

ICRISAT Regional Groundnut Breeding Activities: A Review of Research Progress, 1985-87

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Abstract

*The emphasis of the SADCC/ICRISAT Regional Groundnut Improvement Program is on supplying superior germplasm to breeding programs in the Southern African Development Coordination Conference (SADCC) region. The Program's objectives are to develop germplasm adapted to the varied agroecological requirements of the region. Major emphasis is placed on breeding for resistance to two major diseases, early leaf spot (*Cercospora arachidicola*) and groundnut rosette virus (GRV), as well as breeding for high yield, quality, and earliness. Hybridization continues, using known sources of resistance to GRV as well as genotypes having the ability to retain their leaves longer under severe early leaf spot pressure. Consistently heavy early leaf spot pressure at Chitedze and perfection of the GRV-screening technique has made it possible to carry out effective evaluations of germplasm lines and breeding populations. Breeding lines are evaluated successively in preliminary and advanced yield trials before the most promising material is finally selected for evaluation in SADCC cooperative regional trials. The Program also conducts entries in these may be promoted to regional trials. The results of the 1985/86 and 1986/87 regional trials are reported. It is noted with satisfaction that many entries exhibit the ability to yield consistently well across locations. The performance of ICGMS 42 is particularly pleasing.*

Sumário

*Programa Regional de Melhoramento do Amendoim do ICRISAT: Uma Revisão ao Progresso da Investigação, 1985-87. O ênfase do Programa Regional de Melhoramento do Amendoim do SADCC/ICRISAT está no fornecimento das linhas de germoplasma superiores para os programas de melhoramento da região do SADCC (Conferência Coordenadora para o Desenvolvimento da África Austral). Os objetivos do programa são o desenvolvimento de germoplasma adaptado às necessidades das várias condições ecológicas da região. Ênfase especial é colocado no melhoramento para resistência nas duas das mais importantes doenças, a mancha temporã (*Cercospora arachidicola*) e o vírus da roseta do amendoim (GRV), assim como o melhoramento para alto rendimento, qualidade e precocidade. A hibridização foi continuada usando fontes conhecidas como resistentes ao GRV, assim como, genótipos com habilidade de retenção das folhas durante períodos mais longos, sob grandes pressões de mancha temporã. Constantes altas pressões de mancha temporã, em Chitedze, e o aperfeiçoamento da técnica de avaliação do GRV,*

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tornou possível fazer avaliações eficientes das linhas de germoplasma e populações melhoradas. Linhas melhoradas são sucessivamente avaliadas em ensaios de rendimento preliminares e avançados, antes que o material promissor seja finalmente seleccionado para avaliação em ensaios cooperativos regionais da SADCC. Conduzimos também ensaios preliminares e internacionais coordenados pelo Centro ICRISAT. Nestes, as entradas promissoras podem ser promovidas para os ensaios regionais. Os resultados dos ensaios regionais de 1985/86 e 1986/87 são apresentados. Notou-se com satisfação a existência de um número considerável de entradas, que têm produzido rendimentos consistentemente bons nos vários locais. O comportamento do cultivar ICGMS 42 é particularmente encorajador.

Introduction

The SADCC/ICRISAT Regional Groundnut Improvement Program has continued to make progress since it was last reviewed at Harare in 1986. Our objectives have remained largely unchanged as we continue our endeavors to implement recommendations of the two previous Regional Workshops. The rainfall distribution in 1986/87 was poor with alternating spells of dry and wet weather resulting in lower yields than expected.

Germplasm Evaluation

We completed the evaluation of 345 germplasm accessions obtained from the Zambian national program and 60 newly collected germplasm accessions from Tanzania. Many of these have been entered in preliminary and advanced yield trials.

Hybridization

We completed a total of 175 crosses in 1985/86. These included crosses made for high yield and quality, and crosses made between adapted lines and lines that had given high yields and had retained their leaves well under conditions of severe early leaf spot pressure at Chitedze. We completed 100 crosses in 1986/87 including 12 between adapted Mozambican lines and high-yielding ICGMS lines made for the Mozambican national program; 18 for the Zimbabwean national program for groundnut rosette virus (GRV) and early leaf spot (*Cercospora arachidicola*) resistance; 40 for GRV resistance; 20 for high yield and adaptability; and 10 for high yield and bold seed for the Regional Program. Genotypes having the ability to retain leaves for longer duration under

severe early leaf spot pressure were used in some crosses.

Breeding for Disease Resistance

We continued evaluating breeding material from our own program and from ICRISAT Center. This material included populations from crosses made for early leaf spot resistance and crosses received from ICRISAT Center involving late leaf spot (*Phaeoisariopsis personata*) and rust (*Puccinia arachidis*) resistant parents. Interspecific derivatives were also included. Many promising selections have been entered in preliminary yield trials. We selected a considerable number of symptomless plants from the rosette-screening nursery for further evaluation. Some of these belonged to the sequentially branching group. We have completed a series of GRV-inheritance studies and are satisfied that the inheritance of resistance is controlled by double-recessive genes. We have also purified a source of resistance in a sequentially branching background introduced from West Africa.

