Crop catalogue of farmers' preferred crop cultivars and varieties in western Kenya

An output of collaborative research for nature-positive seed system development




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About ICARDA
Established in 1977, the International Center for Agricultural Research in the Dry Areas (ICARDA) is a non-profit International organization undertaking people-centered research-for-development to provide innovative, science-based solutions to improve the livelihoods of communities across the non-tropical dry areas. In partnership with research institutions, governments, NGOs and the private sector, our work advances scientific knowledge, shapes practices, and informs policy.

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Preface

This catalogue of farmer-preferred cultivars and varieties is a culmination of the collaborative effort under the CGIAR Nature Positive Solutions Initiative, led by the International Center for Agricultural Research in the Dry Areas (ICARDA), with significant contributions from:

- The Alliance of Bioversity and CIAT
- The Vihiga, Kabudi, and Nyando Community Seed Banks
- The Genetic Resources Research Institute of the Kenya Agricultural and Livestock Research Organization
- The Food and Agriculture Organization of the United Nation's Benefit Sharing Fund of the International Treaty for Plant Genetic Resources for Food and Agriculture.

This catalogue is a testament to the invaluable role these groups/organizations play in conserving and utilizing agricultural biodiversity. Indeed, farmers are the true custodians and guardians of biodiversity. Their cultural wisdom, varietal choices, and enduring farming practices have shaped and safeguarded the crops that nourish our families, drive our economies, and sustain our ecosystems. These cultivars, culturally nurtured through generations, and recent collaboration with research, embody the intricate bond between humanity and nature. They are not just the cornerstone of nutritive food security; they are the heartbeat of our cultural heritage and community identity as well.

This catalogue is more than a resource; it's a tribute to the seeds of our shared future. This collection celebrates the resilience, knowledge, and innovation of our farming communities. It stands as a bridge between science and tradition - a vibrant testament to the enduring partnership that sustains our agricultural heritage for future generations.

By documenting Kenya's cultivars, we honor the traits most valued by farmers and society:

- **Inclusive agrobiodiversity conservation:** Empowering farmers through Community Seed Banks to lead in *in-situ* conservation while linking informal and formal seed systems.
- **Resilience to climate variability:** Fostering adaptability to ever-changing environmental conditions.
- **Superior nutritional value and flavor:** Preserving culinary traditions and enriching diets.
- **Market value:** Enhancing economic livelihoods and promoting health.
- **Adaptability to local conditions:** Ensuring crops thrive in specific environments.

In the face of climate change, population growth, and evolving market demands, farmer-preferred cultivars provide a beacon of hope and sustainability. They offer solutions to today's pressing challenges while safeguarding choices for the future. This catalogue underscores the critical importance of Kenyan cultivars and serves as a vital tool for researchers, policymakers, and agricultural practitioners working to strengthen our farming systems.

Let us continue to work hand in hand to conserve, promote, and utilize these treasures of biodiversity. May this catalogue inspire innovation, deepen appreciation for the role of farmers, and guide efforts toward building inclusive and resilient agricultural systems.

To everyone who contributed to this milestone, thank you. Your dedication and effort have brought us closer to our shared vision: securing food, livelihoods, and biodiversity for generations to come.

Warm regards,

Aly Abousabaa	Fadda, Carlo	Desterio Ondieki Nyamongo
		
Director General – ICARDA Regional Director – Central & West Asia & North Africa, One CGIAR	Lever Director – (Alliance Bioversity-CIAT) Biodiversity for Food & Agriculture	Director, Genetic Resources Research Institute – KALRO Kenya

Foreword

This catalogue is an output of collaborative work of the Genetic Resources Research Institute (GeRRI) of the Kenya Agricultural and Livestock Research Organization (KALRO), the International Center for Agricultural Research in the Dry Areas (ICARDA), and the Alliance of Bioversity International and CIAT. The development of the catalogue is funded under the CGIAR Nature Positive Solutions Initiative.

The aim of the collaboration is to develop a farmer-preferred crop cultivars and varieties catalogue to facilitate registration, quality-declared seed production, certification, and commercialization.

Acknowledgements

We acknowledge and appreciate the contributions and collaboration of the Alliance of Bioversity and CIAT, GeRRI of KALRO, and the members and the leadership of the Vihiga, Kabudi, and Nyando Community Seed Banks (CSBs).

The team deeply values the significant contributions of Mrs. Joy Mugisha and the Joy and Family Demonstration Farm, which provided the majority of bean genotypes featured in this catalogue. Mrs. Mugisha's invaluable assistance in verifying, cleaning, and correcting the bean data is also greatly appreciated. The contributions of the Food and Agriculture Organization of the United Nation's Benefit Sharing Fund of the International Treaty for Plant Genetic Resources for Food and Agriculture, played a key role in the project's success.

