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West and Central Africa Sorgum Research Network

(WCASRN)

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Semi-Arid Food Grain Research and Development

International Crops Research Institute for the Semi-Arid Tropics
West African Sorghum Improvement Program
B.P. 320, Bamako
MALI

CONTENTS

INTRODUCTION

Program Description and Objectives

The West and Central Africa Sorghun Research Network (WCASRN) comprises of 17 member countries : Benin, Burkina Faso, Cameroun Central African Republic, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Tchad, and Togo. Through the SAFGRAD/ICRISAT Grant No.698-0452-G-00-6023 the WCASRN addresses itself to the sorghum improvement problems of West Africa on a regional basis, concentrating on prodution constraints of significance to the 17 member countries. In addition to solving sorghum production problems, phase 2 of the WCASRN, which was begun in 1986, stresses training as an important and integral part of its activites. Most of the 17 countries in the Network have weak research programs in sorghum. Thus, the overall theme in the set of Network objectives is to strengthen the sorghum research capabilities of the national agricultural research systems (NARS).

The objectives of the WCASRN are :

- to increase the production of sorghum thereby contributing to the stabilization of food supplies in the region and contributing to improved nutrition and income for farmers in the drier areas of the region;
- to assist and strengthen national sorghum improvement programs, and contribute to their research needs in all agroecological semi-arid zones;
- to develop improved varieties and hybrids and agronomic/management practices capable of giving higher and more stable economic yields in the semi-arid environments;
- to facilitate the development of agricultural research manpower among West Africa nationals at all levels;
- to organize regional workshops and monitor uniform yields through field inspections.

Scope of the Report

This report consists of two sections covering activities of the Network between June 1988 and may 1989. The first section contains results from regional trials and nurseries, and brief information on the third general workshop, and on the fourth and fifth steering committee meetings. Some difficulties encountered and future work plans are presented in section two.

SECTION I

Regional Trials and Nurseries (1988).

. **West African Sorghum Variety Adaptation Trial (WASVAT).** WASVAT early duration consisted of 20 entries and 14 sets were sent to seven countries. The 20 varieties were the same as for 1987 and entries included varieties from Cameroon, Ghana, Mali, senegal, and ICRISAT's West African Sorghum Improvement Program (WASIP). Results were received from 10 locations. The countries and locations from which results were received are given in Table 1. The varieties, their pedigree and source, and the results for grain yield are given in Tables 2 and 3. The variety Nagawhite had the highest mean yield (3530 kg ha^{-1}) of all 10 locations (Table 3). The overall mean days to 50% flowering ranged from 64 to 76 days.

WASVAT medium duration also consisted of the same 20 entries as in 1987, and 19 sets were sent to 15 countries. Varieties were contributed by Burkina Faso, Cameroon, Mali, Niger and ICRISAT-WASIP. Results were received from 11 locations. The countries and locations from which results were received are given in Table 1. The varieties, their pedigree and source, and the results for grain yield are given in Tables 4 and 5. The coefficients of variation were higher than 40% for five locations. Thus, only yield data for the remaining six locations are given in Table 5. The variety ICSV 1003 BF had the highest mean yield (3349 kg ha^{-1}) of all 11 locations. The overall mean days to 50% flowering ranged from 69 to 85 days.

. **West African Sorghum Hybrid Adaptation Trial (WASHAT).** WASHAT consisted of 20 entries and was grown at 12 locations in seven countries. The countries and locations from which results were received are given in Table 6. Results for grain yield from seven locations are given in Table 7. The hybrids ICSH 507 ranked first for mean yield (3315 kg ha^{-1}) of all seven locations, and exhibited consistent performance across locations. Overall mean time to 50% flowering ranged from 66 to 76 days.

. **West African Sorghum Disease Resistance Nursery (WASDRN).** This nursery contained the same 36 entries as in 1987 and was grown at seven locations in six countries. The objective of WASDRN is to identify stable resistance to the important leaf diseases of sorghum in West Africa. The leaf diseases, leaf anthracnose (*Colletotrichum graminicola*), sooty stripe (*Ramulispora sorghi*), and gray leaf spot (*Cercospora sorghi*) are important in West Africa. Three genotypes, 84 S 82, 84 S 103-3, and 84 S 130, had low levels of infection to these three leaf diseases at all seven locations (Table 8). Sooty stripe severity was very low, disease score of 3 or less in a 1-6 scale, at all locations except Bengou in Niger. Disease severity did not exceed 3.0 for any disease for all 36 genotypes in Ghana. Ghana is thus not included in Table 8. Table 9 contains listings of genotypes, other than the three genotypes in Table 8, that were resistant (disease score of 3 or less on the 1-6 scale) at all locations to each of the three leaf diseases.