Breeding for High Yield and Quality

We evaluated populations arising from crosses between genotypes having high-yield potential and bold seed. Many crosses involving indigenous cultivars and promising ICRISAT material performed poorly. In addition, selections showing promise for yield and quality at ICRISAT Center performed poorly and had markedly reduced seed size in trials at Chitedze. It was thought this may have been because of their extreme susceptibility to early leaf spot. In 1986/87, we evaluated 15 lines in a yield trial where each entry was grown with and without fungi-

Table 1. Response of selected confectionery groundnut lines to early leaf spot control¹, Chitedze, Malawi, 1986/87.

Entry	Pod yield (t ha ⁻¹)		Response to spray (%)	100-seed mass(g)		Seed color
	Nonsprayed	Sprayed ²		Nonsprayed	Sprayed	
M 13	3.38	5.37	58.9	65	64	Tan
SP 1	3.34	6.16	84.4	51	53	Tan
Egret	3.75	6.29	63.2	51	54	Tan
HYQ(CG)S-62	3.07	6.12	104.2	58	64	Tan
HYQ(CG)S-5	2.44	5.90	141.8	47	59	Tan
Local control						
Chalimbana	2.17	4.27	96.7	79	96	Tan
SE	±0.234					
Trial mean (15 entries)	2.71	5.54		59	69	
CV (%)	8.6					

1. Split plot in randomized complete blocks, subplot size: 14.4 m².

2. Chlorothalonil as Daconil 2787[®] applied nine times (1.2 kg a.i. ha⁻¹), at 10-day intervals, beginning 42 days after sowing.

Table 2. Performance of some of the groundnut breeding populations in advanced yield trials, Chitedze, Malawi, 1985/86.

Entry	Pedigree	Time to maturity (days)	Pod yield (t ha ⁻¹)	Shelling percent-age	100-seed mass (g)	Seed color	Mean early leaf spot score ¹
Alternate branching²							
ICGMS 49	84/Phoma/7-B ₁ (P84/6/20)-B ₂	154	5.16	69	60	Red	8
ICGMS 50	84/Phoma/6-B ₁ (P84/6/20)-B ₁	155	5.00	71	48	Red	8
ICGMS 51	84/Phoma/5-B ₁ (P84/6/12)-B ₁	162	4.74	66	53	Tan	8
ICGMS 52	84/PP/140-B ₁ (CG st.20/1)-P ₁	141	4.34	75	62	Tan	9
ICGMS 53	84/ISMT/31(CS 43)-B ₁	155	4.13	76	46	Tan	9
Local control							
Mawanga		153	4.01	68	54	Variegated	8
SE		±2.3	±0.06				
Trial mean (64 entries)		138	3.29				
CV (%)		3.3	3.8				
Sequential branching²							
ICGMS 55	84/Phoma/10-B ₁ (ICGM 291-B ₁)	123	3.82	65	48	Tan	9
ICGMS 56	84/HYQF 9-B ₁ (Goldin 1 × Faizpur 1-5) × (Manfredi × M 13)	124	3.02	69	30	Red	9
ICGMS 57	84/RYT/8(JII 60 × PI 259747)-B ₁	123	2.86	68	37	Purple	8
ICGMS 58	87/HYQSBT/11(ICGS 51)	124	2.80	67	44	Red	8
ICGMS 59	84/RYT/5(Colorado Manfredi × DMT 200)-B ₁	101	2.78	75	35	Red	9
Local control							
Malimba		109	2.13	75	28	Tan	9
SE		±1.5	±0.06				
Trial mean (64 entries)		111	2.37				
CV (%)		2.6	4.9				

1. Scored at 90 days after emergence on a 1-9 scale, where 1 = No disease, and 9 = 50-100% of foliage destroyed.

2. 8 × 8 lattice, plot size 18 m².

cide protection. Yield responses to fungicide protection ranged from 59% to 142%. The highest-yielding entries responded least to fungicide (Table 1).

It is apparent that although confectionery groundnut lines received from ICRISAT Center are extremely susceptible to early leaf spot and respond markedly to fungicide application, seed quality, and boldness, even under protected conditions, do not reach the same high levels at Chitedze as at ICRI-SAT Center.

Yield Trials: 1985/86

Preliminary yield trials

We evaluated 22 sequentially branching and 22

alternately branching breeding lines in two yield trials, including selections made for disease resistance, high yield, and quality. Some performed well and were entered in advanced trials in 1986/87.

Advanced yield trials

We evaluated 106 sequentially branching and 86 alternately branching breeding lines in five trials. Some performed well and showed potential for high yields and good quality (Table 2). We selected 23 sequentially branching and 14 alternately branching lines for inclusion in regional yield trials. In addition, 14 valencia lines were selected for regional evaluation.

Table 3. Performance of some groundnut breeding populations in two advanced yield trials, Chitedze, Malawi, 1986/87.

