Acres Genetics	Mycogen list included this
T-E-Y-101G	Golden Acres Genetics	Mycogen list included this
T-E-Y-75	Golden Acres Genetics	Mycogen list included this
H-296W	Golden Harvest	
H-388W	Golden Harvest	
H-390W	Golden Harvest	
H-393	Golden Harvest	
H-403	Golden Harvest	
H-403Y	Golden Harvest	
H-430Y	Golden Harvest	
H-471	Golden Harvest	
H-483	Golden Harvest	
H-495W	Golden Harvest	
H-499Y	Golden Harvest	
H-502	Golden Harvest	
H-505BW	Golden Harvest	
H-512	Golden Harvest	
411	Mycogen	
1482	Mycogen	
1506	Mycogen	
1552	Mycogen	
3595	Mycogen	
3636	Mycogen	
3694	Mycogen	
3696	Mycogen	
3700	Mycogen	
1498E	Mycogen	
444E	Mycogen	
522 DR	Mycogen	

...continued

Appendix II. ***Continued***

Name of the cultivar	Company name	Remarks
M 3838	Mycogen	
ORO ALPHA	Mycogen	
ORO G XTRA	Mycogen	
ORO XTRA	Mycogen	
T-E PROSPER	Mycogen	
T-E-EDEN	Mycogen	
T-E-Y-101G	Mycogen	
T-E-Y-75	Mycogen	
NC+262	NC+ Hybrids	
NC+271	NC+ Hybrids	
NC+371	NC+ Hybrids	
NC+4R48	NC+ Hybrids	
NC+5B74E	NC+ Hybrids	
NC+5B89	NC+ Hybrids	
NC+5C35	NC+ Hybrids	
NC+6B50	NC+ Hybrids	
NC+6B67	NC+ Hybrids	
NC+6B70	NC+ Hybrids	
NC+6C21	NC+ Hybrids	
NC+6C69	NC+ Hybrids	
NC+6R21	NC+ Hybrids	
NC+6R30	NC+ Hybrids	
NC+7B29	NC+ Hybrids	
NC+7B47	NC+ Hybrids	
NC+7C49	NC+ Hybrids	
NC+7R37E	NC+ Hybrids	
NC+7R83	NC+ Hybrids	
NC+7W97	NC+ Hybrids	
NC+7Y57-K	NC+ Hybrids	
NC+8R18	NC+ Hybrids	
NC+Y363	NC+ Hybrids	
Northrup King K73-J6	Northrup King	
251	Novartis	
2030	Novartis	
8310	Novartis	
8414	Novartis	
8500	Novartis	
8505	Novartis	
8699	Novartis	
8875	Novartis	
8925	Novartis	
8950	Novartis	
8212Y	Novartis	
83G66	Novartis	
84G62	Novartis	
84G82	Novartis	
8522Y	Novartis	
85G85	Novartis	
85Y34	Novartis	

...continued

Appendix II. ***Continued***

Name of the cultivar	Company name	Remarks
86G71	Novartis	
87G57	Novartis	
K35-Y5	Novartis	
KS310	Novartis	
8310	Pioneer	
8414	Pioneer	
8500	Pioneer	
8505	Pioneer	
8699	Pioneer	
8875	Pioneer	
8925	Pioneer	
8950	Pioneer	
8212Y	Pioneer	
83G66	Pioneer	
84G62	Pioneer	
84G82	Pioneer	
8522Y	Pioneer	
85G85	Pioneer	
85Y34	Pioneer	
86G71	Pioneer	
87G57	Pioneer	
82G63	Pioneer	
PS 233	Pogue	
PP 333	Production Plus	
PP 599W	Production Plus	
PP 644	Production Plus	
PP 777	Production Plus	
PP 799E	Production Plus	
9300	Richardson Seeds	
9322	Richardson Seeds	
202CR	Richardson Seeds	
9200Y	Richardson Seeds	
9200Y	Richardson Seeds	
9212Y	Richardson Seeds	
DASHE	Richardson Seeds	
JOWAR-1	Richardson Seeds	
RS200E	Richardson Seeds	
RS225	Richardson Seeds	
RS250E	Richardson Seeds	
SPRINT E	Richardson Seeds	
SPRINT II	Richardson Seeds	
251	Sorghum Partners	
2030	Sorghum Partners	
K35-Y5	Sorghum Partners	
K59-Y2	Sorghum Partners	
KS310	Sorghum Partners	
KS524	Sorghum Partners	
KS560Y	Sorghum Partners	
KS585	Sorghum Partners	
KS710	Sorghum Partners	

