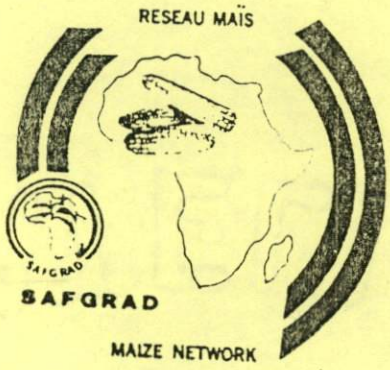
ORGANIZATION OF AFRICAN UNITY
SCIENTIFIC, TECHNICAL AND RESEARCH COMMISSION
(OAU/STRC)

WEST AND CENTRAL AFRICA COLLABORATIVE MAIZE RESEARCH NETWORK



IMPACT ASSESSMENT STUDY

SYNTHESIS OF PRIMARY DATA

SAFGRAD MAIZE NETWORK SYNTHESIS OF PRIMARY DATA.

1. Objective of Maize Network

The Maize Network for West and Central Africa is one of the four collaborative Networks of SAFGRAD Phase II. Its purpose is to enable national maize programs of West and Central Africa to pool their resources to tackle production problems common to countries in the subregion through the development of appropriate technologies. The interaction in Networks is expected to help the NARS avoid unnecessary duplication and to focus their research priorities. The ultimate goal is to increase the productivity of maize in West and Central Africa.

2. Target Area

The maize collaborative research network targets the semi-arid zones of West and Central Africa.

Collaborating Countries

The collaborating countries in the Networks are Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, and Togo. There is enormous variability from country to country regarding the proportion of total land area occupied by the different semi-arid ecologies. The list of names of the maize scientists in the member countries is presented in Table 1.

Production Constraints

The production constraints as identified by NARS scientists during a workshop of the national scientists from West and Central Africa at Ouagadougou, Burkina Faso, 23-27 March, 1987, were as follows:

. Unavailability of maize varieties appropriate to the different ecologies and cropping systems or either.

. Biological stresses.
  - diseases (maize streak, rust, blight, *Curvularia* leaf spot, stalk and ear rots)
  - insect pests especially stem borers, termites, and storage insects
  - parasitic weed, *Striga* spp.

. Drought stress

. Agronomic or crop management constraints
  - low soil fertility
  - soil-water management problems
  - etc.

. Socio-economic constraints
  - unavailable and expensive inputs, or either.
  - low and unstable prices of maize, or either.
  - inadequate or poor seed production and distribution, and
  - lack of or inappropriate on-farm testing.

. Inadequate number of trained research scientists, technicians and extension personnel.

Table 1. West and Central Africa Maize Network : Collaborating scientists in Network member-countries (as of March, 1991).

Country	Collaborating scientist	Qualification	Specialization	Location	% Time on maize
Benin	1. Yallou, Ch. G.	Ing. Agron.	Breeder	Niaouli	100
	2. Akomedi, T.M. (Mme)	M.S.	Seed Tech.	Niaouli	50
	3. Dossou, R.A.	Ing. Agron.	Breeder	Ina	100
	4. Adomou, M.	M.S.	Agronomist	Ina	25
Burkina Faso	1. Hema, I.	3e Cycle	Breeder	Kamboinse	100
	2. Konaté, G.	Ph.D.	Virologist	Kamboinse	30
	3. Sanou, J.	Ing. Agron.	Breeder	Farako-Bâ	100
	4. Traoré, S.	3e Cycle	Entomologist	Saria	50
	5. Paco Sereme	3e Cycle	Pathologist	Kamboinse	25
Cameroon	1. Ayuk-Takem, J.A.	Ph.D.	Breeder	Nkolbisson (IRA Director)	10
	2. Thé, Charles	Ph.D.	Breeder	Nkolbisson	100
	3. Zangue, J.B.	M.S.	Breeder	Nkolbisson	100
	4. Ngoumou, T.N.	M.S.	Agronomist	Garoua	40
	5. Ebete, A.M.	Ing. Agron.	Agronomist	Garoua	100
	6. Tchamo, P.	3e Cycle	Breeder	Bambui	60
	7. Eta-Ndu, J.T.	M.S.	Breeder	Bambui	100
	8. Nankam, C.	M.S.	Pathologist	Bambui	50
	9. Aroga, R. (Mme)	M.S.	Entomologist	Nkolbisson	50
	10. Fobasso, M.	M.S.	Extention Agronomist	Maroua	40
	11. Mongmong, B.	Ing.Agron.	Breeder	Garoua	100
	12. Ondoa, N.M.	Ing.Agron.	Breeder	Nkolbisson	100
Cape Verde	1. Silva, C.	Ing.Agron.	Agronomist	Praia	40
Cent. Af.Rep	1. Ganglaou, C.	Ing.Agron.	Agronomist	Bangui	60
Chad	1. Gaye-Sene, Y.	Ing.Agron.	Breeder	Gassi	
	2. Yagoua, R.	Ing.Agron.			
Côte d'Ivoire	1. Attiey, K.	M.S.	Breeder	Bouaké	100
	2. Acle Dadié	M.S.	Entomologist	Bouaké	60
	3. Akanvou, R.	M.S.	Agronomist	Ferke	50
	4. Akanvou, L. (Mme)	M.S.	Breeder	Ferke	50
	5. Ngoran, A (Mme)	M.S.	Breeder	Bouake	75
Gambia	1. Mbenga, M.S.	M.S.	Breeder	Sapu	75