Entry	Pedigree	Time to maturity (days)	Pod yield (t ha ⁻¹)	Shelling percent-age	100-seed mass (g)	Seed color	Mean early leaf spot score ¹
Alternate branching²							
ICGV-SM 86722	(P84/6/20)P ₁ -B ₁	144	3.24	70	47	Red	8
ICGV-SM 86725	(Robut 33-1 × NC Ac 2821) × (USA 20 × TMV 10)F ₁ -B ₁ -B ₂ -B ₁	123	2.52	79	56	Red	7
Local control							
Mawanga		138	2.86	72	59	Variegated	7
SE			±0.123				
Trial mean (36 entries)			2.14				
CV (%)			11.6				
Sequential branching³							
ICGV-SM 86053	(ICGM 291)P ₁ -B ₁ -B ₂	111	2.49	69	39	Tan	8
ICGV-SM 85057	(Egret × Ah 114)	130	2.48	74	48	Tan	7
ICGV-SM 86068	(Goldin 1 × Faizpur 1-5) × (Manfredi × M 13)F ₃ -B ₁ -B ₂ -B ₁	126	2.36	69	35	Red	8
ICGV-SM 86051	(2328)B ₁ -B ₁ -B ₁	118	2.19	74	41	Red	8
Local control							
Malimba		105	1.69	77	27	Tan	8
SE			±0.056				
Trial mean (64 entries)			1.71				
CV (%)			6.6				

1. Scored at 90 days after emergence on a 1-9 scale, where 1 = No disease and 9 = 50-100% of foliage destroyed.

2. 6 × 6 lattice, plot size 14.4 m².

3. 8 × 8 lattice, plot size 14.4 m².

Yield Trials: 1986/87

Preliminary yield trials

We evaluated 46 sequentially branching and 73 alternately branching breeding lines in three trials. Many had potential for high yield and quality and have been included in the advanced trials.

Advanced yield trials

We evaluated 60 sequentially branching and 31 alternately branching breeding lines in two trials. Many of these performed well (Table 3). Ten sequentially branching and 8 alternately branching lines were selected for inclusion in regional yield trials.

Regional Virginia Cultivar Trials

1985/86

The virginia cultivar trial was grown at three locations in Malawi and Zambia. At all three trial sites, ICGMS 42 maintained its significant yield superiority over local control cultivars (Table 4). Nine of these entries were retained for further evaluation.

1986/87

The virginia cultivar trial was grown at six locations in four SADCC countries. In addition, it was also grown at the ICRISAT Sahelian Center, Niger. The trial in Mozambique was severely affected by lack of

Table 4. Seed and pod yields ($t\ ha^{-1}$) of entries in the SADCC Regional Groundnut Variety Trials (Virginia Type), Malawi and Zambia, 1985/86.

Entry	Chitedze Research Station, Malawi		Msekera Regional Research Station, Zambia		Golden Valley, Zambia		Mean	
	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed
ICGMS 42	3.73	2.80(1) ¹	3.22	2.30(1)	2.29	1.30(1)	3.08	2.13
ICGMS 36	2.48	1.86(6)	2.64	1.87(4)	1.82	1.10(5)	2.31	1.61
ICGMS 35	2.73	1.96(5)	2.49	1.70(5)	1.53	0.97(10)	2.25	1.54
ICGMS 38	2.47	1.83(7)	2.26	1.51(7)	1.87	1.20(2)	2.20	1.51
ICGMS 39	2.61	1.80(8)	2.20	1.37(9)	1.73	1.12(4)	2.18	1.43
ICGMS 45	2.44	1.71(10)	2.62	1.64(6)	1.56	0.91(11)	2.21	1.42
ICGMS 48	2.52	1.74(9)	2.01	1.31(10)	1.87	1.07(6)	2.13	1.37
ICGMS 46	3.17	2.44(2)	0.92	0.64(13)	1.71	0.83(13)	1.93	1.30
ICGMS 47	1.61	1.19(14)	1.96	1.42(8)	1.71	1.15(3)	1.76	1.25
ICGMS 43	2.25	1.62(11)	1.61	0.96(11)	1.67	1.02(8)	1.84	1.20
ICGMS 41	1.96	1.33(12)	1.46	0.84(12)	1.42	0.82(14)	1.61	1.00
ICGMS 37	1.72	1.27(13)	0.92	0.63(14)	1.33	0.84(12)	1.32	0.91
ICGMS 44	1.64	1.23(14)	0.88	0.63(14)	1.20	0.71(15)	1.24	0.86
ICGMS 40	1.59	1.14(15)	0.94	0.63(14)	1.11	0.68(16)	1.21	0.82
Control 1	3.33 (Mani Pintar)	2.43(3)	3.07 (Egret)	2.04(3)	1.98 (Makulu Red)	0.99(9)		
Control 2	3.01 (Chitembana)	2.14(4)	3.03 (Makulu Red)	2.07(2)	1.98 (Egret)	1.07(6)		
SE	±0.049	2	±0.098	±0.069	±0.124	±0.096		
Mean	2.45	1.78	2.01	1.35	1.67	0.99		
CV (%)	4	2	10	10	15	20		

1. Figures in parentheses indicate rank at individual sites.

2. Not available.

Table 5. Pod and seed yields (t ha⁻¹) of 25 entries in SADCC Regional Groundnut Variety Trials (Virginia Type), Malawi, Zambia, and Zimbabwe, 1986/87.