Special appreciation goes to Mr. Dennis Omanje, Mr. Victor Otieno, Mr. Titus Omondi, Mr. Tobias Recha, Mr. Samuel Omolo, and Mr. Dalmus Mitei from the Seed Savers' Network, and Mr. John Obuom, Mrs. Esther Ouma, Mr. John Ogejo, Mrs. Everline Okoth and Mrs. Rose Otok, for their invaluable contributions. Their provision of seed, unwavering support with the trials management, and their input at different sites and stages of the development of this catalogue were instrumental to its success.

Sincere gratitude is extended to Ms. Rachel Kibui, Media and Communication Consultant at the Alliance of Bioversity and CIAT, for her exceptional work in documenting the CSB activities throughout the two seasons.

Introduction

CSBs play a vital role in promoting nature-positive agriculture. They are crucial for conserving agricultural biodiversity on smallholder farms. By placing smallholder male and female farmers at the heart of these systems, CSBs prioritize community-led conservation and utilization of diverse crops and varieties for the benefit of society. However, establishing and operating viable CSBs requires proper variety identification, maintenance of varietal integrity, and implementing standardized operating procedures. The above-mentioned elements are often lacking, especially for farmer-preferred varieties, hindering the development of CSBs that can effectively connect with formal seed systems. This limitation prevents farmers from accessing modern technologies and resources that could improve their livelihoods. This catalogue aims to address these gaps and support CSB development in western Kenya.

To overcome existing challenges, the initiative is supporting the cultivation of farmer-preferred varieties through:

Increasing diversity: Expanding the range of available seeds to include locally-adapted varieties of essential crops like common beans, finger millet, groundnut, maize, mung bean, rice bean, sorghum, and traditional leafy vegetables (TLVs).

Improving seed quality: Producing high-quality seeds of varieties with greater resilience to climate change.

Enhancing access: Ensuring farmers can access improved seeds, diverse seed production methods, and post-harvest technologies.

Within the CGIAR Nature Positive Initiative's seed system development work package, 79 varieties of common beans, finger millet, groundnuts, maize, mung bean, rice bean, sorghum, and TLVs were characterized over two seasons (2023 short rainy season and 2024 long rainy season) in two communities in western Kenya. The characterization processes were:

Pre-planting seed analysis: Seeds were collected from CSBs and the Gene Bank of Kenya. Researchers analyzed physical attributes such as seed color, shape, size, and coat patterns.

Post-planting field evaluation: After planting, various morphological and agronomic traits were observed, including plant height, growth habits, days to flowering and maturity, and seed yield.

The detailed characterization provides valuable information for selecting varieties adapted to local conditions and offering improved end-use quality. Ultimately, these efforts aim to enhance food and nutritional security for resource-poor farmers in Kenya by helping them adapt to climate change.

Descriptors

The catalogue was prepared using simplified protocols and standard plant morphological descriptors of the International Union for the Protection of New Varieties of Plants (UPOV) [1], the International Board for Plant Genetic Resources (IBPGR) and other related publications [2], [3], [4].

Common beans descriptors

The common bean (*Phaseolus vulgaris L.*) is a vital crop in Kenya and around the world. This versatile legume provides a valuable source of nutrition through its various edible components. The distinct characteristics used to differentiate cultivars/varieties are described below:

Leaves

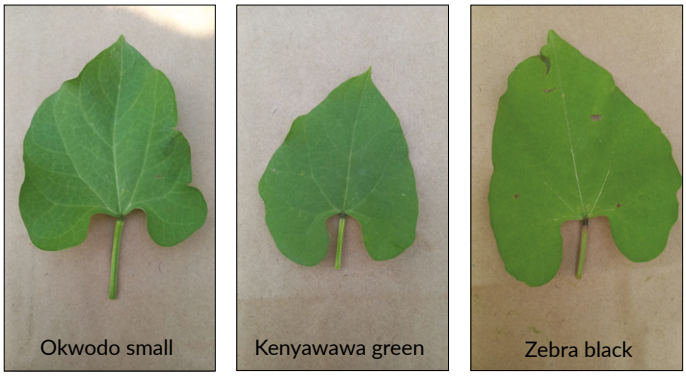
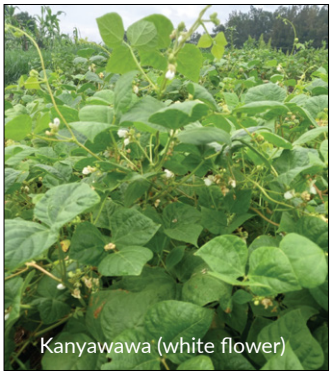
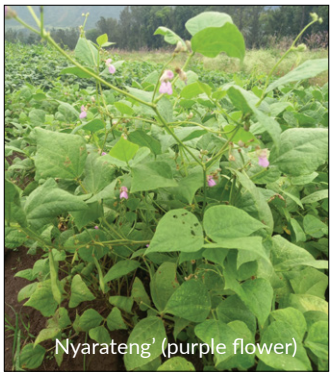