. West African Sorghum Striga Trial (WASST).

This trial was organized for the first time at the request of several national programs. The trial consisted of 11 entries which had been tested by ICRISAT in fields with high Striga infestation and one local control. The trial was sent to Cameroon, Ghana, Mali, Niger, Nigeria, and Togo, and results were received from Cameroon, Ghana, and Mali. The results showed that IS 9830 and ICSV 1007 BF are promising lines for Striga resistance.

Third General Workshop

The third WCASRN Regional Workshop was held at Maroua, Cameroon, between September 19 to 23, 1988. The objectives of the workshop were :

- to discuss the results of sorghum research carried out in 1986 and 1987 in NARS, with emphasis on regional trials;
- to finalize entries of regional trials and nurseries for 1989 and 1990, and
- to select new Steering Committee members.

There were 52 participants and 14 out of 17 national programs were represented. Participants included representatives from SAFGRAD, IRAT/CIRAD, and ICRISAT Center.

Fourth and Fifth Steering Committee Meetings

The fourth meeting of the Steering Committee was held in Maroua, Cameroon on September 24, 1988, after the third general workshop. Present at the meeting were :

- C.E. Ohiagu, Nigeria (Chairman)
- M. Traoré, Mali (member)
- J. Clark, Niger (member)
- S. Da, Burkina Faso (member)
- O.P. Dangi, Cameroon (member)
- C. Luce, Senegal (member)
- K.V. Ramaiah, ICRISAT (Acting Coordinator)
- T. Bezuneh, SAFGRAD (observer)
- J. Chantereau, CIRAD/IRAT (observer)
- C.M. Pattanayak, ICRISAT (observer)
- W. Frolich, Ghana (observer)
- D. Yagoua, Tchad (observer)
- O. Ajayi, ICRISAT (observer)
- D.S. Murty, ICRISAT (observer)
- R. Tabo, ICRISAT (observer)
- A.M. Emechebe, SAFGRAD Oversight Committee (observer)

The meeting decided that in view of inadequate funds to network support, and the need to support weaker national programs, the Coordinator was requested to explore the possibility of transferring funds from underutilized line items to network support line item. The Committee suggested that the proceedings of the third general workshop should be dedicated to Dr. C.M. Pattanayak, former Coordinator.

The fifth Steering Committee meeting was hwld in Bamako, Mali between May 9 and 11, 1989. Present at the meeting were :

- M. Traoré, Mali (member)
- J. Clark, Niger (member)
- O.P. Dangi, Cameroon (member)
- C.C. Nwasike, Nigeria (member)
- K.V. Ramaiah, ICRISAT (Acting Coordinator)
- D. Dakouo, Burj\kina Faso (observer)
- A. Kere, INSAH (observer)
- T. Bezuneh, SAFGRAD (observer)
- J. Chantereau, CIRAD (observer)
- C. Martin, USAID (observer).

The Committee elected Dr. M. Traoré as the new chairman to replace C.E. Ohiagu, who had left the services of IAR, Samaru. The Committee decided to invite Tchad to replace Senegal as member and to invite Global 2000 to become an observer. Important issues at the meeting were as follows :

- the Acting Coordinator informed the Committee that he had presented a revised proposal to SPAAR in March 1989 regarding supplemental funding to strengthen NARS;

- in order to provide relevant training to national programs, selected African Universities and national research centers should be utilized in order to optimize available resources;

- in order to help weaker NARS fully participate in the Network, the Coordinator could use lead NARS scientists to visit weak NARS;

- the Coordinator was asked to promote the intensive evaluation of the selected varieties from the regional trials such as ICSV 1063 BF, CE 180-33, ICSV 111 IN (early), and ICSV 1063 BF, ICSV 1089 BF, and Mali Sor 84-1 (medium).

