



Market Intelligence Digest

Sorghum | Nigeria

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Market Intelligence
Area of Work

The CGIAR Market Intelligence Area of Work aims to maximize the impact and return on investment of breeding programs by integrating market insights, behavioral intelligence, and strategic prioritization. It identifies high-impact opportunities, guides product development, and enhances product adoption and lifecycle management through decision-support tools.

ENGLISH VERSION

Sorghum | Nigeria

A. Market Segments

	Harvested area (ha)	% of Total harvested area
Total Area Covered by Seed Product Market Segment (Active only)	5,320,357	100
<u>Sorghum WAF MS00400</u> Sorghum Non-Hybrid WAF Food; Fodder White; Cream Sudan; Guinea zone Rainfed Mid	2,660,178	50
<u>Sorghum WAF MS00673</u> Sorghum Non-Hybrid WAF Food; Fodder White; Cream Sahelian Zone Rainfed Early	1,330,089	25
<u>Sorghum WAF MS00677</u> Sorghum Non-Hybrid WAF Malting; Feed White; Cream Guinea zone; Sudan Rainfed Mid	532,036	10
<u>Sorghum WAF MS00678</u> Sorghum Non-Hybrid WAF Food; Food Processing; Poultry White Guinea zone; Sudan Rainfed Mid	266,018	5
<u>Sorghum WAF MS00681</u> Sorghum Non-Hybrid WAF Food; Fodder; Local Malting Red Guinea zone; Sudan Rainfed Mid	266,018	5
<u>Sorghum WAF MS00674</u> Sorghum Hybrid WAF Food; Fodder White; Cream Sahelian Zone Rainfed Early	106,407	2
<u>Sorghum WAF MS00675</u> Sorghum Hybrid WAF Food; Fodder White; Cream Sudan; Guinea zone Rainfed Mid	106,407	2
<u>Sorghum WAF MS00680</u> Sorghum Non-Hybrid WAF Ethanol production White; Cream Guinea zone; Sudan Rainfed Mid	53,204	1
National Harvested Area (ha) (FAOSTAT)	5,320,355	
Difference between market-segmented area and national harvested area	-2	0

Sorghum | Nigeria

B. Market Segment Criteria

MS Criteria	Value	Harvested area (ha)	% of Total harvested area
Crop	Sorghum	5,320,357	100
Subregion	West Africa	5,320,357	100
Material Type	Non-Hybrid	5,107,543	96
	Hybrid	212,814	4
Consumer Product Type	Fodder; Food	4,203,081	79
	Feed; Malting	532,036	10
	Food; Food Processing; Poultry	266,018	5
	Fodder; Food; Local Malting	266,018	5
	Ethanol production	53,204	1
Color	Cream; White	4,788,321	90
	White	266,018	5
	Red	266,018	5
Production Environment	Guinea zone; Sudan	3,883,861	73
	Sahelian Zone	1,436,496	27
Production System	Rainfed	5,320,357	100
Maturity	Mid	3,883,861	73
	Early	1,436,496	27