Table 1. Short introduction to the plant characteristics and descriptors used in this catalogue

Plant characteristics	Description
Seed weight and size	The seeds are classified within a given plant species based on their relative specific weight and visual appearances into small, medium and high
Seed shape	Simple morphological appearances
Ground color of testa	UPOV and IBPGR color classification systems
Seed testa pattern	Based on visual observation into marbled, mottled, spotted, speckled and striped
Color of testa pattern	Based on visual observation and the UPOV and IBPGR guidelines
Hilum color and type	Described based on UPOV and IBPGR descriptors
Growth habit	Classified based on visual observation using the UPOV and IBPGR guidelines
Stem color	Based on visual observation and UPOV and the IBPGR guidelines
Flower color	Based on visual observation and UPOV and IBPGR guidelines
Days to 50% flowering	Number of days from germination to flowering of 50% of the plants
Pod characteristics	Measured in centimeters and classified based on the relative differences within plant species into short, medium and long
Plant height	The height of plants in centimeters at physiological maturity, then classified based on the relative differences within plant species into short, medium and tall
Disease severity in sorghum	1 = zero leaf damage; 2 = 1-10% of the plants with one or more leaves damaged; 3 = 11-25% of the plants with one or more leaves damaged; 4 = 26-40% of the plants with one or more leaves damaged; 5 = more than 40% of the plants with one of more leaves damaged

Flower color


Kanyawawa (white flower)


Nyarateng' (purple flower)

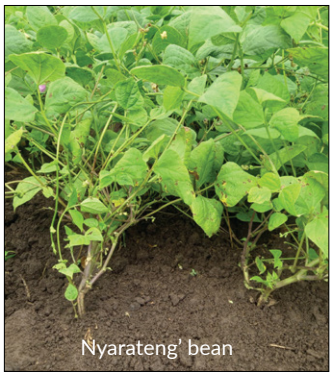
Pods

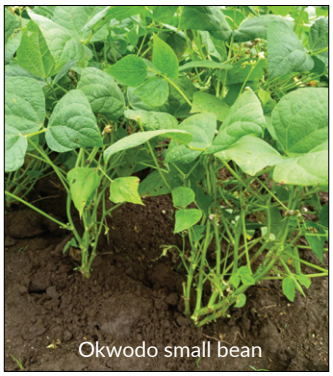

Cowpea red


Cowpea brown


Cowpea black

Stem color


Nyarateng' bean


Okwodo small bean

Seeds


Rosecoco medium


Nya-Uganda


Zebra black


Zebra yellow

This project focused on characterizing 27 common bean cultivars and varieties to maintain varietal identity and integrity, optimize early-generation seed production, and support further multiplication and dissemination for sustainable crop production.

Description of the common bean cultivars and varieties from CSBs

Cultivar 1

Army green/Kanyawawa green

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Army green/Kanyawawa green
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Oval
Ground color of Testa	Jungle green
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, protruding
Thousand seed weight (g)	Low (257)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Very early (33)
Maturing plant and pods:	
Plant height (cm)	Medium (94)
Pod length (cm)	Short (9)
Pods per plant	Medium (21)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	0.64

Cultivar 2

Glo jaber

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Glo Jaber
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Kidney
Ground color of Testa	White
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, depressed
Thousand seed weight (g)	High-very high (430-489)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Medium-tall (90-114)
Pod length (cm)	Very long (15)
Pods per plant	Medium (22)
Pod beak	Long, straight
Agronomic characteristics:	
Yield (t/ha)	0.50

Cultivar 3

Kabanyarwanda

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Kabanyarwanda
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Kidney
Ground color of Testa	Red
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, depressed
Thousand seed weight (g)	Low-medium (220-298)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Tall (123)
Pod length (cm)	Long (13)
Pods per plant	Low-medium (15-20)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	0.85