SECTION 2

Difficulties Encountered

- Funds for long-term training are inadequate;
- Delay in the receipt of field books of regional trials;
- translation and editing the proceedings of the third general workshop;
- high cost of producing hybrid seeds for the 1988 regional trials.

Future Work Plans

1. Five collaborative research projects will be initiated as follows :

   - Leaf anthracnose in Burkina Faso
   - Head bugs in Mali
   - Long smut in Niger
   - Striga in Cameroon
   - Industrial use (composite flour) in Nigeria.

   Each of the five national programs listed above will receive US $ 5,000 to start the project.

2. The next monitoring tour will be organized from 2 to 10th October, 1989, and Burkina Faso, Mali, and Niger will be visited.

3. A training workshop on agronomy and on-farm testing will be held in Bamako during the second half of September, 1989. Member countries not invited to participate in the monitoring tour will attend the training workshop.

Table 1. Country, trial, and location for the regional sorghum trials, rainy season, 1988.

Country	Trial	Location
Benin	WASVAT-Medium	
Burkina Faso	WASVAT-Early	Farako-Ba
	-Early	Saria
	-Medium	Saria
	-Medium	Farako-Ba
Cameroon	WASVAT-Early	Guiering
	-Medium	Karewa
	-Striga	Ndonkole
Cote d'Ivoire	WASVAT-Medium	Ferkessedougou
Ghana	WASVAT-Early	Nyankpala
	-Medium	Nyankpala
	Striga	Manga
Mali	WASVAT-Early	Bema
	-Early	Cinzana
	-Medium	Sotuba
	-Medium	Samanko
	Striga	Ouelessebougou
Niger	WASVAT-Early	Kolo
	-Early	Tarna
	-Medium	Bengou
Nigeria	WASVAT-Early	Bagauda
	-Medium	Bagauda
Senegal	WASVAT-Early	Bambey
Togo	WASVAT-Medium	Tantiegou

Table 2. Entry number, variety, their pedigree, and contributing program for WASVAT early, rainy season, 1988.

Entry no.	Name	Pedigree	Contributing program
1	Nagawhite	-	Ghana
2	S-35	-	Cameroon
3	MaliSor 84-5	-	Mali
4	CE 180-33	-	Senegal
5	CE 194-19	-	Senegal
6	ICSV 401 IN	-	ICRISAT
7	ICSV 210 IN	-	ICRISAT
8	ICSV 111 IN	[(SPV 35 x E 35-1) IS 3541]-81	ICRISAT
9	ICSV 230 IN	(SPV 475 x QL-3)-1-1-1-2	ICRISAT
10	ICSV 247 IN	(E 36-1 x CS 3541)-3-15-1-2-2	ICRISAT
11	ICSV 1082 BF	Tetron x ICSV 1002 BF	ICRISAT
12	ICSV 1083 BF	(ICSV 1004 BF x ISVAT 82/Entry 10)-1-3	ICRISAT
13	ICSV 1084 BF	(ISCV 1003 BF x CSV-11)	ICRISAT
14	ICSV 1095 BF	(ISCV 1004 BF x CSV-11)-1-2	ICRISAT
15	ICSV 1086 BF	(82-S-82 x CSV-11)-4-2	ICRISAT
16	ICSV 1087 BF	Framida x E35-1	ICRISAT
17	ICSV 1078 BF	E35-1 x IS 8785	ICRISAT
18	ICSV 1054 BF	E35-1 x IS 8785	ICRISAT
19	IRAT-204 (Control)	-	ICRISAT
20	Local Control/Temoin local	-	National Program

Table 3. Mean grain yields (Kg ha^{-1}) of early duration cultivars in the West African Sorghum Variety Adaptation Trial (WASVAT-1988) at 10 locations (RBD with 3 replications, plot-size 6.4. to 19.44 cm^2), Rainy season 1988[1].