Table 1. Cont'd

Country	Collaborating scientist	Qualification	Specialization	Location	% Time on maize
Ghana	1. Badu-Apraku, B.	Ph.D.	Breeder	Kumasi	100
	2. Twumasi-Afriyie, J.	Ph.D.	Breeder	Kumasi	100
	3. Sallah, P.Y.K.	Ph.D.	Breeder	Nyankpala	100
	4. Asiedu, E.A.	M.S.	Seed Tech.	Kumasi	75
	5. Owusu-Akyaw, M.	Ph.D.	Entomologist	Kumasi	25
	6. Bolfrey, G. (Mme)	M.S.	Agronomist	Kumasi	75
	7. Aflakpui, G.K.S.	M.S.	Agronomist	Nyankpala	75
	8. J.N. Asafu-Agyei	M.S.	Agronomist	Kumasi	40
	9. K.A. Marfo	M.S.	Ext. Agr.	Kumasi	50
	10. S. Ohemeng-Dapaah	M.S.	Agronomist/ Meteorologist	Kumasi	40
Guinea	1. Camara, S.	Ing.Agron.	Breeder	Kilissi	100
	2. Diallo, P.	Ing.Agron.	Agronomist	Kilissi	100
	3. Bah, I.	Ing.Agron.	Agronomist	Kilissi	100
Guinea Bissau	1. Domingo, F.	Ing.Agron.	Agronomist	Contobuel	100
Mali	1. Coulibaly, N.	M.S.	Agronomist	Sotuba	100
	2. Assa-Kanté, B. (Mme)	M.S.	Food Tech.	Sotuba	100
	3. Dolo, A.B.	Ing.Agron.	Agronomist	Bamako (CMDT)	75
Mauritania	1. Sidi R'Chid	3e Cycle	Agronome	Kaedi	30
Niger	1. Naino, J.	M.S.	Breeder	Kolo	40
Nigeria	1. Obajimi, A.O.	Ph.D.	Breeder	Ibadan	100
	2. Iken, J.E.	Ph.D.	Breeder	Ibadan	100
	3. Fakorede, M.A.B.	Ph.D.	Breeder	Ife	100
	4. Alofe, C.	Ph.D.	Agronomist	Ife	100
	5. Akintunde, Y.	Ph.D.	Agronomist	Ibadan	100
	6. Elemo, K.A.	Ph.D.	Agronomist	Zaria	60
	7. Iwuafor, E.N.O.	Ph.D.	Agronomist	Zaria	50
	8. Chude, V.O.	Ph.D.	Agronomist	Zaria	50
Senegal	1. Ndiaye, A.	3e Cycle	Breeder	St. Louis	100
Togo	1. Esseh-Yovo, M.	Ph.D.	Breeder	Lome	100
	2. Agbobli, C.A.	Ph.D.	Agronomist	Lome	60
	3. Adri, K.	3e Cycle	Agronomist	Lome	75
	4. Gumedzoe, M.	M.S.	Virologist	Lome	30

3. Strategy

Following a review of the production constraints, available research personnel, and infrastructure of the Network 17 member-countries, the problems of common interest to the participating countries and the areas of strength and weakness of each national program were identified. Based on the occurence of the constraints across countries within each network and the existence of strong and weak national programs within the subregion, the strategy of assigning technology development responsibilities to strong national programs (Lead Centers) was adopted. There was an understanding that each Lead Center would make available to other national programs the technologies forthcoming from its efforts. The topics below are the research responsibilities assigned to the Lead Centers.

i. Breeding varieties of different maturities for the semi-arid zone with emphasis on early and extra-early varieties : Burkina Faso, Cameroon, Côte d'Ivoire, Ghana and Togo;

ii. Breeding for drought tolerance : Burkina Faso and Cameroon;

iii. Breeding for streak resistance : Togo and Ghana;

iv. Stem borer control : Côte d'Ivoire;

v. *Striga* control : Cameroon;

vi. Agronomic research for maize varieties of different maturity groups : Cameroon and Nigeria.

4. Network Management and Scientific Leadership

The establishment of the Maize Collaborative Research Network for West and Central Africa and the coordination through the steering committee has facilitated the identification and promotion of research leadership among NARS scientists in the subregion. The steering committee of the Network met biannually, as stipulated in the Project Paper, from 1987 to date (Table 2). In all, nine meetings were held to date, four in Burkina Faso (Ouagadougou), two in Togo (Lome), and one each in Nigeria (Zaria), Benin (Cotonou) and Niger (Niamey). Deliberations at each meeting were promptly documented in the form of Meeting Reports which were distributed to national coordinators in all the network member countries.

The Steering Committee provided concerted leadership and direction to the Network by deciding agendas for meetings, monitoring tours, seminars and workshops as well as allocating research responsibilities among participating member countries. The Committee monitored the performance of member countries including sponsoring consultation visits by its members to assigned countries.

5. Collaborative Research

The progress made by the Lead Centers of each Network towards the generation of technologies that could be shared by other network member countries were the following:

Cameroon

Development of early maturing varieties. Through selection, line extraction, and crossing of promising early and intermediate germplasm, two early maturing synthetics have been created.

Table 2. Maize Network Steering Committee Meetings (March 1987 - March 1991).

No.	Date	Venue	Participants*	
			Members	Observers
1st	23-27 March, 1987	Ouagadougou, Burkina Faso	7	4
2nd	7-9 November, 1987	Ouagadougou, Burkina Faso	6	8
3rd	7-9 April, 1988	Lome, Togo	6	7
4th	8-10 November, 1988	Zaria, Nigeria	6	8
5th	23-24 March, 1989	Lome, Togo	7	8
6th	6-10 November, 1989	Ouagadougou, Burkina Faso	6	5
7th	26-30 March, 1990	Ouagadougou, Burkina Faso	6	4
8th	5-8 November, 1990	Cotonou, Benin	7	5
9th	13-14 March, 1991	Niamey, Niger	7	3

*The Committee consists of the 6 elected national maize scientists and the Network Coordinator; the observers are representatives of IITA, SCO, USAID.

Development of drought tolerant maize. Drought tolerant synthetics were created from a Drought tolerant pool developed from Pool 16 DR and Drought Resistant Synthetic obtained from SAFGRAD and IITA, respectively. Also, several other introductions have been used to form drought tolerant heterotic pools.

Development of *Striga* resistant maize. Inbred lines developed from IITA *Striga* tolerant germplasm were evaluated under *Striga* stress to form a *Striga* resistant population.

Seed treatment for improved plant establishment and yield. From results of over 20 on-station and on-farm trials, it was established that seed treatment with Marshall 25 ST (Carbosulfan) produced better emergence, improved seedling vigor, and 100% more grain yield than untreated seed. Economic analysis showed a 33:1 benefit/cost ratio in favor of the use of Marshal over that of Thioral (current recommendation) as seed treatment. The advantage of Marshal 25 ST has been attributed to its effect on soil insects, especially termites.

Contribution of "technology components" to maize performance. In the Sudan savana, the contributions of improved technological components to total maize yield were as follows : 5% for tillage, 27% for seed treatment and 38% for fertilization.

Management practices for early and extra-early maize. Across various locations, the highest yields of early (DMR-ESRY and Pool 16 DR) and extra-early (TZEF-Y) varieties were obtained when N was topdressed 20-25 days after plant emergence as compared with the 30-35 days, the current recommendation for medium to late varieties. A combination of 80 x 20 cm spacing and 90-135 kg N/ha was found necessary to allow the early and extra-maize to express their yield potential.

Ghana

Development of maize varieties of different maturities. For systematic, simultaneous population improvement and extraction of different varieties for the various ecological zones and grain color preferences, five breeding populations (120-day, 105-day, 95-day white dent, 120-day yellow flint/dent, and 95-day yellow flint populations and two back-up gene pools (120-day and 105-day white dent) have been created. Also, the high yielding white dent maize, EV 8443-SR has been converted to yellow grain color through backcrossing using Golden crystal as the yellow-color donor.