Sorghum | Nigeria

C. Target Product Profiles and Breeding Pipelines

Seed Product Market Segment	Target Product Profile	Breeding Pipeline	Breeding Effort
<u>Sorghum WAF MS00400</u>	<u>Sorghum WAF CIMMYT TPP00810</u> <u>Sorghum WAF ICRISAT TPP01036</u>	Sorghum CIMMYT BP00226 Sorghum ICRISAT BP00176	Category 1: Full -
<u>Sorghum WAF MS00673</u>	<u>Sorghum WAF CIMMYT TPP00809</u> <u>Sorghum WAF ICRISAT TPP01037</u>	Sorghum CIMMYT BP00225 Sorghum ICRISAT BP00174	Category 1: Full Category 1: Full
<u>Sorghum WAF MS00674</u>	<u>Sorghum WAF CIMMYT TPP00812</u> <u>Sorghum WAF ICRISAT TPP01039</u>	Sorghum CIMMYT BP00228 Sorghum ICRISAT BP00176	Category 1: Full Category 1: Full
<u>Sorghum WAF MS00675</u>	<u>Sorghum WAF CIMMYT TPP00813</u> <u>Sorghum WAF ICRISAT TPP01040</u>	Sorghum CIMMYT BP00229 Sorghum ICRISAT BP00180	Category 1: Full Category 1: Full
<u>Sorghum WAF MS00677</u>	<u>Sorghum WAF CIMMYT TPP01042</u> <u>Sorghum WAF ICRISAT TPP01043</u>	Sorghum CIMMYT BP00226 Sorghum ICRISAT BP00180	Category 2: Early and Late Testing Category 2: Early and Late Testing
<u>Sorghum WAF MS00678</u>	<u>Sorghum WAF CIMMYT TPP00814</u> <u>Sorghum WAF ICRISAT TPP01041</u>	Sorghum CIMMYT BP00226 Sorghum ICRISAT BP00180	Category 2: Early and Late Testing Category 2: Early and Late Testing
<u>Sorghum WAF MS00680</u>	-	-	-
<u>Sorghum WAF MS00681</u>	<u>Sorghum WAF CIMMYT TPP00811</u> <u>Sorghum WAF ICRISAT TPP01038</u>	Sorghum CIMMYT BP00227 Sorghum ICRISAT BP00176	Category 1: Full Category 1: Full

Sorghum | Nigeria

D. Mapping Traits from TPPs and MI Evidence to Value Propositions

Value Proposition	Essential improved traits from 14 TPPs*	Key traits from MI Evidence
01 Farmer • Higher Productivity	Grain yield (at 12.5% moisture content) (14)	High Grain Yield
02 Farmer • Higher fodder yield or value	Fodder yield (10)	No key traits found from MI Evidence
03 Farmer • Less Loss & Risk: CC relevant stress	No essential traits to be improved	Drought Tolerance
04 Farmer • Less Loss & Risk: Biotic stress	- Anthracnose Resistance (8) - Midge Tolerance (14) - Striga resistance (14)	Striga Resistance
07 Farmer • Greater fertilizer use efficiency	No essential traits to be improved	Nitrogen Use Efficiency
08 Farmer • Less labour	No essential traits to be improved	Free Threshability
09 Farmer • Appropriate maturity	No essential traits to be improved	Early Maturity
11 User • Less labour	No essential traits to be improved	- Corneous (Horny) Endosperm Texture - Easy Dehulling and Short Cooking Time - Corneous Texture for Milling Recovery
12 User • Meeting end-user requirements	No essential traits to be improved	- Good Taste / Eating Quality - White and Yellow Grain Color - Bold/Large Grain Size - High Free Amino Nitrogen (FAN) - High Flour Cohesiveness
13 User • Better nutrition and/or health	No essential traits to be improved	- Corneous Endosperm Texture - High Micronutrient Density (Zinc/Iron) - Gluten-Free Functionality - Low Condensed Tannins
14 Multiplier – Easier to multiply	No essential traits to be improved	- Seed Longevity - Seed Supply Gap

* Values in parentheses () reflect the frequency of appearance of each essential improved trait across the active TPPs.

See **Section E** for reference

Note: "Essential: Maintain" and "Nice-to-Have" traits of TPPs are not included in the table