Entry	Malawi				Zambia				Zimbabwe		Mean	
	Chitedze ¹		Meru		Msekera ²		Chisamba ³		Gwebi ⁴		Pod	Seed
	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed
ICGMS 42	2.61	2.04(6) ⁵	1.80	1.27(1)	2.69	1.76(1)	1.11	0.79(1)	5.49	4.10(2)	2.74	1.99
ICGM 336	2.82	2.17(3)	1.64	0.67	2.05	1.34(5)	0.67	0.35	5.99	4.46(1)	2.63	1.80
ICGM 623	2.80	2.15(4)	1.76	1.09(4)	1.86	1.21(10)	0.56	0.24	5.43	3.94(4)	2.48	1.73
ICGMS 52	2.60	1.98(8)	1.12	0.69	2.02	1.36(4)	0.89	0.45(8)	5.18	3.76(5)	2.36	1.65
ICGM 749	2.59	1.94(9)	1.20	0.62	1.80	1.05	0.78	0.31	5.49	3.98(3)	2.37	1.58
ICGM 631	2.65	2.06(5)	1.20	0.58	2.06	1.24(8)	0.50	0.20	5.25	3.67(9)	2.33	1.55
ICGMS 50	3.14	2.20(1)	1.64	0.77	1.95	0.93	0.56	0.18	5.83	3.56(10)	2.62	1.53
ICGMS 51	2.78	1.92	1.53	0.78(10)	2.08	0.91	0.83	0.46(5)	5.86	3.37(13)	2.62	1.49
ICGMS 53	2.52	1.94(10)	1.37	0.83(8)	1.71	0.96	0.44	0.18	4.91	3.56(10)	2.19	1.49
ICGMS 49	3.11	2.18(2)	1.39	0.65	2.05	0.94	0.50	0.17	5.68	3.41(12)	2.55	1.47
ICGMS 54	2.55	1.93	1.08	0.65	1.44	0.77	0.50	0.23	5.00	3.75(7)	2.11	1.47
ICGM 484	2.37	1.61	1.59	0.79(9)	2.22	1.34(5)	0.50	0.26	4.88	3.31	2.31	1.46
ICGMS 46	2.15	1.70	1.34	0.85(6)	2.12	1.20	0.89	0.51(2)	4.01	3.01	2.10	1.45
ICGM 608	2.27	1.68	1.18	0.73	1.45	0.90	0.72	0.46(6)	4.54	3.29	2.03	1.41
ICGM 614	2.53	1.89	1.13	0.62	1.89	1.16	0.50	0.25	3.92	2.94	1.99	1.37
ICGMS 38	1.31	1.00	1.40	0.93(5)	1.90	1.25(7)	0.78	0.46(6)	3.80	2.79	1.84	1.29
ICGM 633	2.29	1.70	1.18	0.44	1.72	0.99	0.78	0.29	4.10	2.87	2.01	1.26
ICGMS 36	1.85	1.38	1.46	0.62	2.19	0.99	0.73	0.48(3)	3.36	2.37	1.92	1.25
ICGMS 39	1.73	1.32	1.23	0.85(6)	1.62	1.39(2)	0.89	0.48(4)	3.30	2.42	1.75	1.22
ICGMS 48	1.46	1.06	1.38	0.83(8)	1.85	1.03	0.83	0.39(9)	3.61	2.73	1.83	1.22
ICGMS 35	1.56	1.15	0.94	0.64	1.74	1.10	0.56	3.35	3.86	2.73	1.73	1.18
ICGMS 45	1.84	1.32	1.07	0.44	1.76	1.05	0.44	0.25	3.73	2.67	1.77	1.15
ICGMS 43	1.69	1.30	1.53	1.13(2)	1.68	1.05	0.56	0.36	3.36	2.57	1.76	1.06
Control 1	2.57	2.03(7)	1.93	1.13(2)	2.16	1.23(9)	0.73	0.37(10)	5.46	3.70(8)	- ⁶	-
	(Mani Pintar)		(Chalimbana)		(MGS 2)		(MGS 2)		(Egret)			
Control 2	2.34	1.66(17)	1.38	0.78(10)	2.34	1.39(3)	0.61	0.24(20)	5.18	3.76(5)	-	-
	(Mawanga)		(Mani Pintar)		(Makulu Red)		(Makulu Red)		(Flamingo)			
SE	±0.064	±0.062	±0.194	±0.123	±0.082	±0.072	±0.063	±0.046	±0.324	-		
Trial mean	2.32	1.73	1.38	0.79	1.93	1.14	0.67	0.35	4.69	3.31		
CV (%)	7	7	28	31	8	13	19	26	12	-		

1. Research Station. 2. Regional Research Station. 3. Subresearch Center. 4. Variety Testing Center. 5. Figures in parentheses indicate rank at individual sites. 6. Not available.

rainfall. ICGMS 42 was ranked high at the remaining locations and was once again significantly superior to local control cultivars at most sites (Table 5). Eight of these entries were retained for further evaluation.

We report with satisfaction that ICGMS 42 is now at the prerelease testing stage in eastern Zambia.

Regional Spanish Cultivar Trials

1985/86

Spanish cultivar trials in Maputo (Mozambique), Sebele (Botswana), Ngabu and Lupembe (Malawi), and Magoye (Zambia), were adversely affected by highly variable emergence, poor plant stands, or low shelling percentages. However, at Chitedze (Malawi), ICGMS 5, 11, 29, and 30, and at Masumba (Zambia) ICGMS 11, 12, 15, and 31, significantly outyielded the best local control entries (Table 6). Eleven of these entries were retained for further evaluation.