Improvement of streak resistance levels of elite varieties. The streak resistance level of three elite maize varieties developed in Ghana was improved through evaluation and selection utilizing IITA streak resistance screening facilities during the 1-year visiting scientist tenure of Dr. Badu-Apraku at IITA. The varieties are (i) Dorke (early, white extracted from Pool 16 SR) (ii) Abeleehi (intermediate, white extracted from Ikenne 8149 SR) and (iii) GH 8363 SR (a high quality protein maize from EV 8363-SR BC4).

Inbred line and hybrid development. Tropcially adapted, disease-resistant lines were produced and tested in hybrid combination using elite inbreds from IITA. Hybrids GH 17 x 9071 and GH5 x B73 outyielded Okomasa, the best Ghanian open-pollinated varieties by 31 and 30%, respectively. Both hybrids yielded as much or higher than IITA hybrid 8321-21. Work has been initiated on the formation of two heterotic pools for systematic hybrid development.

Inheritance of floury endosperm in local maize. The inheritance of the soft and floury endosperm of some local maize varieties from Ghana, Togo and Cameroon was studied using five generations derived from a cross between each local variety and a normal endosperm variety (F1, F2, and the reciprocal backcrosses).

Results showed that Ghana and Togo locals possess seemingly identical recessive gene for the floury endosperm. The Cameroon local, however, possesses a different single recessive gene for the floury endosperm.

Côte d'Ivoire

Local maize germplasm evaluation. One hundred and two maize accessions collected from the central region of Côte d'Ivoire, where farmers grow 90-day maize, were evaluated for twenty different characteristics. In addition to conserving these accessions, promising cultivars have been utilized in developing an early maturing maize population.

Stem borer control research. Three species of stem borers were identified in the central and northern parts of the country, namely *Eldana saccharina*, *Sesamia calamistis*, and *Busseola fusca*. Using insecticide control, yield losses of up to 56.9% were attributed to stem borer damage on maize sown in June in the central-south part of the country. A mass screening laboratory is under construction at Bouake to facilitate uniform and reliable screening of germplasm for stem borer resistance.

Togo

Development of streak resistant maize. Streak resistance screening facilities have been established at Ativeme near Lome, Togo. Over 24,000 *Cicadulina* leaf hoppers can be raised per week in the screenhouse, enough to infect about 5,000 plants. Two maize populations, AB12 (Togo local floury x Pop 49-SR) and AB13 (Togo floury x Pop 43-SR) are being improved for streak resistance, good husk cover, soft endosperm and prolificacy. ZL2-BD, another local-based maize population, is being improved for its preferred grain type. It has been crossed with Pool 16-SR for the generation of early maturing varieties.

Nigeria

Fertilizer requirement for maize/cowpea mixture. At Samaru (northern Guinea savanna), maize grain yield increased up to 75 kg N/ha. Maize responded significantly to P up to 40 kg P_2O_5 but there was no response to K. For cowpea, N application depressed grain yield significantly but there was a positive response to P at 80 kg P_2O_5/ha.

Response of maize to zinc. Field trials conducted at five locations in the semi-arid zone of Nigeria during 1988-90 showed that maize grain and dry matter yields increased with increasing zinc (1, 2, 3 kg Zn/ha) across all locations. The optimum Zn fertilizer rates for the soils studied ranged between 1-2 kg Zn/ha.

Field evaluation of Nigerian-made granular urea. There were no significant differences among the sources of N at all the five semi-arid locations studied. Generally, the Nigerian-made urea gave higher grain and straw dry matter yields than imported prilled urea but slightly lower yields than CAN at all locations. The optimum N requirement for maize in all the locations were between 100 and 150 kg/ha. All the three N fertilizer sources, at rates higher than 100 kg N/ha, had varying acidifying effects on the soil pH; the order of magnitude being CAN < granular urea < prilled urea.

Burkina Faso

The following activities were carried out by the Network Coordinator in collaboration with the National Program of Burkina Faso.

Development of drought resistant/tolerant maize. Pool 16 DR has been taken through three cycles of full-sib recurrent selection. Emphasis was placed on family selection under two levels of soil-moisture stresses created by planting in tied and simple (open)

ridging systems at Kamboinse (Sudan savanna) at every cycle. Also, there was selection on the set of families subjected to high plant population (133,000 plants/ha) at Farako-Bâ (northern Guinea savanna). Three sets of experimental varieties have been developed from the 1986, 1988 and 1990 full-sib family trials. The population and the 1988 varieties were subjected to improvement for streak resistance under controlled leaf hopper infestation at IITA, Ibadan. Pool 16 DR varieties performed very well in the 1987-1990 regional uniform variety trials. Many national programs are using this germplasm for release to farmers and/or for breeding purposes.

A drought resistant pool has been created from some local and introduced varieties previously identified to show good performance under drought stress. This pool will be used to create yellow drought resistant varieties and to widen the genetic base of Pool 16 DR.

Development of extra-early maize. Several extra-early maturing maize varieties (less than 82 days to maturity) were developed from crosses between locals and improved germplasm. In the past 4 years, emphasis had been placed on improved plants type and producing higher grain yield, while retaining the earliness trait and disease resistance. Susceptibility to foliar fungal diseases (*Helminthosporium* leaf blight and *Curvularia* leaf spot) has also been reduced. Streak resistance has also been incorporated into varieties of TZEE-W, TZEE-Y and CSP-Early.

Incorporation of streak resistance into some elite early varieties. Two early maturing local varieties, well appreciated for their grain type and/or adaptation, were converted to streak resistant forms. They are Blanc Deux Précoce (BDP) from Bénin Republic and Maka from Mauritania. The original crosses were made at Kamboinse (Burkina Faso) and advanced to BC1F2 before forwarding them to IITA, Ibadan, for selection under streak pressure and advancing them to BC3 F3. These are included in the 1991 regional variety trials.

6. Regional Trials

The Maize Network offered three types of regional uniform variety trials to the network-member countries from 1987 to 1989 namely: (i) RUVT 1 comprising early maturing, drought resistant/tolerant varieties (85-90 days) (ii) RUVT 2 consisting of late and intermediate maturing varieties (105-120 days) and (iii) RUVT-3, the extra-early varieties (less than 82 days).

The composition of each trial varied from year to year by introducing promising varieties from the NARS and IITA and eliminating the least performing ones. Generally, a variety is tested for two years before it is withdrawn. In 1990, following an arrangement with the IITA Maize Program to harmonize germplasm delivery to NARS to prevent duplication and overburdening of the national scientists, the coordination of the late/intermediate variety trials was left with IITA. IITA also handed over to SAFGRAD the organization of the international testing of all early and extra-early maturing varieties in the subregion.