Entry	Cultivar	Saria	Bema	Cinzana	Bagauda	Tarna	Maroua	Farako-Ba	Kolo	Bambey	Nyankpala	Mean
1	Nagawhite	4780 1	2880	2860 1	2590	3790 5	6350 2	3600 2	3000 6	2980 5	2440 4	3530 1
2	S-35	3320	3510	1690	1930	4150 3	5550	3690 1	2440	3190 3	2810 1	3230 4
3	MaliSor 84-5	2720	3390	2430 4	2770	2750	5330	1760	2440	1610	2150 6	2740
4	CE 180-33	2950	3770 3	1830	3360	4250 2	5500	2390	2610	3310 2	1680	3170 6
5	CE 194-19	3050	3580 6	2450 3	2130	2920	5300	2630	2550	3930 1	1270	2980
6	ICSV 401 IN	3870	3450	1890	3020	2730	4540	2610	3990 2	1510	1580	2920
7	ICSV 210 IN	3900	4570 1	1980	2720	4320 1	5930 4	3050 4	3180 5	1950	2540 3	3410 2
8	ICSV III IN	4180 4	3570	2110	2090	3560 6	5450	3120 3	2810	3190 3	2600 2	3270 3
9	ICSV 230 IN	3710	3280	2420 5	1920	280	5650	2030	2610	3000 4	830	2570
10	ICSV 230 IN	3870	3320	2160	2510	2170	5160	2620	2920	1680	1600	2800
11	ICSV 1082 BF	3670	3680 4	2370	3160 2	2590	5330	1970	2740	1800	1450	2880
12	ICSV 1083 BF	4680 2	4130 2	2370	2190	3940 4	5830 6	1380	2730	2330	990	3060
13	ICSV 1084 BF	4340 3	3440	1980	1970	2050	4610	1090	2300	1860	1440	2510
14	ICSV 1085 BF	4060 6	3060	1620	2470	2880	5270	2020	2450	490	1080	2540
15	ICSV 1086 BF	4180 4	3650 5	2160	2170	2120	4160	2280	2830	2440	1330	2730
16	ICSV 1087 BF	4090 5	3380	2850 2	2230	1890	5900 5	2810 6	4100 1	2350	2180 5	3180 5
17	ICSV 1078 BF	2860	2990	2310	3010	3010	6290 3	2890 5	2710	2500	2600 2	3120 7
18	ICSV 1054 BF	3820	3210	2400 6	1890	2070	6420 1	2810 6	3470 3	2880 6	2100	3110 8
Controls												
19	IRAT 204	3660	2760	2230	2410	720	5270	2220	3390 4	2160	1360	2620
20	Local	2020	3190	2340	1300	2810	5640	1480	1680	1800	1410	2370
SE		+600	+338	+206	+529	+316		+200	+300	+932	+141	
Mean		3495	2599	1668	2393	2751	5472	2414	2804	2354	1771	
CV(%)		24	23	21	21	21	14	24	21	35	19	

1. Number 1-6 following yield data indicate the ranking of the top 6 varieties.

Table 4. Entry number, variety, their pedigree, and contributing program for medium, rainy season 1988[1].

Entry	Cultivar	Pedigree	Contributing Program
1	S-34	-	Cameroon
2	Malisor 84-1	-	Mali
3	BF 80-6-4-1-1	38-3 x IRAT S10	Burkina Faso
4	BF 80-7-7-2-1	38-3 x 73-/12-1-2	Burkina Faso
5	BF 80-9-8-3-1	38-3 x 73-9/46-2-1	Burkina Faso
6	BF 80-10-23-2-1	38-3 x 73-9/29-1-1	Burkina Faso
7	SEPON-82	P 967083 x SEPON 82	Niger
8	M 24581	SPV 475 (IS 12611 x SC 108-3)-3-2-7-8-2-2	ICRISAT
9	M 24791	SPV 475 (IS 12611 x SC 108-3)-3-2-2-2	ICRISAT
10	M 24525	SPV 475 (IS 12611 x SC 108-3)-5-2-2	ICRISAT
11	M 24723	[(GPR 148 x E35-1) - 16-3 x IS 9327 deriv (2077B x IS 9327)-7-1-3)]	ICRISAT
12	ICSV 1088 BF	(82596 x CSV-11)-14-2	ICRISAT
13	ICSV 1089 BF	(ISCV 1004 BF x ISVAT 82/Entry 10)-1-2	ICRISAT
14	ICSV 1090 BF	(82-S-86 x ISVAT 82/Entry 14)-1-2	ICRISAT
15	ICSV 1092 BF	(82-S-86 x ISV 4)-3-3	ICRISAT
16	ICSV 1093 BF	(82-S-86 x ISV 4)-2-9	ICRISAT
17	ICSV 1063 BF	[E35-1 x Najjadh) x (ISC 423 x SC 3541) x E35-1]	ICRISAT
18	ICSV 1074 BF	(SEPON #2 x E35-1) x ICSV 4	ICRISAT
19	ICSV126IN	[(SC 108-3 xSwarna) E35-1]-6-1	ICRISAT
20	Local Control		National Program