1986/87

Spanish cultivar trials in Sebele (Botswana), Maputo (Mozambique), Ngabu (Malawi), and Magoye (Zambia) were adversely affected by lack of rainfall. However, certain entries showed promise in some of these trials. ICGMS 56 and 58 gave consistently high yields across locations (Table 7). ICGMS 5 and 11 also performed well but ICGMS 29 and 30 were disappointing at most sites. ICGMS 30 was also ranked poorly at Niamey but performed well in Burundi. Twenty-four of these entries were retained for further evaluation.

Regional Valencia Cultivar Trials

A separate trial containing 14 valencia cultivars was grown for the first time in two SADCC countries in 1986/87. Many entries showed promise, notably ICGM 189, 197, and 286. These entries also performed well in trials in Burundi (Table 8) and Niger.

The composition of the 1987/88 trial has not been altered in view of the limited number of trial sites in 1986/87.

Table 6. Pod and seed yields ($t\ ha^{-1}$) of 36 entries in SADCC Regional Groundnut Variety Trials (Spanish Type), Malawi, Zambia, and Botswana, 1985/86.

Entry	Malawi						Zambia						Botswana					
	Chitedze ¹		Ngabu		Lupembe		Magoye		Masumba		Sebele ¹		Sebele ¹		Sebele ¹		Sebele ¹	
	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed
ICGMS 18	2.30	1.77(4) ²	1.17	0.79(10)	2.23	0.97(8)	1.59	1.06(6)	2.76	1.98(10)	0.85	0.55(1)	0.85	0.55(1)	1.82	1.19	1.82	1.19
ICGMS 34	2.14	1.60	1.18	0.70	2.57	1.12(2)	1.60	1.05(7)	2.83	2.05(6)	0.80	0.52(5)	0.80	0.52(5)	1.85	1.17	1.85	1.17
ICGMS 2	2.28	1.73(8)	1.74	1.09(4)	1.85	0.88	1.70	1.08(5)	2.62	1.81	0.63	0.40	0.63	0.40	1.80	1.16	1.80	1.16
ICGMS 21	1.99	1.45	1.49	0.98(6)	2.17	0.99(6)	1.43	0.88	2.95	2.11(3)	0.88	0.54(3)	0.88	0.54(3)	1.92	1.16	1.92	1.16
ICGMS 11	2.55	1.76(5)	1.64	0.80(9)	2.05	0.86	1.53	0.93	3.46	2.26(1)	0.75	0.32	0.75	0.32	2.00	1.15	2.00	1.15
ICGMS 1	2.04	1.57	1.52	0.91(7)	2.37	1.13(1)	1.61	1.10(3)	2.45	1.74	0.63	0.40	0.63	0.40	1.77	1.14	1.77	1.14
ICGMS 9	2.16	1.51	1.71	1.20(2)	1.83	0.88	1.33	0.87	2.83	2.00(9)	0.67	0.39	0.67	0.39	1.76	1.14	1.76	1.14
ICGMS 33	1.93	1.45	1.96	1.10(3)	2.03	0.81	1.22	0.89	2.82	2.07(5)	0.74	0.45(10)	0.74	0.45(10)	1.78	1.13	1.78	1.13
ICGMS 5	2.70	1.94(2)	1.19	0.66	1.94	0.87	1.56	0.98	3.02	2.04(7)	0.54	0.25	0.54	0.25	1.82	1.12	1.82	1.12
ICGMS 17	2.23	1.72(9)	1.18	0.72(12)	2.05	0.94	1.50	0.93	2.67	1.88	0.95	0.50(7)	0.95	0.50(7)	1.76	1.12	1.76	1.12
ICGMS 27	2.31	1.76(5)	1.08	0.63	2.03	1.03(4)	1.62	0.92	2.72	1.82	0.80	0.50(7)	0.80	0.50(7)	1.76	1.11	1.76	1.11