Sorghum | Nigeria

D. Mapping Traits from TPPs and MI Evidence to Value Propositions

List of Value Propositions

- **01 Farmer • Higher Productivity:** More yield in a representative target environment.
- **02 Farmer • Higher fodder yield or value:** More fodder: yield and quality (like digestibility)
- **03 Farmer • Less Loss & Risk: CC relevant stress:** Avoided yield losses and more production stability in the face of climate change-relevant shocks and stresses such as drought, excess water (excessive rains, waterlogging, submergence, typhoons), heat, and salinity
- **04 Farmer • Less Loss & Risk: Biotic stress:** More production where and when this pest or disease occurs.
- **05 Farmer • Less Loss @ Location:** Crop production in less favorable environmental conditions, such as cold, acidity, alkalinity, shade, salinity, iron toxicity.
- **06 Farmer • Less Loss – Other:** Less loss in the field due to shattering or lodging.
- **07 Farmer • Greater fertilizer use efficiency:** Less need for fertilizer, more production at low levels of fertilizer, biological nitrification inhibition (BNI).
- **08 Farmer • Less labour:** Ability to mechanize. Less work and drudgery for weeding, harvesting and on-farm sorting.
- **09 Farmer • Appropriate maturity:** Better fit in the cropping system. Varieties that may induce early maturity or prolong the time it takes to harvest the crop.
- **10 Farmer/user • Longer storage life:** Longer storage with fewer losses. Other avoided losses due to processing?
- **11 User • Less labour:** Less labour for home processing (peeling/shelling ability (incl. shape), cooking time).
- **12 User • Meeting end-user requirements:** Product meets market intermediaries/end-use requirements in critical aspects. Physiological improvements that focus on standards/qualities of formal markets (e.g. color, size, texture, protein)
- **13 User • Better nutrition and/or health:** More nutritional and/or healthier product regarding protein, fiber, iron, zinc, beta-carotene and toxins. When combined with awareness raising and nutrition education, results in higher (induced) demand.
- **14 Multiplier – Easier to multiply:** Lower costs to multiplier; greater seed availability to farmers.
- **15 Other:** Undefined value to farmer, end user, or multiplier

Sorghum | Nigeria

E. Synthesis of evidence highlighting key traits by thematic area

Overview

The potential for sorghum to drive economic transformation in Nigeria is currently throttled by a disjointed seed system where 74.4% of farmers remain trapped in the informal sector due to the high cost of certified seeds and their exclusion from the government's Anchor Borrowers Program (ABP). Breeding programs must shift from focusing solely on yield to a multi-functional Target Product Profile (TPP) that bridges the gap between smallholder risk and industrial demand. This requires interweaving high-performance genetic traits—such as drought tolerance and Striga resistance—with "system-synergy" traits like morphological distinctness and seed longevity to ensure variety purity and viability within the informal exchange networks that dominate rural Nigeria. Furthermore, to unlock the industrial brewery and malting markets, new varieties must meet rigid technical standards for High Free Amino Nitrogen (FAN) and Corneous endosperm while simultaneously addressing the "time poverty" of female processors through easy dehulling and short cooking times. Success in this market is not merely a biological challenge; it requires a coordinated institutional shift to relax rigid certification rules and invest in rural logistics and digital transparency to connect the savanna's productivity to the nation's industrial hubs.

1. Consumers

- **Good Taste / Eating Quality:** Consistently ranked as the top priority in participatory rural appraisals for traditional staple preparations like *Tuwo*.
- **White and Yellow Grain Color:** Highly preferred for marketability and visual appeal in traditional Nigerian food segments.
- **Bold/Large Grain Size:** A critical driver for variety adoption and marketability for both commercial and domestic processing.
- **Gluten-Free Functionality:** Essential for the health-conscious and medical market segments, specifically for Nigerian celiac patients.
- **Corneous Endosperm Texture:** Identified as a key source of protein and essential for high-quality flour production.

2. Processors

- **High Free Amino Nitrogen (FAN):** A critical malting trait required by the Nigerian brewing sector to ensure consistent yeast activity.
- **Low Condensed Tannins:** Essential for improving biodegradation in fermenters and enhancing protein bioavailability in processed foods.
- **Corneous (Horny) Endosperm Texture:** Solves technical bottlenecks related to low milling recovery and the difficulty of mechanical dehulling.
- **Free Threshability:** A morphological trait that solves primary processing bottlenecks by allowing seeds to separate easily from glumes.
- **Seed Longevity:** Essential stop-gap trait to ensure seed viability under poor on-farm storage conditions in Northern Nigeria.