Cultivar 4

Kanyawawa

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Kanyawawa
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Oval
Ground color of Testa	Grey
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, depressed
Thousand seed weight (g)	Low (210)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green-striped maroon
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Late (41)
Maturing plant and pods:	
Plant height (cm)	Very tall (155)
Pod length (cm)	Medium (10)
Pods per plant	Medium (20)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	0.85

Cultivar 5

Kanyawawa maroon

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Kanyawawa maroon
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Oval
Ground color of Testa	Maroon
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, protruding
Thousand seed weight (g)	Medium-high (310-448)
Growing plant characteristics:	
Growth habit	Bushy
Stem color	Green
Flowering plant characteristics:	
Flower color	Pink
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Very short (28)
Pod length (cm)	Medium (12)
Pods per plant	High (26)
Pod beak	Long, straight
Agronomic characteristics:	
Yield (t/ha)	1.01

Cultivar 6

Kanyawawa purple

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Kanyawawa purple
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Oval
Ground color of Testa	Purple
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, protruding
Thousand seed weight (g)	Medium (322)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	Pink
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Medium (83)
Pod length (cm)	Short (9)
Pods per plant	Medium (20)
Pod beak	Short, straight
Agronomic characteristics:	
Yield (t/ha)	0.99

Cultivar 7

Nyarateng'

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Nyarateng'
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Kidney
Ground color of Testa	Black
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, depressed
Thousand seed weight (g)	Low-medium (230-344)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green-striped maroon
Flowering plant characteristics:	
Flower color	Purple
Days to 50% flowering	Late (42)
Maturing plant and pods:	
Plant height (cm)	Tall-very tall (105-158)
Pod length (cm)	Medium (10)
Pods per plant	Medium (20)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	1.03

Cultivar 8

Nya-Uganda

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Nya-Uganda
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Oval
Ground color of Testa	Pink
Seed Testa pattern	Marbled
Color of Testa pattern	Maroon
Hilum color and type	White, protruding
Thousand seed weight (g)	Medium-high (360-433)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	Pink
Days to 50% flowering	Late (39)
Maturing plant and pods:	
Plant height (cm)	Tall-very tall (107-141)
Pod length (cm)	Medium (12)
Pods per plant	Medium-high (17-31)
Pod beak	Long, straight
Agronomic characteristics:	
Yield (t/ha)	0.98

Cultivar 9

Nyayo purple long

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Nyayo purple long
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Kidney
Ground color of Testa	Purple
Seed Testa pattern	Mottled
Color of Testa pattern	White
Hilum color and type	White, depressed
Thousand seed weight (g)	High-very high (450-460)
Growing plant characteristics:	
Growth habit	Bushy
Stem color	Green
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Medium (36)
Maturing plant and pods:	
Plant height (cm)	Short (33)
Pod length (cm)	Long (13)
Pods per plant	High (29)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	0.98

Cultivar 10

Nyayo short

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Nyayo short
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Oval
Ground color of Testa	Red
Seed Testa pattern	Mottled
Color of Testa pattern	White
Hilum color and type	White, protruding
Thousand seed weight (g)	Medium-high (390-427)
Growing plant characteristics:	
Growth habit	Bushy
Stem color	Green
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Medium (35)
Maturing plant and pods:	
Plant height (cm)	Tall (40)
Pod length (cm)	Medium (12)
Pods per plant	Low (19)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	1.32

Cultivar 11

Nyazaire/Piriton

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Nyazaire/Piriton
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Oval
Ground color of Testa	Cream
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, protruding
Thousand seed weight (g)	Low (196)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Late (40)
Maturing plant and pods:	
Plant height (cm)	Tall (117)
Pod length (cm)	Medium (11)
Pods per plant	Medium (21)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	1.59

Cultivar 12

Nyota

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Nyota
Original seed source	The Kenya Agricultural and Livestock Research Organization (KALRO)
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Oval
Ground color of Testa	Red
Seed Testa pattern	Mottled
Color of Testa pattern	White
Hilum color and type	White, depressed
Thousand seed weight (g)	High (430)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	Light pink
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Tall (107)
Pod length (cm)	Medium (12)
Pods per plant	Medium-very high (17-39)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	1.53

Cultivar 13

Jeshi green

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Jeshi green
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Oval
Ground color of Testa	Cream
Seed Testa pattern	Spotted
Color of Testa pattern	Jungle green
Hilum color and type	White, protruding
Thousand seed weight (g)	Low (234)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Very early (33)
Maturing plant and pods:	
Plant height (cm)	Medium (94)
Pod length (cm)	Short (9)
Pods per plant	Medium (23)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	0.96