1. Research Station. 2. Figures in parentheses indicate rank at individual sites.

Continued

Table 6. *Continued*

Entry	Malawi						Zambia				Botswana		Mean	
	Chitedze ¹		Ngabu		Lupembe		Magoye		Masumba		Sebele ¹		Pod	Seed
	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed
ICGMS 22	2.10	1.58	1.37	0.70	2.00	0.96(9) ²	1.41	0.94	2.61	1.89	0.81	0.53(4)	1.72	1.10
ICGMS 32	2.10	1.60	1.13	0.76	2.48	1.09(3)	1.54	0.96	2.65	1.92	0.70	0.29	1.77	1.10
ICGMS 31	2.18	1.59	0.76	0.35	1.84	0.96(10)	1.53	1.11(2)	3.11	2.20(2)	0.62	0.34	1.67	1.09
ICGMS 12	2.38	1.62	1.20	0.69	1.75	0.82	1.35	0.92	3.15	2.08(4)	0.61	0.33	1.74	1.08
ICGMS 26	2.16	1.62	1.36	0.84(8)	1.64	0.76	1.37	0.92	2.58	1.84	0.63	0.39	1.62	1.06
ICGMS 29	2.49	1.84(3)	1.02	0.64	1.79	0.79	1.36	0.90	2.51	1.79	0.63	0.37	1.63	1.05
ICGMS 14	1.70	1.28	1.82	1.06(5)	1.83	0.85	1.37	0.81	2.65	1.77	0.81	0.49(9)	1.70	1.04
ICGMS 16	2.07	1.51	1.17	0.60	1.89	0.84	1.43	0.94	2.58	1.86	0.68	0.37	1.64	1.02
ICGMS 3	1.84	1.38	1.38	0.71(13)	2.12	0.91	1.12	0.88	2.76	1.83	0.61	0.37	1.64	1.01
ICGMS 25	2.22	1.51	1.19	0.55	1.84	0.86	1.50	1.02(8)	2.77	1.83	0.50	0.26	1.67	1.00
ICGMS 28	2.24	1.61	1.09	0.68	1.72	0.71	1.36	0.83	2.51	1.80	0.67	0.37	1.60	1.00
ICGMS 30	3.41	2.35(1)	0.36	0.17(36)	1.62	0.68(35)	1.33	0.81(32)	2.67	1.81(26)	0.48	0.13(36)	1.64	0.99
ICGMS 10	1.91	1.38	1.24	0.72	2.23	0.97(7)	1.10	0.68	2.61	1.82	0.64	0.32	1.62	0.98
ICGMS 23	1.99	1.43	0.88	0.51	2.07	0.92	1.38	0.96	2.49	1.77	0.55	0.29	1.56	0.98
ICGMS 24	1.94	1.44	0.85	0.53	1.60	0.74	1.40	1.10(4)	2.48	1.77	0.53	0.29	1.47	0.98
ICGMS 13	1.83	1.24	1.38	0.76(11)	2.01	0.79	1.41	0.92	2.59	1.79	0.52	0.23	1.62	0.96
ICGMS 15	2.15	1.42	1.22	0.59	1.69	0.62	1.56	0.98	3.21	1.96	0.50	0.18	1.72	0.96
ICGMS 20	1.84	1.32	0.87	0.46	1.49	0.75	1.50	0.99(9)	2.70	1.87	0.63	0.35	1.50	0.96
ICGMS 4	2.12	1.50	1.08	0.50	1.76	0.70	1.11	0.73	2.85	2.02(8)	0.44	0.20	1.56	0.94
ICGMS 6	2.25	1.64(10)	0.50	0.26	1.83	0.77	1.19	0.84	2.22	1.54	0.52	0.26	1.42	0.88
ICGMS 19	1.42	1.01	0.96	0.54	1.38	0.68	1.42	0.98(10)	2.33	1.62	0.72	0.43	1.37	0.88
ICGMS 7	1.98	1.27	1.09	0.51	1.67	0.79	1.30	0.70	2.84	1.81	0.42	0.15	1.58	0.87
ICGMS 8	2.03	1.54	0.99	0.50	1.75	0.83	1.06	0.72	1.97	1.45	0.45	0.19	1.38	0.87
Control 1	2.19	1.62(11)	1.32	0.72(12)	2.20	0.95(11)	1.51	0.98(11)	2.66	1.92(12)	0.81	0.52(5)		
	(Malimba)		(Malimba)		(Malimba)		(Comet)		(Comet)		(Sellie)			
Control 2	2.32	1.74(7)	1.88	1.21(1)	2.18	1.00(5)	1.59	1.25(1)	2.63	1.88(16)	0.90	0.55(1)		
	(Spancross)		(JL 24)		(JL 24)		(Natal Common)		(Natal Common)		(55-437)			
SE	±0.037	3	±0.123	±0.085	±0.226	±0.100	±0.121	±0.090	±0.130	±0.096				
Mean	2.15	1.56	1.22	0.70	1.94	0.87	1.41	0.93	2.70	1.88	0.66	0.36		
CV (%)	3	3	20	24	23	23	17	19	10	10	21	--		

1. Research Station. 2. Figures in parentheses indicate rank at individual sites. 3. Not available.

Table 7. Pod and seed yields (t ha⁻¹) of 36 entries in SADC Regional Groundnut Variety Trials (Spanish Type), Malawi, Zambia, Zimbabwe, Botswana, and Burundi, 1986/87.

