



With financial support from the Soybean Innovation Lab (SIL) team and the International Institute of Tropical Agriculture (IITA), IITA Mozambique conducted the Pan-African Soybean Variety Trials at two sites (Figure 1): Angonia and Gurue. The 2019/2020 trials in Mozambique tested 31 soybean lines from six countries and seven organizations: Kenya (Kenya Agricultural and Livestock Research Organization – KALRO), Malawi (Department of Agricultural Research Services – DARS), Mozambique (International Institute of Tropical Agriculture - IITA), Uganda (Makerere University), Zambia (IITA, ZamSeed), and Zimbabwe (Seed Co). There were three replications at each location with 4-rows 5 m long, and 50-cm row spacing. The planting and harvest dates for each location are listed in Table 1.

Table 1: Site locations and respective planting and harvest dates, Mozambique 2019/2020

Site Name	IITA	
	Angonia	Gurue
Planting Date	Dec. 30, 2019	Jan. 17, 2020
Harvest Date	May 25, 2020	May 28, 2020
Site Latitude	14.7470° S	15.3509° S
Site Longitude	34.3682° E	36.79293° E
Site Altitude	1151 m	777 m

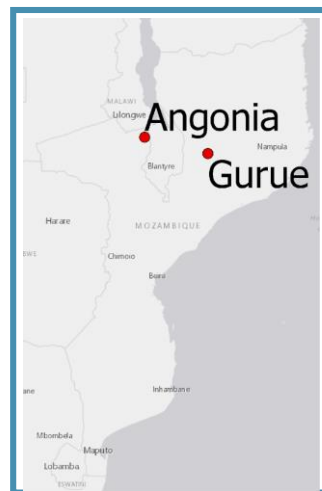


Figure 1: Locations of Mozambique trial sites, 2019/2020

The soils at both sites are highly acidic and would benefit from application of lime. Despite this low pH, Gurue has excessive available P, well above the critical limit of 25-30 mg/kg for soybean; hence; it is not necessary to apply P. Soil amendment with Lime is a better resource investment. For Angonia, a combination of P application and liming is recommended. At least 26 kg P per ha should be added to increase the soil test level to the 25 mg/kg critical value. This should be accompanied by liming to avoid P fixation. Soils at both sites are adequate in available K, so only maintenance application is recommended to account for export with grain harvest are needed. Organic matter at both sites is high (Angonia) to very high (Gurue), suggesting that correcting soil acidity may have as much a benefit to fertility as inputs.

Table 2: Pre-planting soil properties of 2019/2020 IITA – Mozambique sites

Test	Units	Angonia	Gurue
Soil pH		5.3	5.4
Phosphorus (P)	ppm	12	111
Potassium (K)	ppm	135	185
Organic matter	%	3.6	5.5

Table 3: Recommendations on soil nutrient concentrations of Mehlich III extraction, used for soils with pH < 7. Values are in parts-per-million on a soil basis.

Nutrient	Low	Adequate	High
P	<25	26-50	>51
K	<60	61-175	>175

Environmental conditions are presented in Table 4. Angonia experienced lower temperatures throughout the growing season than Gurue. Data on seed yield, days to flowering, days to maturity, plant height, shattering, lodging, and seed size were collected (Table 5) and a statistical analysis was conducted across environments and for each individual environment (Table 6).

Table 4: Total monthly rainfall (mm) and average minimum and maximum temperatures (°C) for the trial sites in Mozambique, 2019/2020

Location	Angonia			Gurue		
	Rainfall (mm)	Min (°C)	Max (°C)	Rainfall (mm)	Min (°C)	Max (°C)
December	136.8	19.5	28.2	126.5	21.2	29.9
January	302.9	18.7	26.2	329.2	19.9	28.8
February	129.1	18.9	27.2	113.8	19.0	28.7
March	9.8	17.8	27.4	15.9	15.8	26.7
April	8.1	17.0	28.2	12.8	14.6	24.6
May	6.1	13.5	25.9	4.7	13.5	23.6



Figure 2: Trial site at Angonia, 2019/2020

Table 5: Methods and units for traits measured in the 2019/2020 soybean variety test