...continued

Appendix II. ***Continued***

Name of the cultivar	Company name	Remarks
800	Southern States	
TV1050	Terral	
TV9421	Terral	
TS 489	Texas Seed	
TR430	Triumph	
TR432	Triumph	
TR438	Triumph	
TR445	Triumph	
TR447	Triumph	
TR459	Triumph	
TR461	Triumph	
TR462	Triumph	
TR464	Triumph	
TR474	Triumph	
TR481	Triumph	
TR60G	Triumph	
TR65G	Triumph	
TR82G	Triumph	
Two 80-D	Triumph	
DG 730B	UAP Seed	
DG 740C	UAP Seed	
DG 752B	UAP Seed	
DG 760C	UAP Seed	
DG 762B	UAP Seed	
DG 780B	UAP Seed	
DALE(1970)	USDA-ARS & MAFES	
M81-E(1981)	USDA-ARS, MAFES, and the Experiment Stations of Alabama, Florida and Georgia, Kentucky, and South Carolina	
THEIS(1974)	USDA-ARS, MAFES, and the Experiment Stations of Alabama, Florida and Georgia	
Topper 76-6(1994)	USDA-ARS, MAFES, and the University of Georgia	
W-494	Warner Seeds	
W-528W	Warner Seeds	
W-560T	Warner Seeds	
W-588Y	Warner Seeds	
W-614-W	Warner Seeds	
W-622E	Warner Seeds	
W-624-Y	Warner Seeds	
W-625Y	Warner Seeds	
W-632W	Warner Seeds	
W-644E	Warner Seeds	
W-664T	Warner Seeds	
W-816-E	Warner Seeds	
W-818E	Warner Seeds	
W-839-DR	Warner Seeds	
W-844E	Warner Seeds	
W-851DR	Warner Seeds	
W-858E	Warner Seeds	
W-876-DR	Warner Seeds	
W-902W	Warner Seeds	
W-965E	Warner Seeds	

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Research Evaluation and Impact Assessment (REIA) Project

Sorghum Research Impacts Questionnaire

for Public National Agricultural Research Systems
Global Sorghum Cultivar Releases, 1972-1997.

Country:

Respondent:

Name:

Organization:

Position:

Address:

The following information is being collected as part of a Joint NARS-ICRISAT study which will quantify the global impact of sorghum research activities by National Agricultural Research Systems and ICRISAT. It also aims to create, and periodically update, a comprehensive database of public sorghum varieties and hybrids released by public NARSs since 1972.

This questionnaire focuses on the following areas:

1) Sorghum varieties and hybrids released by NARS from 1972 to 1997
2) Area planted to different sorghum varieties and hybrids
3) Sorghum research effort

Please return this questionnaire to:

Dr. MCS Bantilan, Research Evaluation and Impact Assessment (REIA) Project, ICRISAT, Patancheru -502 324, AP, India.

Part I. Public sorghum cultivars (varieties and hybrids) released during the period 1972-1997.

(If the full list of releases is unavailable, please give information for as many years as available. Information on public releases before 1972 and on private sector releases is optional.)

Name of the cultivar released	Year of release	Name of source germplasm	Origin (Code A)	Type of cultivar (Code B)	Ecological niche (Code C)	Commercial success (Code D)	Grain color (Code E)	Insect resistance (Code F)	Disease resistance (Code G)	Reasons for release/ cultivation(Code H)
e.g. CSV 13	1988	ICSV 112	4	1	1	1	1	2	2	1