Sorghum | Nigeria

E. Synthesis of evidence highlighting key traits by thematic area

3. Producers

- **High Grain Yield:** Consistently ranked as the top priority for food security and income generation.
- **Drought Tolerance:** Required for survival and stable production in rainfed savanna environments with erratic rainfall.
- **Striga Resistance:** Critical for preventing severe economic damage from parasitic witchweed infestations in Northern Nigeria.
- **Nitrogen Use Efficiency:** Maintains yield stability for smallholders with limited access to inorganic fertilizers.
- **Early Maturity:** Enables the crop to complete its cycle within shortened or unreliable growing seasons to offset drought risk.

4. Gender & Social Inclusion

- **Easy Dehulling and Short Cooking Time:** Directly addresses the labor drudgery and "time poverty" traps faced by Nigerian women.
- **High Flour Cohesiveness:** Meets the sensory standards held by female household processors for traditional staples like *Tuwo* and *Kunu*.
- **Seed Supply Gap:** Aids in variety identification within the informal seed networks used by over 74% of farmers.
- **High Micronutrient Density (Zinc/Iron):** Provides essential health benefits for children, addressing consumer demands often driven by female managers.
- **Corneous Texture for Milling Recovery:** Supports women and youth entering the value chain as small-scale flour milling entrepreneurs.

5. Enabling Environment

- **Anchor Borrowers Program (ABP) Inclusion:** Institutional fix needed to provide smallholders with low-interest loans for production inputs.
- **Relaxation of Seed Certification Rules:** Policy fix to enable flexible, quality-declared delivery systems and legalize informal seed flows.
- **Industrial Market Linkages:** Institutional fix to connect producers to the industrial malting and brewing sectors via off-taker agreements.
- **Rural Infrastructure (Feeder Roads):** Infrastructure fix required to reduce the high transaction and access costs at trade hubs like Dawanu.
- **Digital Market Information Systems:** Infrastructure fix to enhance transparency in prices and demand for rural producers.

Sorghum | Nigeria

E. Synthesis of evidence highlighting key traits by thematic area

References

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Sorghum | Nigeria

Annex 1. Insights from Market Intelligence Publications

No data available

Sorghum | Nigeria

Annex 2: Requests for MI Evidence from PDT Meetings

MI Researchable Questions	Value Chain	Regional Crop Network	CGIAR coordinating Center	Network Priority
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No data available

Sorghum | Nigeria

Annex 3: Definitions of commonly-used terms

Terms	Description
Market Segment or Seed Product Market Segment (SPMS)	A group of farmers with common product needs, driven by consumer and processor requirements (what) combined with a set of farmer requirements based on where and how the product is grown.
Market Segment Criteria	The eight criteria used to identify and define a market segment. Not all market segments will require all criteria to be identified e.g. maturity is not relevant for perennial crops. Non-applicable terms are captured as NA. To begin with, Market Segments were captured at the subregional level. • Crop: A crop in the CGIAR crop breeding portfolio. What entails a crop (as compared to a germplasm type) follows the convention what FAO defines to be a crop, so interoperability with FAO data sets can be ensured. Germplasm Type are used for subspecies (e.g. Plantain and Banana, Durum and Bread (wheat) or other types of consistent subgroupings of crops between which crosses are rarely made (winter wheat, spring wheat). It is the crop's assessment whether and how they want to use this attribute. • Subregion: Subregion(s) and countries on where the crop is grown (MS subregions derived from the seven regions recognized by CGIAR). • Material Type: Hybrid or non-Hybrid • Consumer Product Type: The processor and consumer requirements for a product, how they choose to process the product. • Color: Color of the grain or flesh of the product required by a market segment. • Production Environment (Agroecological Zone): Geographical areas exhibiting similar climatic conditions that determine their ability to support agriculture, typically defined by their geography, humidity and elevation. • Production System: How the crop is grown • Maturity: Maturity of the crop required where the crop is grown.