In Tables 3A, 3B and 4 are presented information on the sets of regional maize trials that were sent, on request, to the 17 member-countries of the SAFGRAD between 1979 and 1992.

Table 3A. Number of regional maize trials whose data were returned to SAFGRAD by collaborating countries 1979-1986.

Country	RUVT-1								RUVT-2								RUVT-3	Total/ country
	79	80	81	82	83	84	85	86	79	80	81	82	83	83	85	86	86	
Benin	1	-	-	-	-	1	4	-	-	-	1	1	-	-	5	-	-	13
Burkina Faso	2	2	3	1	2	2	1	3	1	2	3	3	2	3	2	1	4	37
Cameroon	-	1	3	2	-	-	1	2	-	2	2	2	-	2	-	-	2	19
Cape Verde	-	-	-	-	-	-	1	1	-	-	-	-	1	-	1	1	-	4
Cent. Afr. Rep.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Côte d'Ivoire	1	1	-	-	-	-	-	-	1	1	-	-	-	-	1	-	-	5
Ethiopia	-	-	-	-	1	-	2	-	-	-	-	-	-	-	2	-	-	5
Gambia	1	1	-	2	-	-	1	-	-	1	-	-	1	-	1	-	1	9
Ghana	-	1	1	1	-	-	1	1	-	1	1	1	-	-	1	1	1	11
Guinea	-	1	1	1	1	-	1	-	-	-	1	-	2	-	2	-	1	11
Guinea Bissau	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Mali	2	2	2	-	2	-	3	-	1	-	1	-	2	-	2	-	-	17
Mauritania	-	-	-	1	-	1	1	-	-	-	-	-	1	1	1	-	-	6
Niger	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Nigeria	-	-	2	2	1	-	-	-	-	-	2	1	2	-	-	-	-	10
Senegal	1	-	2	1	1	-	2	3	1	-	2	1	2	-	3	2	2	23
Togo	-	-	-	-	1	1	2	2	-	-	1	-	1	1	2	2	2	15
Total returned	8	9	16	11	9	5	20	12	4	7	14	9	14	7	23	8	13	188
Total dispatched*	-	23	25	-	50	27	-	-	-	24	22	-	35	26	-	-	-	232

* = No information available
RUVT-1 = Early maturing drought tolerant variety trial
RUVT-2 = Full season/intermediate maturing variety trial
RUVT-3 = Extra-early maturing variety trial.

Table 3B. Number of sets of regional maize trials received by NARS 1987-1991*

Country	RUVT-1					RUVT-2**			RUVT-3					Total per country
	87	88	89	90	91	87	88	89	87	88	89	90	91	
Benin	2	4	4	4	3	2	2	2	2	4	3	2	2	36
Burkina Faso	2	3	2	3	3	1	2	2	1	3	3	3	3	31
Cameroon	1	3	3	3	3	1	2	2	0	2	3	3	3	29
Cape Verde	-	-	0	0	1	0	0	0	2	2	1	1	0	7
Cent.Afr. Rep.	2	2	2	2	2	2	1	1	0	1	1	1	2	19
Chad	1	1	1	2	2	0	1	0	2	1	1	2	2	16
Côte d'Ivoire	1	2	2	2	3	0	1	2	0	3	2	1	2	21
Gambia	2	2	2	2	2	0	0	0	2	2	2	2	2	20
Ghana	1	1	3	2	3	1	1	2	0	0	1	1	3	19
Guinea	3	0	2	2	2	2	4	4	0	0	2	2	1	24
Guinea Bissau	0	2	2	2	2	0	2	1	1	3	2	0	2	19
Mali	0	0	1	2	2	1	0	0	1	0	2	3	3	15
Mauritania	0	0	1	1	1	0	0	0	0	0	1	1	1	6
Niger	1	1	1	1	2	0	1	1	0	1	1	1	1	12
Nigeria	2	1	1	3	3	1	2	1	0	1	1	2	3	21
Senegal	2	3	3	0	2	2	3	3	1	3	2	0	2	26
Togo	3	3	2	2	2	2	3	2	3	3	2	2	2	31
TOTAL/YEAR	23	28	32	33	38	15	25	23	15	29	30	27	34	352

* RUVT-1 = Early maturing drought tolerant variety trial ;
RUVT-2 = Full-season/Intermediate maturing variety trial ;
RUVT-3 = Extra-early maturing variety trial.

** In 1990, there was an arrangement between IITA and SAFGRAD to harmonize trials (germplasm) delivery to NARS. SAFGRAD handed over late variety trials (RUVT 2) to IITA and IITA has stopped delivering early variety trials (RUVT 1).

Table 4. Number of regional uniform maize variety trials requested by NARS and data recovery (1987-1991).

Country	No. of trials received					Data recovery*			
	1987	1988	1989	1990**	1991	1987	1988	1989	1990
Benin	6	10	9	6	5	0(0)	6(60)	6(67)	6(100)
Burkina Faso	4	8	7	6	6	4(100)	8(100)	7(100)	6(100)
Cameroon	2	7	8	6	6	0(0)	6(86)	8(100)	6(100)
Cape Verde	2	2	1	1	1	0(0)	0(0)	0(0)	0(0)
Cent. Afr. Rep.	4	4	4	3	4	0(0)	2(50)	2(50)	2(67)
Côte d'Ivoire	1	6	6	3	5	0(0)	0(0)	2(33)	2(67)
Gambia	4	4	4	4	4	2(50)	0(0)	4(0)	2(50)
Ghana	2	2	6	3	6	2(100)	2(100)	6(100)	3(100)
Guinea	5	4	8	4	3	5(100)	0(0)	2(25)	3(75)
Guinea Bissau	1	7	5	2	4	0(0)	0(0)	0(0)	0(0)
Mali	2	0	3	5	5	1(50)	-	3(100)	4(80)
Mauritania	0	0	2	2	2	-	-	2(100)	2(100)
Niger	1	3	3	2	3	1(100)	1(33)	2(67)	2(100)
Nigeria	3	4	3	5	6	2(67)	3(75)	3(100)	4(80)
Senegal	5	9	8	0	4	5(100)	0(0)	5(63)	-
Chad	3	3	2	4	4	0(0)	0(0)	2(100)	4(100)
Togo	8	9	6	4	4	3(38)	6(67)	6(100)	4(100)
TOTAL	53	82	85	60	72	25(47)	34(42)	56(66)	50(83)

* Figs in parentheses represent % recovery.

** In 1990, there was an arrangement between IITA and SAFGRAD to harmonize trials (germplasm) delivery to NARS. SAFGRAD handed over late variety trials (RUVT 2) to IITA and the latter ceases to deliver early variety trials (RUVT 1).