Code A. ***(Origin code):*** 1 = Public material, contains no ICRISAT germplasm; 2 = Public material, contains some ICRISAT germplasm; 3 = Public material, contains substantial ICRISAT germplasm; 4 = Public material, contains 100% ICRISAT germplasm; 5 = Private (proprietary) hybrid, contains no ICRISAT germplasm; 6 = Private (proprietary) hybrid, contains some ICRISAT germplasm. **Code B**. ***(Type of cultivar):*** 1 = Open pollinated variety (OPV); 2 = Conventional hybrid; 3 = Non-conventional hybrid; 4 = Others (please specify). **Code C**. ***(Ecological niche):*** 1 = Moist semi-arid tropics; 2 = Dry semi-arid tropics; 3 = Humid tropics; 4 = Sub-humid tropics; 5 = Others. **Code D.** ***(Commercial success):*** 1 = Yes (covered at least 5% of total national sorghum area, or 25,000 ha in 1995 or before); 2 = No (did not meet criterion in 1). **Code E**. ***(Grain color):*** 1 = White; 2 = Yellow; 3 = Red; 4 = Brown; 5 = Buff; 6= Other color (specify). **Code F**. ***(Insect resistance):*** 1 = Resistant; 2 = Moderately resistant; 3 = Susceptible; 5 = Severely susceptible. **Code G**. ***(Disease resistance)***: 1 = Resistant; 2 = Moderately resistant; 3 = Susceptible; 4 = Severely susceptible. **Code H**. ***(Reasons for release/cultivation):*** 1 = Grain purpose; 2 = Forage purpose; 3 = Dual purpose; 4 = Other purposes (please specify).

Part I. Public sorghum cultivars (varieties and hybrids) released during the period 1972-1997. (Contd.)

(If full list of releases is unavailable, please give information for as many years as available. Information on public releases before 1972, and also on private sector releases is optional.)

Name of the cultivar released	Year of release	Name of source germplasm	Origin (Code A)	Type of cultivar (Code B)	Ecological niche (Code C)	Commercial success (Code D)	Grain color (Code E)	Insect resistance (Code F)	Disease resistance (Code G)	Reasons for release/ cultivation(Code H)
e.g. CSV 13	1988	ICSV 112	4	1	1	1	1	2	2	1

Code A. ***(Origin code):*** 1 = Public material, contains no ICRISAT germplasm; 2 = Public material, contains some ICRISAT germplasm; 3 = Public material, contains substantial ICRISAT germplasm; 4 = Public material, contains 100% ICRISAT germplasm; 5 = Private (proprietary) hybrid, contains no ICRISAT germplasm; 6 = Private (proprietary) hybrid, contains some ICRISAT germplasm. **Code B**. ***(Type of cultivar):*** 1 = Open pollinated variety (OPV); 2 = Conventional hybrid; 3 = Non-conventional hybrid; 4 = Others (please specify). **Code C**. ***(Ecological niche):*** 1 = Moist semi-arid tropics; 2 = Dry semi-arid tropics; 3 = Humid tropics; 4 = Sub-humid tropics; 5 = Others. **Code D.** ***(Commercial success):*** 1 = Yes (covered at least 5% of total national sorghum area, or 25,000 ha in 1995 or before); 2 = No (did not meet criterion in 1). **Code E**. ***(Grain color):*** 1 = White; 2 = Yellow; 3 = Red; 4 = Brown; 5 = Buff; 6= Other color (specify). **Code F**. ***(Insect resistance):*** 1 = Resistant; 2 = Moderately resistant; 3 = Susceptible; 5 = Severely susceptible. **Code G**. ***(Disease resistance)***: 1 = Resistant; 2 = Moderately resistant; 3 = Susceptible; 4 = Severely susceptible. **Code H**. ***(Reasons for release/cultivation):*** 1 = Grain purpose; 2 = Forage purpose; 3 = Dual purpose; 4 = Other purposes (please specify).

Part II. Status of Sorghum Cultivation in the country.

Summary of national sorghum area under different types of materials in different years.

Year of reference	Type of material	Total area planted (hectares)	Percent of national sorghum area
1975-76	Hybrids		%
	Improved open pollinated varieties		%
	Local varieties		%
	TOTAL		100 %
1980-81	Hybrids		%
	Improved open pollinated varieties		%
	Local varieties		%
	TOTAL		100 %
1985-86	Hybrids		%
	Improved open pollinated varieties		%
	Local varieties		%
	TOTAL		100 %
1990-91	Hybrids		%
	Improved open pollinated varieties		%
	Local varieties		%
	TOTAL		100 %
1995-96 ***or***	Hybrids		%
most recent year	Improved open pollinated varieties		%
	Local varieties		%
	TOTAL		100 %

Source of above estimates (check one or more):

Official statistics _____ Seed sales _____

Breeders' estimates _____ Farm surveys _____

Other (specify) _____

Part III. Percent area planted to major sorghum varieties and hybrids in different crop years.
(Please make sure that all listed varieties in this section are also included in section I. Also, if necessary, please fill in the bottom part of this table so that the total sorghum area reported adds up to the national sorghum area in the country.)