Table 5. Mean grain yields (Kg/ha^{-1}) of medium duration cultivars in the West African Sorghum Variety Adaptation trial (WASVAT-1988) at 6 locations, Rainy season 1988[1].

Entry	Farakoba	Saria	Baganda	Sotuba	Samanko	Karena	Mean
1 S-34	2630 6	5320 3	1530	3900 3	1180 4	3420 3	2000
2 Malisor 84-1	3160 2	4380	2670	3100	1270 1	3910 2	3080 2
3 BF 80-6-4-1-1	1660	5480 2	2400	2220	800	2620	2530
4 BF 80-7-7-2-1	2780 4	5180 5	1830	3710 5	1230 2	3110 4	2970 4
5 BF 80-9-8-3-1	2590	4560	2910 6	3100	950	2980	2850 6
6 BF 80-10-23-2-1	2550	4820	1780	2630	890	2930	2600
7 SEPON-82	1100	3590	3250 3	3160	920	3020 5	2510
8 M 24581	1880	4120	2930 5	3390	870	3420 3	2770
9 M 24791	1140	4240	2110	3370	1230 2	2670	2460
10 M 24525	2290	4980	2230	3750 4	1100	2710	2840
11 M 24723	1430	5630 1	1660	3000	820	2270	2470
12 ICSV 1088 BF	1710	3790	2570	4070 2	820	3110 4	2680
13 ICSV 1089 BF	2810 3	4900	3310 2	3450	910	2670	3010 3
14 ICSV 1092 BF	2480	5250 4	2040	2840	1030	2760	2730
15 ICSV 1092 BF	2380	4380	3480 1	3180	1120 5	2710	2880 5
16 ICSV 1093 BF	2690 5	4760	2090 6	3640 6	1000	2800	2830
17 ICSV 1063 BF	3450 1	4660	3000 4	4330 1	1200 3	3420	3340 1
18 ICSV 1074 BF	2550	4310	2720	2970	1110 6	2930 6	2770
19ICSV126 IN	2060	5040 6	2910	3290	670	2440	2740
20 Local control	1610	2230	830	3110	650	4440 1	2150
SE	+200	+624	+721	+173	+169		
Mean	2248	4581	2412	3309	988	3017	
CV(%)	25	20	28	13	29	16	

1. Numbers 1-6 following yield data indicate the ranking of the top 6 varieties.

Table 6. Country and location for the West African Sorghum Hybrid Adapatation Trial (WASHAT), rainy season, 1988.

Country	Location
Burkina Faso	Farako-Ba
Cote d'Ivoire	Bouake Ferkessedougou
Ghana	Nyankpala
Mali	Samanko Cinzana
Niger	Tarna (2 sites) Kolo
Nigeria	Samaru Bagauda
Togo	Tantiegou

Table 7. Grain yield (kg/ha-1) of test hybrids in the West African Sorghum Hybrid Adaptation Trial (WASHAT) at seven locations, rainy season, 1988[1].