Entry	Malawi				Zambia				Zimbabwe		Mean of Malawi, Zambia, and Zimbabwe		Botswana		Burundi	
	Chitedze ¹		Lupembe		Magoye ²		Masumba ³		Gwebi ⁴		Pod	Seed	Sebele ¹		Bujumbura	
	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed			Pod	Seed	Pod	Seed
ICGMS 56	2.07	1.49(2) ⁵	4.34	2.25(1)	1.09	0.42(2)	2.22	1.44(13)	3.55	2.31(5)	2.40	1.58	0.31	0.09	1.57	0.88(2)
ICGMS 63	2.42	1.74(1)	2.69	1.72(10)	0.61	0.26(23)	1.99	1.34(21)	3.40	2.46(2)	2.22	1.50	0.21	0.09	-	-
ICGMS 58	1.92	1.33(3)	3.42	1.82(7)	0.68	0.24(25)	1.83	0.95(31)	3.80	2.47(1)	2.24	1.36	0.36	0.11	0.95	0.48
ICGM 473	1.44	1.09(20)	2.70	1.74(8)	0.72	0.34(11)	2.50	1.90(1)	1.76	1.36(26)	1.82	1.29	0.28	0.08	1.23	0.73(4)
ICGMS 60	1.11	0.84(36)	2.76	1.88(6)	0.81	0.37(7)	1.97	1.34(22)	2.56	1.98(8)	1.84	1.28	0.38	0.19(6)	0.99	0.44
ICGMS 11	1.46	1.08(22)	2.18	1.36(31)	0.92	0.42(1)	2.41	1.68(3)	2.78	1.80(11)	1.95	1.27	0.39	0.18(7)	1.23	0.63
ICGMS 5	1.41	1.04(28)	2.32	1.56(15)	0.79	0.30(17)	2.32	1.60(4)	2.62	1.84(9)	1.89	1.27	0.26	0.08	1.08	0.60
ICGMS 12	1.27	0.93(34)	3.27	1.74(8)	0.90	0.37(7)	2.15	1.46(10)	2.31	1.68(14)	1.77	1.24	0.27	0.14	0.79	0.45
ICGMS 65	1.85	1.30(5)	2.32	1.38(29)	0.78	0.31(16)	1.63	0.94(32)	2.99	2.24(6)	1.91	1.23	0.27	0.13	-	-
ICGMS 13	1.20	0.30(35)	2.85	1.65(12)	0.74	0.30(19)	2.07	1.44(13)	2.62	1.84(9)	1.89	1.23	0.24	0.10	-	-
ICGMS 57	1.62	1.17(15)	2.36	1.37(30)	0.27	0.09(36)	1.94	1.18(29)	3.24	2.35(4)	1.89	1.23	0.18	0.03	1.23	0.67(8)
ICGMS 69	1.87	1.33(4)	2.24	1.48	0.73	0.32	1.90	1.30	2.31	1.74	1.81	1.23	0.25	0.12	-	-
ICGMS 61	1.70	1.28(8)	3.02	1.92(5)	0.49	0.18	2.04	1.29	1.98	1.43	1.76	1.22	0.10	0.04	-	-
ICGMS 68	1.38	0.99	3.38	2.15(2)	0.80	0.38(5)	2.00	1.42	1.60	1.16	1.73	1.22	0.32	0.19(5)	-	-
ICGMS 66	1.35	1.03	3.00	2.04(3)	0.81	0.38(6)	2.22	1.46(10)	1.60	1.12	1.80	1.21	0.30	0.17(9)	-	-
ICGMS 67	1.63	1.14	2.51	1.49	0.89	0.40(3)	1.87	1.23	2.35	1.76	1.85	1.20	0.26	0.15	-	-
ICGM 734	1.37	1.08	2.29	1.54	0.70	0.31	1.96	1.42	2.01	1.60	1.67	1.19	0.33	0.21(4)	0.78	0.61
ICGM 522	1.60	1.20	2.64	1.64	0.48	0.22	1.72	1.20	2.28	1.66	1.74	1.18	0.31	0.16	0.90	0.44
ICGMS 9	1.55	1.18	2.49	1.56	0.55	0.25	2.15	1.58(5)	1.70	1.31	1.69	1.18	0.37	0.22(3)	1.16	0.68(7)
ICGMS 21	1.47	1.12	2.39	1.70	0.85	0.30	2.15	1.46(10)	1.79	1.34	1.73	1.18	0.23	0.12	1.11	0.70(6)
ICGMS 71	1.66	1.21	2.52	1.26	0.61	0.28	2.28	1.52(7)	2.13	1.54	1.84	1.16	0.22	0.07	-	-
ICGMS 70	1.85	1.29(6)	2.42	1.49	0.60	0.22	1.80	1.16	2.31	1.62	1.80	1.16	0.24	0.15	-	-
ICGMS 1	1.62	1.25(9)	2.48	1.54	0.77	0.38(4)	2.26	1.71(2)	1.23	0.92	1.67	1.16	0.25	0.13	0.94	0.57

