

Product Profile name: High yielding, *Striga* resistant and *Fusarium oxysporum* f.sp. *strigae* (FOS) compatible, and low tannin sorghum for Tanzania



Emmanuel Justine Mrema,
Sorghum Breeder, TARI, Tumbi

Design target

Delivery of high yielding, *Striga* resistant and low tanning sorghum varieties in the semi-arid parts of Africa.

Dr. Emmanuel Justine Mrema is currently a Director and Plant Breeder at Tanzania Agricultural Research Institute Tumbi Centre (TARI Tumbi). Apart from administration activities at the centre, he leads a sorghum breeding program aiming at delivery of sorghum varieties with low tannin, *Striga* resistant and compatible to *Fusarium oxysporum* f.sp. *strigae* (FOS) and a biocontrol agent of *Striga*. He has worked on sorghum for over 8 years and he graduated for his PhD in April 2018 at the University of KwaZulu Natal (UKZN), South Africa. His thesis was on Integrated *Striga* Management in Sorghum through Resistance Breeding and Biocontrol in the Semi-Arid Regions of Tanzania. Dr Mrema published six articles as the part of his PhD work and two sorghum varieties (TARISOR1 and TARISOR2) were released in 2021 in Tanzania. Their target is to commercialized the released varieties across SADEC countries of Africa.



Product Profile design team

Step 1

PP Design Team Lead/Champion		
Emmanuel Justine Mrema		Tanzania Agricultural Research Institute, Tumbi Centre
PP Design Team		
Person	Area of Expertise	Name of organization
Dr. Emmanuel Justine Mrema	Plant Breeder	Tanzania Agricultural Research Institute, Tumbi Centre
Prof. Hussein Shimelis	Prof of Plant Breeding	University of KwaZulu-Natal, African Centre for Crop Improvement
Prof. Mark Laing	Prof of Plant Pathology	
Dr. Kiddo Mtunda	Plant Breeder	IITA
Mr Dismass Paschal Ringi	Agriculture Economics	Tanzania Agricultural Research Institute, Tumbi Centre
Dr Dyness Dickson Kejo	Food Scientist	Tanzania Food and Nutrition Centre
Mr James Kalist Mwajombe	Agriculture Extension	Tanzania Agricultural Research Institute, Tumbi Centre

Step 2

Product profile descriptors	
Product profile name	High yielding, <i>Striga</i> resistant and FOS compatible, and low tanning sorghum
Crop	Sorghum [<i>Sorghum bicolor</i> (L.) Moench]
Country	Tanzania
Geographic regions	East and South Africa countries
Market segment and positioning	Beverage industries and domestic use for food, feed and local brew for both rural and urban communities
Name of target variety to be replaced	Macia Strength: High yielding and low tannin Weaknesses: Susceptible to birds' attack and <i>Striga</i> inversion
Date PP created	01 July 2022

Target client and use	
Value chain primary clients/customers	Farmers, seed agencies, beverage industries, processors, transporters, and consumers are the main beneficiaries of sorghum seeds, grain or sorghum products and by-products
Market scale	Households, local, regional, national and international markets
Use	Food, brewing, and animal feed
Type of processing	Threshing, drying, cooking, milling, and brewing
Market class	Seed, grain, flour, processed feed, stalk

Target crop producers and production system	
Number of farmers	6,000 – 10,000
% ratio: male to female farmers	50 to 60 females and 40 to 50 males
Production system	Open field, irrigation, and screen house
Area of production system	500 to 900 (ha)
Growth habit	Sorghum
Expected level of inputs	Medium (fertilizers, herbicides and crop and seed protection chemicals)
Typical yield range of target system	3.2 to 3.6 t/ha

Cropping system Mechanization	Sole and intercropping
	Plant management (weeding and insecticide application) and processing (threshing, winnowing and seed dressing)
Agroecological zone(s)	800 – 1500 metres above sea level
Total vegetative propagation material market	300 to 600 tonnes

Variety technical specification

Step 3

Client/customer	Driver	Trait category	Preference group: Women (W) Men (M) Youth (Y) W+M+Y (All)	Trait demand classification: 1. Essential/ "must have" 2. Niche opportunity 3. Added-value 4. Winning trait	Target traits	Trait description (Quantitative measures)	Name of benchmark variety	Performance required compared to benchmark variety <, =, > etc.
Farmer	Productivity	Yield	All	1	Grain yield	1.8 (t/ha)	TARISOR1	=
			All	2	Low tannin	Low to medium	Macia	=
			W	1	High carbohydrate	High	TARISOR2	=
		Biotic stress resistance	All	4	<i>Striga</i> resistance	Tolerance	TARISOR1	<
			All	3	Bird resistance	Tolerance	TARISOR1	<
		Abiotic stress tolerance	All	1	Drought tolerance	Tolerance	Macia	=
	Fodder/Forage	Biomass	All	3	Stem length and leaf size	Medium	Macia	>
		Animal nutrition	All	3	Low fibre content	Low fiber content	Macia	<
		Animal palatability	All	4	Taste and digestibility	High	TARISOR1	<
		Animal digestibility	All	3	Highly digestible	High	Macia	=
	Crop management and harvesting	Plant architecture	All	1	Plant length	Short to medium	TARISOR1	<
		Market value and price	Grain weight	All	1	Heavy	High	Macia
	Crop duration		All	1	Early maturing	Medium	TARISOR1	<
	Post-harvest storage	Storage life	All	3	Resistance to storage weevils	Tolerance	TARISOR2	=
Transporter	Durability and cost	Container suitability	All	3	Reflection of seeds in a packaging material	white	TARISOR2	<
		Transportability and storage	All	3	Resistance to breakage	Tolerance	TARISOR2	<
Retailer	Sales and profit	Shelf-life	All	3	Duration from harvesting to processing	Medium	Macia	>
Consumer	Satisfaction	Taste	All	1	Palatability	Palatable	Macia	=
		Appearance	All	3	Colour	White	TARISOR2	<
		Shelf-life	All	3	Duration from harvesting to processing	Medium	Macia	>
		Nutrition	All	1	Nutritional composition	Nutritive	Macia	=
		Digestibility	All	1	Tannin, fibre, protein and carbohydrate composition	Digestible (contain low tannin, fibre, protein and high carbohydrate)	Macia	=
		Food preparation	(W)	3	Cooking time	Less than one hour	Macia	=
Seed/vegetative material producer	Scalability and cost	Seed numbers	All	1	Number of seeds per panicle	Many	TARISOR2	<

Seed distributors	Variety identification	Reproductive fertility	All	1	Number of tillers	Medium	TARISOR2	<
		Ease of vegetative propagation	All	4	Ability to transplant	High	TARISOR1	=
		Unique appearance of plants, grain and produce	All	1	Grain size, colour, number and weight and stem length	Large grain size which white in colour, and with many heavy seeds. Stem length should be short to medium	TARISOR1	=
Processor	Raw material quality specification	Milling	All	3	chemically and physically distinct flour and bran fractions	Bran material that contained low amounts of ash, protein, fat, total dietary fiber, and total phenolic and higher starchcontent but less starch,	Macia	=



Experimental trilas for sorghum breeding at TARI Tumbi, Tabora (A), and the two benchmark released sorghum varieties; TARISOR2 (B) and TARISOR1 (C) under field conditions

“Demand-Led Breeding is helping African Breeders to produce varieties with farmers and consumers preferences, adaptable to climate change and with high adoption”