Trait	Units	Measurement Method
Seed Yield	tons/hectare	Plants harvested and threshed, seed winnowed and weighed at 13% moisture
Days to Flowering	days	Days until 50% of the plants in a plot have at least 1 open flower
Days to Maturity	days	Days until 95% of the pods have turned their maturity color
Plant Height	centimeters	Distance from soil surface to the top node on the main stem at maturity
Lodging Score	1-5 score	Visually estimated; 1 = plants fully erect and 5 = plants prostrate
Shattering Score	1 – 5 score	Visually estimated; plots rated 2 weeks after maturity; 1 = no shattering and 5 = 100% shattered
100 Seed Weight	grams/100 seeds	100 seeds are randomly selected and weighed

The top five yielding varieties across environments were from Seed Co and IITA (Table 6). S1146/5/25 (2.7 tons/ha), SC Status (2.6 tons/ha), TGx2014-16FM (2.5 tons/ha), TGx2014-23FM (2.4 tons/ha), and TGx2001-8DM (2.4 tons/ha) were the top yielding varieties across environments (Table 6). The mean yield across the two sites ranged from 1.6 tons/ha (TGX 2014-5GM) to 2.7 tons/ha (S1146/5/25) with an average yield of 2.1 tons/ha.

Across environments days to flowering ranged from 37 to 45 days after planting, while days to maturity ranged from 93 to 104 days after planting (Table 6). The earliest maturing entries were Tikolore and TGx 1991-22F, both registered in Malawi, while the latest maturing line was Zamboane, a commercial variety in Mozambique. Plant height ranged from 49.2 cm (TGX 2014-23FM) to 86.7 cm (TGX 2014-5GM). Seed size ranged from 12.6 g/100 seeds (Zamboane) to 20.6 g/100 seeds (S1150/5/22). Plant lodging scores ranged from 1.0 to 1.5. Shattering scores ranged from 1.0 to 2.3, with the highest shattering scores recorded for Lukanga. These trial results supported decisions on what varieties to grow during the 2020/2021 production season and which varieties show promise for eventual registration and release.

Table 6: Average grain yield, days to flowering, days to maturity, plant height, plant lodging score, shattering score, and 100-seed weight across locations and grain yield at each site in Mozambique, 2019/2020.

Entry	Source	Across locs			Days to flowering	Days to maturity	Plant Height	100 Seed Weight	Lodging	Shattering
		Angonia	Gurue	Mean						
		----- tons/ha -----			days	days	cm	g	1-5	1-5
S1146/5/25	Seed Co (Zimbabwe)	2.7	2.6	2.7	43	97	71.2	15.9	1.0	1.2
SC STATUS	Seed Co (Zimbabwe)	2.6	2.7	2.5	41	97	66.9	16.6	1.0	1.0
TGX 2014-16FM	IITA (Zambia)	2.5	2.5	2.5	39	95	69.9	14.8	1.0	1.0
TGX 2014-23FM	IITA (Zambia)	2.4	2.3	2.5	44	96	86.7	15.2	1.0	1.0
TGX 2001-8DM	IITA (Zambia)	2.4	2.9	1.9	42	99	58.4	17.9	1.0	1.2
MAKSOY 5N	Makerere U. (Uganda)	2.3	2.5	2.1	45	96	76.3	17.2	1.5	1.7
SC SQUIRE	Seed Co (Zimbabwe)	2.3	2.5	2.1	41	95	67.5	18.7	1.0	1.3
TGX 1987-62F	IITA (Zambia)	2.3	2.5	2.0	44	96	70.0	13.6	1.5	2.0
TGX 1991-22F	DARS (Malawi)	2.2	2.7	1.7	42	94	71.2	14.8	1.2	1.7
MAKWACHA	DARS (Malawi)	2.2	2.7	1.8	40	95	66.8	15.4	1.0	1.3
NASOKO	DARS (Malawi)	2.2	2.4	2.0	42	97	58.0	16.2	1.0	1.0
SC SIGNAL	Seed Co (Zimbabwe)	2.2	1.8	2.5	41	99	70.1	14.6	1.0	1.2
NYALA	KALRO (Kenya)	2.2	2.7	1.7	37	95	53.2	17.6	1.0	1.8
GAZELLE	KALRO (Kenya)	2.1	2.8	1.4	40	96	68.0	17.4	1.0	1.8
TGX 2002-3FM	IITA (Zambia)	2.1	2.4	1.7	40	96	62.8	18.8	1.0	1.0
S1150/5/22	Seed Co (Zimbabwe)	2.1	2.7	1.4	38	97	51.9	20.6	1.0	1.8
TGX 1835-10E	IITA (Zambia)	2.0	2.6	1.4	42	98	60.0	13.7	1.0	1.0
SC SPIKE	Seed Co (Zimbabwe)	2.0	2.2	1.7	40	96	68.0	17.0	1.0	1.0
S1079/6/7	Seed Co (Zimbabwe)	1.9	2.1	1.8	40	96	75.6	17.2	1.0	1.0
TIKLORE	DARS (Malawi)	1.9	2.5	1.3	40	93	66.5	14.2	1.0	1.3
TGX 2001-3FM	IITA (Zambia)	1.9	1.9	1.9	38	97	71.2	16.7	1.0	1.0
LUKANGA	ZamSeed (Zambia)	1.9	2.7	1.0	42	97	56.3	15.9	1.0	2.3
S1180/5/54	Seed Co (Zimbabwe)	1.9	2.0	1.8	42	99	51.9	20.1	1.0	1.0
TGX 2001 11DM	IITA (Zambia)	1.8	2.3	1.3	40	98	68.3	18.9	1.0	1.0
TGX 2001-13DM	IITA (Zambia)	1.8	1.7	2.0	42	98	68.7	15.7	1.0	1.2
KALEYA	ZamSeed (Zambia)	1.8	2.4	1.1	43	95	54.9	14.7	1.0	1.0
Zamboane	IITA (Mozambique)	1.7	2.1	1.4	44	104	73.3	12.6	1.0	1.0
SC SAGA	Seed Co (Zimbabwe)	1.6	1.9	1.3	41	96	58.6	18.7	1.0	1.7
TGX 2002-14DM	IITA (Zambia)	1.6	1.9	1.3	40	98	54.7	17.7	1.0	1.5
TGX 2001-6FM	IITA (Zambia)	1.6	1.7	1.4	43	96	65.3	15.0	1.0	1.0
TGX 2014-5GM	IITA (Zambia)	1.6	2.0	1.1	39	97	49.2	16.4	1.0	1.2
Mean		2.1	2.3	1.8	41	97	64.9	16.4	1.0	1.3
LSD		0.6	1.0	0.5	5	3	13.2	2.9	0.3	0.7
CV (%)		22.8	25.3	16.3	3.9	3.6	16.5	6.9	7.1	23.0
Genotype significance		**	ns	**	**	**	**	**	**	**
G x E significance		**	-	-	**	ns	**	**	**	**