7. Workshops and Seminars

The maize network organized many workshops, seminars and in-service training to strengthen the research capabilities of the NARS and promote an exchange of information and a sense of friendship and common purpose among the national scientists. Thus, a major accomplishment of the Project has been the breaking of barriers between anglophone and francophone NARS scientists. This has allowed for closer interaction.

Joint Workshops and Seminars

Three biennial joint workshops and one special purpose seminar were organized jointly for the maize and cowpea scientists from the national programs in West and Central Africa.

The 1987 Workshop permitted the national scientists to assemble and to (i) check-list and prioritize the constraints to the successful production of maize and cowpea and the resources and needs of the different NARS to carry out effective research, (ii) develop strategy for the networks, and (iii) elect the first steering committee for each network.

One of the major achievements of the Project is that the 1989 and 1991 Workshops emphasized the presentation of original scientific papers and discussions on collaborative research (Table 5). This is a progressive step in professionalism compared with the workshops during SAFGRAD Phase I which were limited to country reports. In 1989, the Workshop was a joint effort of both the Maize and Cowpea Networks. In 1991, the SAFGRAD Coordination Office got involved and included the Sorghum Network for West and Central Africa and representation from the East African Sorghum and Millet Network. Most of the scientific papers derived from the three West and Central African Networks, were presented in joint plenary sessions. Other activities carried out during the 1989 and 1991 biennial workshops (in separate sessions for each

Table 5. Joint Biennial Workshops (1987, 1989, 1991): some important statistics.

	1987	1989	1991
Date	March 23-27	March 20-24	March 8-14
Venue	Ouagadougou, Burkina Faso	Lome, Togo	Niamey, Niger
Maize Network			
- No. NARS Scientists	18	22	40
- No. of countries	15	15	17
- Scientific papers	-	20	20
Cowpea Network			
- No. NARS Scientists	19	30	49
- No. countries	15	16	17
- Scientific papers	-	15	15
No. General Papers	10	10	13
International Organizations (Scientists/Representatives)	17	19	37
West & Central Sorghum Network			12
East Africa Sorghum & Millet Network			2

network), were presentation of country reports, review of work on collaborative research, formulation of regional trials and the re-constitution of steering committees. From the number and quality of papers presented by the NARS maize, sorghum and cowpea scientists and the "great interaction" generated among the networks, the participants were unanimous in advocating that the biennial inter-network workshops should be encouraged.

A seminar for research agronomists was organized jointly by the SAFGRAD maize, cowpea and sorghum networks from 7 to 19 January, 1991 at IITA, Ibadan, Nigeria. The objectives of the seminar were:

(i) "improvement" of research capabilities of research agronomists through exchange of ideas.

(ii) "elucidation" of the major constraints to agricultural production in the subregion to identify areas that require research emphasis, and

(iii) "understanding" of the concept of low-input technology to identify appropriate technologies compatible with farmers' needs and requirements and the sustainability of agricultural production and the ecosystem.

The seminar was attended by 20 national program research agronomists from 12 countries (Table 6) and 13 resource persons from IITA, ICRISAT and some national research institutions. Papers were presented by subject-matter specialists from both the national and international research systems. An interesting feature of the seminar was that emphasis was placed on discussions. This enabled participants and presenters to exchange views on new concepts and how to approach seemingly difficult problems in the subregion.

Table 6. List of Participants to the Joint Networks' Seminar for Research Agronomists, IITA/Ibadan, Nigeria, 7-19 January, 1991

Name of Participant	Country	Address
1. M. Amidou	Benin	Station de recherches sur les cultures vivrières d'INA, BP 03, N'Dali
2. M. Adomou	"	Station de Recherches sur les cultures vivrières d'INA, BP 03, N'Dali
3. Hien Victor	Burkina Faso	INERA, 03 BP 7192, Ouagadougou 03
4. Lompo François	"	INERA, 03 BP 7192, Ouagadougou 03
5. Ebete Anatole	Cameroon	IRA, Box 2123, Yaounde
6. Ngoumou Nga Titus	"	IRA/MESIRES, Box 415, Garoua
7. Yandia Abel	Cent. Afr. Rep.	Direction de la Recherche SOCADA, BP 997, Bangui
8. Gayesena Yassine	Chad	Station Expérimentale de Gassi, BP 101, N'Djamena
9. L.O.Tetebo	Ghana	Crops Research Institute, N.A.E.S., Box 52, Tamale
10. Patterson Osei Bonsu	"	Crops Research Institute Box 3785, Kumasi
11. Ibrahima Bah	Guinea Conakry	C.R.A. Kilissi, BP 163, Kindia
12. N'Tji Coulibaly	Mali	IER, BP 438, Bamako
13. Diakalia Sogodogo	"	IER, BP 438, Bamako
14. Sidi R'Chid	Mauritania	CNRADA, BP 22, Kaedi
15. Cherif Ari Oumarou	Niger	INRAN, BP 429, Niamey
16. O.O. Olufajo	Nigeria	IAR/ABU, PMB 1044, Zaria
17. K.A. Elemo	"	IAR/ABU, PMB 1044, Zaria
18. A.Y. Akintunde	"	National Rice/maize Centre PMB 5042, Moor Plantation Ibadan
19. Sene Manievel	Senegal	SRA-CNRA, BP 53, Bambey
20. Saliou Diangar	"	ISRA-CNRA, BP 53, Bambey

Table 7. List of Participants at Training Course for Maize Research Technicians (1988, 1989 and 1990)

1988 Participants	Country
1. Soumanou Mohammed	Benin
2. Zouré Grégoire	Burkina Faso
3. Badahoro-Zaromo, A.	Central Afr. Republic
4. Romtitingar Djidinray	Chad
5. Sow Abdoulaye	Guinea
6. Sidibe Issa	Mali

1989 Participants	Country
1 Ali Imam Abacar	Chad
2. Dawuni Ahmed	Ghana
3. Fernandez Augusto	Guinea-Bissau

1990 Participants	Country
1. Denangnon Gangbo	Benin
2. Noba Raymond	Burkina Faso
3. Faikreo Jean	Cameroon
4. Bojang Abdoulaye	Gambia
5. Maïga D. Mohamadou	Mali
6. Attiley Kossi	Togo

10. Improvement Of Linkages Among National Programs

The Maize Network sponsored several activities to promote the development of linkages among NARS scientists and with scientists from IITA.

Monitoring Tours

The primary purpose of monitoring tours, usually conducted during the growing season, is to bring together national scientists from 5-8 countries (per crop) and IITA scientists to visit national maize or cowpea programs in 2-3 countries. Such tours allow the scientists to interact on the field with regard to production constraints, research methodologies and appropriate new technologies. During monitoring tours, the relative performance of entries and/or management practices included in the regional testing are evaluated, as well as the performance of any other maize, or agronomic trial. The tour enables participants to gain experience on how research activities are linked with development agencies.