Sorghum | Nigeria

Annex 3: Definitions of commonly-used terms

Terms	Description
Target Product Profiles (TPPs)	Defined to understand what essential (and nice-to-have) traits are required in a new product to meet or exceed the needs of farmers, processors and consumers in one particular crop market segment.
Breeding Effort	The extent of effort put on closely related Target Product Profiles (TPPs) that derive from one Breeding Pipeline = crossing block • Category 1: Full: The TPP which is the main target of the breeding effort (= for which most resources are available) is called Category 1 TPP. The Category 1 TPP Essential Trait requirements define the crossing block, and the extraction of candidates for early stage testing, late stage testing and on-farm verification. A Breeding Pipeline can only have one Category 1 TPP. The other TPPs that derive from the same population improvement effort, are assigned Category 2, 3 or 4. • Category 2: Early and Late Testing: This category has a separate variety selection effort that selects different candidates from early stage testing, before proceeding to late stage testing and on-farm verification. This is typically the case when CGIAR breeding programs send the same set of lines, clones or hybrids for early testing to partners and these partners select (and/or extract in the case of segregating lines) different TPPs out of the materials received.. • Category 3: Backcrossing: This category differs from Category 1 by one or two simply inherited Essential Improve Trait(s) that can be achieved through backcrossing. • Category 4: Late Testing: This category has a separate variety selection effort that selects different candidates from late-stage testing, before proceeding to on-farm verification. • Category 5: None: This category is for Market Segments with no TPP defined or no TPP linked to a CGIAR Breeding Pipeline
Breeding Pipeline	The sum of the breeding efforts (product design, crossing and screening, early-stage testing, late-stage testing and on farm verification) focused on a market segment or on a group of similar market segments with very similar target product profiles ending with the identification of distinct products for each market segment the pipeline is focused on.

Sorghum | Nigeria

Annex 3: Definitions of commonly-used terms

Terms	Description
Essential Traits	Traits must be at or above the threshold value in all new products for a market segment in order to meet/exceed farmer, processor, and consumer requirements.
Essential Improve Traits	Traits are deliberately being improved in the breeding scheme for a market segment.
Essential Maintain Traits	Traits are being maintained at their current level in the breeding scheme for a market segment.
Nice-to-Have Traits	Traits do not need to be in all new products for a market segment to meet/exceed farmer, processor, and consumer requirements.

Value Proposition

Value Proposition is both a strategic and a marketing concept. Value propositions identify the benefits that products (or services) will deliver to users. In the case of B4T, value propositions cluster Target Product Profile Traits with similar potential benefits. They help in (i) conceptualizing benefit projections, (ii) discussions of relative priorities of TPPs with users and stakeholders, and (iii) feasibility assessments of TPPs - the more value propositions are being pursued through the same Target Product Profile, the less progress will be made for every individual value proposition and the less feasible is meaningful impact. These groupings therefore, provide a practical handle on the substantial set of traits considered in the TPPs.

References:

- Donovan J, Coaldrake P, Rutsaert P, Bänzinger M, Gitonga A, Naziri D, Demont, M, Newby J, Ndegwa M. 2022. Market intelligence for informing crop-breeding decisions by CGIAR and NARES. Market Intelligence Brief Series 1, Montpellier: CGIAR. <https://hdl.handle.net/10883/22248>
- CGIAR Breeding Portal User Manual version 5.0 [unpublished document]

About this Market Intelligence Digest

The **Market Intelligence Digest** provides concise, evidence-based guidance to support **Product Design Team (PDT) discussions** in line with CGIAR **Product Design Standards**. It synthesizes market intelligence insights to inform market segmentation, trait prioritization, and advancement decisions within existing breeding pipelines. By complementing technical breeding data, the Market Intelligence Digest helps PDTs clarify the relevance of market segments, demand signals, and adoption considerations for product design decisions.

This series is a collaborative effort of CGIAR centers and partners working on CGIAR Market Intelligence. The views and opinions expressed in this publication are those of the authors and are not necessarily representative of or endorsed by CGIAR.

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