1. Research Station.

2. Regional Research Station.

3. Subresearch Station.

4. Variety Testing Center.

5. Figures in parentheses indicate rank at individual sites.

Continued

Table 7. *Continued.*

Entry	Malawi				Zambia				Zimbabwe		Mean of Malawi, Zambia, and Zimbabwe		Botswana		Burundi	
	Chitedze ¹		Lupembe		Magoye ²		Masumba ³		Gwebi ⁴				Sebele ¹		Bujumbura	
	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed
ICGM 437	1.29	1.02	2.44	1.61	0.43	0.22	1.84	1.30	2.04	1.63	1.61	1.16	0.21	0.13	0.93	0.61
ICGMS 64	1.53	1.06	2.63	1.40	0.74	0.34	2.18	1.38	2.41	1.50	1.90	1.14	0.28	0.17(10) ⁵	1.13	0.63(10)
ICGMS 21	1.39	1.10	2.28	1.43	0.74	0.31	1.90	1.36	1.85	1.48	1.63	1.14	0.34	0.23(2)	1.16	0.73(9)
ICGMS 2	1.69	1.22(10)	2.33	1.49	0.81	0.35(10)	2.22	1.49(8)	1.45	1.09	1.70	1.13	0.25	0.17	0.96	0.56
ICGMS 59	1.28	0.97	2.20	1.42	0.46	0.24	1.95	1.37	2.25	1.63	1.63	1.13	0.26	0.14	0.54	0.34
ICGMS 55	1.93	1.29(7)	2.22	1.18	0.35	0.10	1.65	0.39	3.43	2.14(7)	1.92	1.12	0.14	0.05	0.76	0.40
ICGMS 31	1.31	1.00	2.44	1.46	0.44	0.21	1.86	1.35	2.01	1.40	1.61	1.08	0.25	0.14	0.74	0.41
ICGMS 29	1.29	0.98	2.40	1.48	0.59	0.29	2.07	1.31	1.64	1.27	1.60	1.07	0.22	0.13	1.21	0.66(9)
ICGMS 30	1.33	0.97(33)	2.44	1.53(19)	2.56	0.17(32)	1.42	0.71(36)	2.13	1.54(13)	1.58	0.98	0.34	0.06(34)	1.90	1.05(1)
ICGMS 62	1.50	1.06	2.26	1.36	0.24	0.07	1.30	0.30	2.35	1.52	1.53	0.96	0.27	0.08	1.49	0.87(3)
ICGMS 72	1.60	1.10	1.79	1.00	0.35	0.11	1.35	0.77	1.88	1.27	1.39	0.85	0.23	0.09	-	-
Control 1	1.38	1.04(25)	2.18	1.32(33)	0.71	0.35(9)	2.16	1.55(6)	3.15	2.20(3)			0.31	0.18(8)	0.35	0.52(19)
	(Malimba)		(Malimba)		(Natal Common)		(Natal Common)		(Valencia R 2)				(Sellie)		(Malimba)	
Control 2	1.56	1.20(13)	3.36	2.04(4)	0.79	0.27(22)	2.09	1.48(9)	3.39	2.54(3)			0.40	0.25(1)	1.00	0.60(15)
	(Spancross)		(JL 24)		(Comet)		(Comet)		(Valencia R 2)				(S5-437)		(Spancross)	
SE	±0.057	±0.041	±0.322	±0.166	±0.095	±0.043	±0.114	±0.086	±0.167	- ⁶			- ⁶	- ⁶	- ⁶	- ⁶
Mean	1.55	1.14	2.61	1.59	0.66	0.29	1.98	1.32	2.27	1.69			0.27	0.13	1.06	0.61
CV (%)	7	7	25	21	29	31	12	13	12	- ⁶			42	- ⁶	- ⁶	- ⁶

1. Research Station.

2. Regional Research Station.

3. Subresearch Station.

4. Variety Testing Center.

5. Figures in parentheses indicate rank at individual sites.

6. Not available.

Table 8. Pod and seed yields (t ha⁻¹) of SADCC Regional Groundnut Variety Trials (Valencia Type), Malawi, Zambia, and Burundi, 1986/87.

Entry	Chitedze Research Station, Malawi		Msekera Regional Research Station, Zambia		Bujumbura, Burundi		Mean	
	Pod	Seed	Pod	Seed	Pod	Seed	Pod	Seed
ICGM 189	2.08	1.56(3) ¹	2.07	1.40(2)	1.46	0.86(11)	1.87	1.27
ICGM 286	2.00	1.52(4)	2.19	1.32(4)	1.41	0.87(10)	1.87	1.24
ICGM 284	2.36	1.75(1)	1.85	1.16(7)	1.33	0.71(16)	1.85	1.21
ICGM 197	1.94	1.40(5)	2.09	1.38(3)	1.53	0.78(14)	1.85	1.19
ICGM 285	2.20	1.58(2)	1.81	1.02(10)	1.65	0.93(7)	1.89	1.18
ICGM 281	1.70	1.19(9)	2.20	1.41(1)	1.59	0.91(8)	1.83	1.17
ICGM 177	1.91	1.39(6)	2.14	1.29(5)	1.51	0.84(12)	1.85	1.17
ICGM 525	1.91	1.37(7)	1.37	0.81(12)	2.38	1.21(2)	1.89	1.13
ICGMS 30	1.40	1.04(10)	1.41	0.88(11)	1.65	1.01(5)	1.49	0.98
ICGMS 31	1.22	0.94(12)	1.68	1.09(8)	1.39	0.74(15)	1.43	0.92
ICGM 559	1.18	0.84(15)	0.67	0.36(16)	2.74	1.43(1)	1.53	0.88
ICGM 550	1.35	0.94(13)	1.07	0.58(13)	2.07	1.03(4)	1.50	0.85
ICGM 554	1.12	0.81(16)	0.82	0.46(14)	2.31	1.10(3)	1.42	0.79
ICGM 561	1.22	0.88(14)	0.79	0.41(15)	2.02	0.99(6)	1.34	0.76
Control 1	1.65	1.24(8)	1.99	1.22(6)	1.57	0.91(8)		
	(Valencia R 2)		(Jacana)		(Spancross)			
Control 2	1.32	0.99(11)	1.62	1.03(9)	1.31	0.81(13)		
	(Malimba)		(Comet)		(Malimba)			
SE	±0.070	±0.051	±0.066	±0.45	±0.054	±0.033		
Trial mean	1.66	1.22	1.61	0.99	1.74	0.95		
CV (%)	8	8	8	9	2	2		

1. Figures in parentheses indicate rank at individual sites.

2. Not available.

1987/88 Program

In addition to ongoing screening and evaluation of breeding material, an enlarged testing program is being conducted this season. This includes five preliminary and two advanced trials of entries from the SADCC/ICRISAT Regional Groundnut Improvement Program, three preliminary and five international trials from ICRISAT station at Chitedze, and one preliminary trial from ICRISAT station at Ngabu.