Monitoring tours were organized in 1988 and 1990 (that is, years alternating with the biennial workshops) to selected countries in the subregion. Scientists from two different sets of 7 countries visited Burkina Faso and Ghana in 1988 and Cameroon and Nigeria in 1990 (Tables 9 and 10).

Visits to National Programs

In order to increase the chances for increased interaction and follow-up activities, visits were undertaken by the Coordinators and members of the steering committees to many countries yearly. The objectives of the visits were (i) to assess the activities of the various national programs and thus increase the effectiveness of their participation in the network, (ii) to

Table 9: Maize Monitoring Tour to Burkina Faso and Ghana, 12-20 September, 1988.

Participants	Country	Address
1. Mr. Ch. Gouro Yallou	Benin	Maize Breeder DRA, BP 884 Cotonou
2. Mr. Jacob Sanou	Burkina Faso	Maize Breeder INERA, Farako-Bâ BP 910 Bobo-Dioulasso
3. Mr. Alloudoumyngue Nadingar	Chad	Research Administrator Bureau de Recherche Agronomique BP 441, N'Djamena
4. Mr. Lansana Touré	Guinea	Maize Agronomist IRAG, Bordo-Kankan BP 576, Conakry
5. Dr. N.U.A. Idem	Nigeria	Maize Agronomist IAR/ABU BP 1044, Zaria
6. Mr. Abdou Ndiaye	Senegal	Maize Breeder CRA/Fleuve BP 240, Saint Louis
7. Mr. Payaro Toky	Togo	Maize Agronomist RPAA BP 218, Kara
8. Dr. J.M. Fajemisin	Network Coordinator	Pathologist/Breeder IITA/SAFGRAD 01 B.P. 1495 Ouagadougou 01

Table 10. Maize Monitoring Tour to Cameroon and Nigeria 8-22 September, 1990.

Participants	Country/position	Address
1. Dr. Charles Thé	Cameroon	Maize Breeder IRA/NCRE BP 2067, Yaoundé
2. Mr. Clément Ganglaou	Central Afr. Republic	Maize Agronomist Direction de la Coordination Agricole BP 786, Bangui
3. Mr. Koffi Attiey	Côte d'Ivoire	Maize Breeder IDESSA, 01 BP 635, Bouake
4. Mr. M.S. Mbenga	Gambia	Maize Agronomist/Breeder Dept of Agricultural Research Station Ministry of Agric. Yundum Agric. Station, Yundum
5. Mr. G.K.S. Aflakpui	Ghana	Maize Agronomist CRI, P.O. Box 3785 Kumasi
6. Mr. NTji Coulibaly	Mali	Maize Agronomist IER-SRCVO, BP 438 Bamako
7. Mr. Naino Jika	Niger	Cereal Breeder INRAN, BP 429, Niamey
8. Dr. J.M. Fajemisin	Network Coordinator	Pathologist/Breeder IITA/SAFGRAD, 01 BP 1495 Ouagadougou 01
9. Dr. Taye Bezuneh	SAFGRAD Director of Research	Research Administrator OAU/STRC/SAFGRAD 01 BP 1783, Ouagadougou 01
10. Dr. S.K. Kim	IITA Maize Breeder	Maize Breeder IITA, PMB 5320 Ibadan, Nigeria
11. Dr. J. Kling	IITA Maize Breeder	Maize Breeder IITA, PMB 5320 Ibadan, Nigeria

effective and sustainable national maize programs, (iii) to find out how maize produce is utilized locally and, where necessary, advise on how to increase consumption/utilization and therefore enhance farmers' incentive to produce, and (iv) to promote interaction between research institutions and development agencies including small scale farmers for realistic conception and implementation of research goals.

The involvement of members of the steering committees in visits to assigned countries enabled them to learn more about the subregion and enhanced the gradual development of self-driven and sustainable networks. Other objectives were (i) to share experience with the scientists of the host countries, and (ii) to promote exchange of technologies, ideas and visits among national scientists in the subregion.

The countries visited are listed below.

1987: Coordinator: Burkina Faso, Central African Republic, Guinea, Mali.

1988: Coordinator: Benin, Burkina Faso, Central African Republic, Ghana, Guinea, Nigeria, Senegal, Togo.

Steering Committee:

- Esseh-Yovo Mawule (Togo) : Senegal
- Hema Idrissa (Burkina Faso): Cape Verde and Guinea Bissau
- Charles Thé (Cameroun): Chad and Central African Republic
- Badu-Apraku (Ghana): Gambia

1989: Coordinator: Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Gambia, Guinea-Bissau, Chad, Togo.

Steering Committee:

- Attiey Koffi (Côte d'Ivoire): Cape Verde
- Charles Thé (Cameroon): Chad, Central African Republic
- Esseh-Yovo Mawule (Togo): Senegal

1990: Coordinator: Burkina Faso, Cameroon, Côte d'Ivoire, The Gambia, Guinea, Mali, Nigeria.

Steering Committee:

- Badu-Apraku (Ghana): Togo
- Charles Thé (Cameroon): Benin

1991 (Planned): Coordinator: Burkina Faso, Cape Verde, Côte d'Ivoire, Ghana, Mauritania, Togo

Steering Committee:

- Romuald Dossou (Benin): IITA & Nigeria
- Abdou Ndiaye (Senegal): Mali
- Charles Thé (Cameroon): Ghana.

11. Network Impact

The Maize Network has "significantly" influenced the scope and quality of maize research in regional and national terms, with some "obvious" or potential impact in terms of diffusion of improved production technologies at farm level.

Management Of Research Activities

A "strong" link has been established between the SAFGRAD Coordination Office (SCO) and the Directors of Agricultural Research of the participating countries. This has "facilitated" the mobility of germplasm and scientists in the subregion. The Council of Directors meets biennially and the Oversight Committee

of proven research administrators, academicians and researchers set up by the Council provides policy direction for all the SAFGRAD Networks; it also monitors and evaluates their activities regularly. The directors have thus been very active and responsive to the activities of the network by encouraging the contribution and participation of their scientists and/or hosting such activities (steering committee meetings, monitoring tours, workshops, training and regional trials). The Network activities and the benefits derived by the participating countries have reduced linguistic barrier to scientific interaction in the subregion.

Maize Research

The Maize Network has promoted interest in maize research and the linkages developed within and among NARS scientists have greatly increased the morale of individual scientists. The enhanced interaction coupled with the training activities organized by the network and the technical back-stopping by IITA scientists and resource persons from Lead NARS have increased the efficiency and effectiveness of research within individual national programs through sharper focusing on major constraints and better utilization of resources. The collaborative research activities initiated and coordinated by the Maize Network has resulted in the development of new technologies which are subsequently exchanged within the Network. An indicator of this impact is the progressive increase in the number of improved varieties and technologies contributed by national programs into the Networks' regional trials. In the past, these trials were composed of only entries from international research centers (IITA and CIMMYT).