Entry ICSH #	Bagauda	Kolo	Tarna-2	Samanko	Cinzana	Farako-Ba	Ferkessedougou	Mean
230	2986	398	4693 (3)	2911	2649	1921	552	2301
231	2889	2940	3654	2333	2523	2734 (5)	1980 (1)	2723
232	3139	1987	3944	3422 (6)	2160	2322	903	2554
780	3889 (2)	2595	4250	2622	2233	2757 (4)	1612	2851 (6)
527	3181	3081 (6)	4526 (5)	1667	1917	1619	1160	2450
88038	3111	2666	4915 (1)	3400	3380 (1)	2262	701	2919 (5)
88039	3056	3700 (1)	4082	3044	2962 5)	2010	617	2782
369	3111	2334	4403	2911	2762 (6)	1445	1168	2591
643	2708	2112	1626	3933 (1)	2319	2026	1335 (5)	2294
507	3986 (1)	3540 (2)	4138	3667 (4)	3162 (2)	3049 (1)	1663 (2)	3315 (1)
330	3250	3282 (5)	4499 (6)	3867 (2)	2992 (4)	2447	1315 (6)	3093 (2)
88040	3278 (6)	3314 (4)	4750 (2)	3844 (3)	2748	1739	775	2921 (4)
88041	2583	3351 (3)	3903	3444 (5)	2002	2489	1268	2720
88042	3139	2885	4611 (4)	3933 (1)	3058 (3)	2398	1191	3031 (3)
88043	2889	3001	3167	2956	2160	2156	985	2473
336	3347 (5)	2894	3656	3200	2428	2182	1163	2696
88044	3167	2503	4207	2978	2336	2507 (6)	571	2610
88045	3556 (4)	1624	4167	3933 (1)	2412	2791 (3)	526	2716
Controls								
ICSV 111	3583 (3)	1504	4318	2467	2494	3043 (2)	558	2567
Local	1411	1655	2724	1000	2138	1760	1519 (4)	1744
Mean	3113	2570	4012	3077	2542	2283	1078	2668
S.E.±	413	465	367	263	340	296.1	237	
C.V. (%)	23	31	16	15	23	22	38	

1. Numbers in parenthesis indicate the ranking of the top six hybrids.

Table 8. Three genotypes with disease severity scores of three or less (1-6 scale) for the three more important leaf diseases of sorghum in the West African Sorghum Disease Resistance Nursery, rainy season, 1988[1].

	Disease severity											
	Leaf anthracnose						Gray leaf spot					Sooty stripe
Genotype	BEN	FAR	FER	LON	NIA	SAM	FAR	FER	LON	NIA	SAM	BEN
84 S 82	1.0	2.0	2.0	1.5	1.5	1.0	2.0	2.0	2.0	2.0	3.0	2.0
84 S 103-2	1.0	2.5	2.0	1.5	2.0	1.0	2.0	1.5	2.0	2.2	2.5	3.0
84 S 130	1.0	2.5	2.5	1.5	3.0	1.0	2.0	1.5	1.5	2.0	3.0	3.0
Controls												
ICSV 20-1 BF	1.0	1.5	2.0	1.5	1.6	1.0	4.0	4.0	1.5	3.7	3.5	5.5
IS 18696	1.0	2.0	3.0	1.5	3.7	1.0	5.0	4.0	1.5	4.5	3.5	5.5
SE	±0.5	±0.5	±0.3	±0.5	±0.3	±0.2	±0.4	±0.3	±0.4	±0.2	±0.3	±1.2
Trial Mean (36 entries)	1.2	3.0	2.2	1.0	2.2	1.5	2.1	2.1	1.8	2.4	3.2	3.8
CV (%)	58	23	21	39	23	17	30	18	33	10	12	43

1. 6 x 6 simple lattice, two replications, two row plots, 4 m x 0.8 m. Controls : ICSV 20-1 BF for gray leaf spot and IS 18696 for leaf anthracnose and gray leaf spot. BEN = Bengou in Niger, FAR and NIA = Farako-Ba and Niangoloko in Burkina Faso, FER = Ferkessedougou in Côte d'Ivoire, LON = Longorola in Mali, SAM = Samaru in Nigeria.

Table 9. Sorghum genotypes in the West African Sorghum Disease Resistance Nursery with mean disease severity score of 3 or less for the three more prevalent leaf diseases recorded at seven locations in West Afria, rainy season, 1988.

Gray leaf spot	Leaf anthracnose	Sooty stripe
84 S 22	84 S 103-2	84 S 103-1
84 S 103-2	ICSV 2 IN	84 S 157
84 S 105-2	ICSV 85-4 BF	84 W 848
84 S 115	IS 956	84 W 852
84 S 126	IS 3555	ICSV 16-5 BF
84 S 852	IS 9928	IS 21629
ICSV 2 IN	IS 18495	
IS 956	IS 21658	
IS 3555	IS 21629	
IS 9928		
IS 18495		
IS 22380		

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