Crop year = 1975-76

Name of material	Total area planted to this variety or hybrid (Thousand ha)	Percent of national sorghum area planted to this variety or hybrid	Yield level (kg/ha) at the experimental field	Yield level (kg/ha) at the farmers' field	Remarks (varieties replaced)
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
Other public varieties (OPVs)		%			
Other public hybrids		%			
Other proprietary hybrids		%			
Local varieties		%			
TOTAL		100%			

Part III. Percent area planted to major sorghum varieties and hybrids in different crop years.
(Please make sure that all listed varieties in this section are also included in section I. Also, if necessary, please fill in the bottom part of this table so that the total sorghum area reported adds up to the national sorghum area in the country.)

Crop year = 1980-81

Name of material	Total area planted to this variety or hybrid (Thousand ha)	Percent of national sorghum area planted to this variety or hybrid	Yield level (kg/ha) at the experimental field	Yield level (kg/ha) at the farmers' field	Remarks (varieties replaced)
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
Other public varieties (OPVs)		%			
Other public hybrids		%			
Other proprietary hybrids		%			
Local varieties		%			
TOTAL		100%			

Part III. Percent area planted to major sorghum varieties and hybrids in different crop years.
(Please make sure that all listed varieties in this section are also included in section I. Also, if necessary, please fill in the bottom part of this table so that the total sorghum area reported adds up to the national sorghum area in the country.)

Crop year = 1985-86

Name of material	Total area planted to this variety or hybrid (Thousand ha)	Percent of national sorghum area planted to this variety or hybrid	Yield level (kg/ha) at the experimental field	Yield level (kg/ha) at the farmers' field	Remarks (Varieties Replaced)
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
Other public varieties (OPVs)		%			
Other public hybrids		%			
Other proprietary hybrids		%			
Local varieties		%			
TOTAL		100%			

Part III. Percent area planted to major sorghum varieties and hybrids in different crop years.
(Please make sure that all listed varieties in this section are also included in section I. Also, if necessary, please fill in the bottom part of this table so that the total sorghum area reported adds up to the national sorghum area in the country.)

Crop year = 1990-91

Name of material	Total area planted to this variety or hybrid (Thousand ha)	Percent of national sorghum area planted to this variety or hybrid	Yield level (kg/ha) at the experimental field	Yield level (kg/ha) at the farmers' field	Remarks (varieties replaced)
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
Other public varieties (OPVs)		%			
Other public hybrids		%			
Other proprietary hybrids		%			
Local varieties		%			
TOTAL		100%			

Part III. Percent area planted to major sorghum varieties and hybrids in different crop years.
(Please make sure that all listed varieties in this section are also included in section I. Also, if necessary, please fill in the bottom part of this table so that the total sorghum area reported adds up to the national sorghum area in the country.)

Crop year = 1995-96 *or most recent year for which data is available*

Name of material	Total area planted to this variety or hybrid (Thousand ha)	Percent of national sorghum area planted to this variety or hybrid	Yield level (kg/ha) at the experimental field	Yield level (kg/ha) at the farmers' field	Remarks (varieties replaced)
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
		%			
Other public varieties (OPVs)		%			
Other public hybrids		%			
Other proprietary hybrids		%			
Local varieties		%			
TOTAL		100%			

Q. What factors are responsible for the differences between on-station and on-farm yield level? Please mention the percent contribution of different components to the total yield gap.

Part IV. Sorghum research effort (Give data for most recent year available.)
Reference Year = 199_

1. Number of full-time equivalent scientists working on developing improved sorghum varieties in the public sector.

	Breeders	Agronomists	Seed technologist	Other*	Total
B.Sc.					
M.Sc.					
Ph.D.					
Other					
TOTAL					

* Other disciplines that support varietal improvement, such as pathologists, entomologists, social scientists, etc.

2. Number of sorghum seed companies operating in the country:

Government or parastatal seed company _____

Private sector - international company _____

Private sector - national (domestic) company _____

3. Approximate number of sorghum scientists in the private sector working on:

Crop improvement research _____

Varietal testing _____

Seed production only _____