SUMMARY OF MAIZE NETWORK IMPACT INDICATORS

LEVEL I. Strengthening of NARS' Technology Development Base and Generation of Appropriate Technologies.

1.1. Conception of Appropriate Research Objectives

Impact Indicators	Supporting documents/ references
1. Constraints to increased maize productivity and production identified and prioritized.	- Proc. Network Estab. Workshop.
2. Resources --human, infrastructure-- inventorized.	- Proc. Network Estab. Workshop.
3. Research objectives formulated and prioritized.	- Proc. Network Estab. - St. Comm. Rept. N°. 2.

1.2. Development and Implementation of Collaborative Research Strategy.

Impact Indicators	Supporting documents/ references
1. Establishment of a Network Steering Committee of elected, active national scientists to plan, and monitor network activities.	- Proc. Network Estab. Workshop.
2. Lead Centre approach used to obtain and mobilize 'critical mass' for addressing region-wide researchable issues.	- St. Comm. Rept. No. 2.
3. Implementation of Collaborative research to generate maize production technologies.	- St. Comm. Rept. No.2-10.

1.3. Enhancing the capability and capacity of National Programs.

Impact Indicators	Supporting documents/ references
1. Restructured national maize programs as evidenced by institutionalization of National Variety Trials, prudent varietal and germplasm maintenance, and seed production in many countries.	- Special Publ. No.3 - St. Comm Rept No.2-10
2. Fifteen (15) maize research technicians from 11 countries received 5-month intensive training of trial management, variety maintenance, seed production, data analysis and interpretation.	- Trainees' Rept for 1988(6), 1989(3), 1990(6).
3. Improved implementation and efficacy of research trials.	- Coordinators Trip Reports - Reg. Trials' Rept: 1987, 1988, 1989, 1990, 1991.
4. Increase in number of NARS developed varieties in regional uniform variety trials.	- Reg. Trials Rept: 1987, 1988, 1989, 1990, 1991.
5. Increase in the number of papers presented by NARS scientists at Network -organized workshops, indicating increased research activities.	- Special Publ. No. 1 - Special Publ. No. 6
6. Increased avenues for scientist-to-scientist contacts resulting from Network activities.	- SAFGRAD II Final Rept. - Special Publ. No.3
7. Progressively diversified research program.	- Special Publ. No. 3 - St. Comm. Rept. No.4-10 - Special Publ. No.5
8. Research problems once reserved for International Centers now gradually being addressed by some NARS programs.	- St. Comm. Rept No.1-10 - Special Publ. No.3

9. Increased research activities as a result of provision of additional funds, research equipment/materials, and documents.	- SAFGRAD II Final Rept. - St. Comm. Rept No. 1-10 - Special Publ. No. 3.
10. Increased types of maize germplasm to suit needs of farmers and consumers.	- Reg. Trials' Rept. 1987, 1988, 1989, 1990, 1991. - Special Publ. No. 2.

1.4. Improved linkage with extension agents

1. More national programs have extension departments/unit within or closely linked with research system.	- Special Publ. No. 3 - Steering Comm. Repts.
2. National programs organize joint annual workshops attended by researchers, extension agents and farmers for review and planning.	
3. More countries have seed production decentralized to include farming groups or private organizations.	

1.5 Increased scientific leadership to direct sustained collaborative regional research network.

1. Exchange visits between scientists from different national programs for technological information.	
2. Experienced scientists visit weaker national programs to offer on-the-spot advice.	
3. Spill-over of research technologies to other countries.	
4. SAFGRAD Strategic plan developed by Network scientists after program review and appraisal.	

LEVEL II. Ghanges in Output from Research and Development Agents

2.1. Technology Menu

(a) Maize Varieties made available to NARS by the Network.

1) Late and intermediate maturing varieties (110-120 days) for Northern Guinea Savanna Zone.

Impact indicators		Supporting documents/ references
Variety	Origin	
Abeleehi	Ghana	- Special Publ. No.2,
Aburotia	Ghana	- reg. Trials Repts.
AB 22	Togo	1987, 1988, 1989, 1990,
CSM 8710	Cameroon	1991.
Okomasa	Ghana	
Dobidi	Ghana	
EV 8422-SR	CIMMYT-IITA	
EV 8428-SR	CIMMYT-IITA	
EV 8435-SR	CIMMYT-IITA	
EV 8443-SR	CIMMYT-IITA	
EV 8444-SR	CIMMYT-IITA	
EV 8449-SR	CIMMYT-IITA	
FARAKO-BA 85 TZSR-W-1	IITA	
FARAKO-BA 85 TZSR-Y-1	IITA	
NDOCK 8701	Cameroon	
LOUMBILA 84 TZUT-Y	IITA & Burkina	
TZB-SR	IITA	
TZPB-SR	IITA	
Golden Crystal	Ghana	
Composite 4	Ghana	
Zm10	Senegal	
Synthetic C	Senegal	
BDS	IRAT/Senegal	
AB22	Togo	
CJ1	IRAT/Benin	
Composite 4	IRAT/Côte d'Ivoire	
Staha	Tanzania	
IRAT 100	IRAT/Burkina Faso	
IRAT 102	IRAT/Burkina Faso	
IRAT 178	IRAT/Côte d'Ivoire	
NH2	IRAT/Benin	
Elite x Early Mexican Composite	Ghana	

2) Early maturing (90-100 days) and/or drought tolerant varieties for Sudan savanna.

Impact indicators		Supporting documents/ references
Variety	**Origin**	
Across 86 Pool 16 DR	IITA-SAFGRAD	- Special Publ. No.2,
Across 87 Pool 16 SR	IITA	- Reg. Trials Repts:
Across 88 Pool 16 DR	IITA-SAFGRAD	1987, 1988, 1989,
BDP-SR BC3 F3	Benin-SAFGRAD	1990, 1991.
DMR-ESRW	IITA	
DMR-ESRY	IITA	
DR Comp. Early	IITA-SAFGRAD	
Early 86 Pool 16 DR	IITA-SAFGRAD	
EV 8730-SR	CIMMYT-IITA	
EV 8731-SR	CIMMYT-IITA	
Farako-Bâ 86 Pool 16 DR	IITA-SAFGRAD	
Farako-Bâ 88 Pool 16 DR	IITA-SAFGRAD	
FBC 6	Burkina Faso	
Ikenne 88 BU-ESRW	IITA	
Kamboinse 88 Pool 16 DR	IITA-SAFGRAD	
Kawanzie	Ghana	
Maka-SR	Mauritania-SAFGRAD	
SAFITA-2	IITA-SAFGRAD	
TZE Comp. 3 x 4	IITA	
TZESR-W	IITA	
TZESRW-SE	IITA	
Mexican 17 Early	Ghana	
Jaune Dente de Bambey	Senegal	
MTS	IRAT/Côte d'Ivoire	

3) Extra-early maturing varieties for Sahel savanna and to bridge hunger gap in other zones. No international centre worked on this maturing group.