*, ** There is significant differences between sources of variation at 5% and 1% level of probability; ns: not significant



For further information on where to obtain seed of available registered varieties, or for companies and organizations interested in registering varieties, please contact the variety supplier below:

Department of Agricultural Research Services (DARS):

Florence Kamwana Ngwira, Legume Agronomist (MSc)

Chitedze Research Station

P. O. Box 158, Lilongwe, Malawi

Mobile: +265 996 386 536

kamwanaflorence@yahoo.co.uk

Makerere University:

Phinehas Tukamuhabwa, Professor

Plant Breeding and Genetics

P.O Box 7062

Kampala, Uganda

Phone: +256 772498691

p.tuka@caes.mak.ac.ug

tphinehas@yahoo.com

International Institute for Tropical Agriculture (IITA) – Mozambique:

Steven Boahen

Av. FPLM, Via Corrane, KM8

PO Box 709, Nampula, Mozambique

Phone: +258 823 045 286

s.boahen@cgiar.org

Seed Co Limited:

Dennis Mdzalimba, Marketing Manager
Zimbabwe

Cell: +265 99 948 7391

dennis.mdzalimba@seedcogroup.com

International Institute for Tropical Agriculture (IITA) – Zambia:

Godfree Chigeza, Soybean Breeder

Plot 1458B, Ngwerere Road Chongwe District,

P.O. Box 310142, Chelston, Lusaka, Zambia

Phone: +260 971 799 245

G.Chigeza@cgiar.org

ZamSeed:

Zambia Seed Company

Buyantanshi Rd,

PO Box 35441, Lusaka, Zambia

Phone: +260 21 1243762/248025

seed@zamnet.zm

zamseed@zamseed.co.zm

Kenya Agricultural & Livestock Research Organization (KALRO):

James N. Njoroge, Plant Breeder (MSc)

P.O Private Bag-20107, Njoro, Kenya

Phone: +254 720 672 327

jamnjoros@gmail.com

James.Njoroge@kalro.org

For further information on the 2019/2020 trials in Mozambique with the International Institute for Tropical Agriculture, contact the trial operator below:

International Institute for Tropical Agriculture (IITA) – Mozambique:

Steven Boahen

(see information provided in seed supplier list)