Impact indicators		Supporting documents/ references
Variety	**Origin**	
(Across 8131 x JFS) x Local Raytiri	IITA-SAFGRAD	- Special publ. No.2,
CSP	CIMMYT	- Reg. Trials Repts.
CSP-SR	IITA-SAFGRAD	1987, 1988, 1989,
CSP x Local Raytiri	IITA-SAFGRAD	1990, 1991.
Pool 27 x Gua 314	IITA-SAFGRAD	
Pool 28 x Gua 314	IITA-SAFGRAD	
Pool 30 x Gua 314	IITA-SAFGRAD	
TZEE-W1	IITA-SAFGRAD	
TZEE-W2	IITA-SAFGRAD	
TZEE-White Pool	IITA-SAFGRAD	
TZEE-WSR	IITA-SAFGRAD	
TZEE-Y	IITA-SAFGRAD	

TZEE-Yellow Pool	IITA-SAFGRAD
TZEE-YSR	IITA-SAFGRAD
TZEF-Y	IITA-SAFGRAD
TZESR-W x Gua 314	IITA-SAFGRAD

(b) Improved agronomic practices

Impact indicators	Supporting documents/ references
1. Tied ridges for soil moisture conservation in Sudan savanna	- Special Publ. No.3
2. Better seed treatment chemicals for improved plant establishment and grain yield.	- Special Publ. No.3
3. Increased plant population for higher grain yield of early and extra-early varieties.	- Special Publ. No.3
4. Earlier date of fertilizer application (top dressing) for increased yield of early and extra-early varieties.	- Special Publ. No.3

2.2. Technologies Released by Individual National Programs for use by their Farmers.

Country Name of technology	Remarks	Supporting documents/ references
BENIN		
Pirsaback 30-SR	Version of EV 8430-SR	- SAFGRAD II Final Rept
Sekou 81 TZSR-W-1	Well accepted for local dishes	- Special Publ. No.4
DMR-ESRW	Noted for wide adaptability across the country	
TZESR-W	For green maize	
TZB/TZB-SR	High yield in northern Guinea savanna	
Poza Rica 7843-SR	Version of EV 43-SR	

BURKINA FASO

SR 22	Local name of EV 8322-SR
KPB	Local name for EV 30-SR
KPJ	Local name for EV 31-SR
KEB	Local name for TZEE-WSR
KEJ	Local name for TZEE-YSR
Maka	-
SAFITA-2	A variety from Pool 16
Pool 16 DR	Streak resistant and drought tolerant variety replacing SAFITA-2.
Tied ridging	"Adopted" by farmers to conserve soil moisture in the Sudan savanna
Ridge tying implement	"Accepted and fabricated" for use with donkey or cow.

CAMEROON

TZB-SR	"Wide adaptability in Guinea savanna
CMS 8602	Local name for EV 31-SR
CMS 8806	Local name for DMR-ESRY
SAFITA-2	A variety from Pool 16
Pool 16 DR	Streak resistant and drought tolerant.
Mex. 17 Early	Ghanaian variety

Country/Name of technology	Remarks	Supporting documents/ references
Marshall ST 25 as seed treatment	Replaces Thioral because it has a 33:1 benefit/cost ratio over use of Thioral.	- Special Publ. No.3
Tied ridging	Adopted as a methodology for simulating 2 levels of soil moisture for breeding for drought tolerance.	- Special Publ. No.3

CENTRAL AFRICAN REPUBLIC

CMS 8505	A Cameroonian variety; now in on-farm trial.
CMS 8710	A Cameroonian variety; now in on-farm trial.

COTE D'IVOIRE

TZSR-Y-1

- SAFGRAD II Final Rept.
- Special Publ. No. 4

Maka
Pool 16 DR

GHANA

Kawanzie	
Dobidi	
Composite 4	
Elite x Early Mexican Composite	
Mexican 17 Early	
Aburotia	
Golden Crystal	
La Posta	
SAFITA-2	A variety from Pool 16
Okomasa	Derived from EV 43-SR
Abeleehi	Derived from EV 49-SR
Dorke-SR	Derived from EV 31-SR
Obatanpa	Derived from GH 8363 SR
Streak screening technique	For development of varieties resistant to maize streak virus.

GUINEA

Ikenne 83 TZSR-Y-1	On-farm trial
DMR-ESRY	On-farm trial
EV 8428-SR	On-farm trial

GUINEA BISSAU

TZESR-W
TZESR-Y

MALI

Golden Crystal	A Ghanaian variety
SAFITA-2	
DMR-ESRY	
TZEF-Y	On-farm trial

MAURITANIA

Maka	Tolerant to drought
CSP Early	

NIGER

TZESR-W
Maka
Pop 31-SR
J.F. Saria

NIGERIA

TZB-SR
TZPB-SR
TZESR-W
TZSR-W-1
TZSR-Y-1
DMR-ESRW
DMR-ESRY

SENEGAL

Maka	
Ikenne(1) 8149-SR	
Pool 16 DR	
JDB	Local name for Tocumen 7835

TCHAD

Gusau 82 TZESR-W	
CMS 8501	Developed in Cameroon
CMS 8507	Developed in Cameroon

III B, C

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IV. MAIZE TECHNICIAN TRAINEES' REPORTS

1988 Training

1. Mohammed Soumanou (Benin)
2. Zaromo-Badahoro Alphonse (Central Africa Rep.)
3. Sow Abdoulaye (Guinea)
4. Sidibé Issa (Mali)
5. Zouré Grégoire (Burkina Faso)
6. Romtitingar Djidinray (Tchad).

1989 Training

1. Ahmed Dawuni Mohammed (Ghana)
2. Augusto Fernandes (Guinea Bissau)
3. Abakar Ali Iman (Tchad).

1990 Training

1. Denagnon Gangbo (Benin)
2. Raymond Noba (Burkina Faso)
3. Jean Faikreo (Cameroon)
4. Abdoulaye Bojang (Gambia)
5. Mahamadou D. Maïga (Mali)
6. Kossi Attiley (Togo).

1991-03

IMPACT ASSESSMENT STUDY SYNTHESIS OF PRIMARY DATA (WECAMAN)

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