Cultivar 14

Jeshi red

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Jeshi red
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Oval
Ground color of Testa	Red
Seed Testa pattern	Spotted
Color of Testa pattern	White
Hilum color and type	White, protruding
Thousand seed weight (g)	Medium-high (380-408)
Growing plant characteristics:	
Growth habit	Bushy
Stem color	Green
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Very short (26)
Pod length (cm)	Short (10)
Pods per plant	Medium (22)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	0.92

Cultivar 15

Okwodo big/Punda

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Okwodo big/Punda
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Kidney
Ground color of Testa	Grey
Seed Testa pattern	Speckled
Color of Testa pattern	Purple
Hilum color and type	White, depressed
Thousand seed weight (g)	Medium (381)
Growing plant characteristics:	
Growth habit	Bushy
Stem color	Green
Flowering plant characteristics:	
Flower color	Purple
Days to 50% flowering	Late (40)
Maturing plant and pods:	
Plant height (cm)	Short-medium (32-36)
Pod length (cm)	Long (13)
Pods per plant	Medium (20)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	0.68

Cultivar 16

Okwodo small

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Okwodo small
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Kidney
Ground color of Testa	Grey
Seed Testa pattern	Speckled
Color of Testa pattern	Purple
Hilum color and type	White depressed, surrounded by a black ring
Thousand seed weight (g)	Low (220)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	Purple
Days to 50% flowering	Very late (47)
Maturing plant and pods:	
Plant height (cm)	Tall-very tall (103-170)
Pod length (cm)	Medium (11)
Pods per plant	Medium-very high (24-35)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	0.44

Cultivar 17

Osuko pease small/Kinyonyozi

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Osuko pease small/Kinyonyozi
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Oval
Ground color of Testa	White
Seed Testa pattern	Marbled
Color of Testa pattern	Jungle green
Hilum color and type	White, protruding
Thousand seed weight (g)	Low (220)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green-striped maroon
Flowering plant characteristics:	
Flower color	Purple
Days to 50% flowering	Medium (37)
Maturing plant and pods:	
Plant height (cm)	Tall (127)
Pod length (cm)	Short (9)
Pods per plant	Medium-very high (23-44)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	1.37

Cultivar 18

Pinki

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Pinki
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Oval
Ground color of Testa	Peach
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, protruding
Thousand seed weight (g)	Low (201)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green-striped maroon
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Tall (116)
Pod length (cm)	Medium (10)
Pods per plant	High-very high (26-42)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	1.49

Cultivar 19

Purple long

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Purple long
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Kidney
Ground color of Testa	Purple
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, depressed
Thousand seed weight (g)	Very high (497)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	Purple
Days to 50% flowering	Very early (32)
Maturing plant and pods:	
Plant height (cm)	Tall (121)
Pod length (cm)	Very long (14)
Pods per plant	Medium (21)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	1.67

Cultivar 20

Rosecoco big/Rosecoco long

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Rosecoco big/Rosecoco long
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Kidney
Ground color of Testa	Pink
Seed Testa pattern	Spotted
Color of Testa pattern	Maroon
Hilum color and type	White, depressed
Thousand seed weight (g)	Very high (498)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	Pink
Days to 50% flowering	Medium-late (35-40)
Maturing plant and pods:	
Plant height (cm)	Medium (94)
Pod length (cm)	Long (13)
Pods per plant	Medium-high (20-28)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	1.09

Cultivar 21

Rosecoco yellow long

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Rosecoco yellow long
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Kidney
Ground color of Testa	Tan
Seed Testa pattern	Spotted
Color of Testa pattern	Maroon
Hilum color and type	White, depressed
Thousand seed weight (g)	Medium (359)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	Purple
Days to 50% flowering	Medium-late (35-40)
Maturing plant and pods:	
Plant height (cm)	Tall (126)
Pod length (cm)	Long (13)
Pods per plant	Medium-very high (18-35)
Pod beak	Long, straight
Agronomic characteristics:	
Yield (t/ha)	1.51

Cultivar 22

Rosecoco medium

General information:

Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Rosecoco medium
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB

Seed characteristics:

Seed size	Medium
Seed shape	Oval
Ground color of Testa	Pink
Seed Testa pattern	Spotted
Color of Testa pattern	Maroon
Hilum color and type	White, protruding
Thousand seed weight (g)	Medium (363)

Growing plant characteristics:

Growth habit	Climber
Stem color	Green

Flowering plant characteristics:

Flower color	Pink
Days to 50% flowering	Early (34)

Maturing plant and pods:

Plant height (cm)	Medium-tall (97-136)
Pod length (cm)	Medium (10)
Pods per plant	Medium-high (22-28)
Pod beak	Short, curved

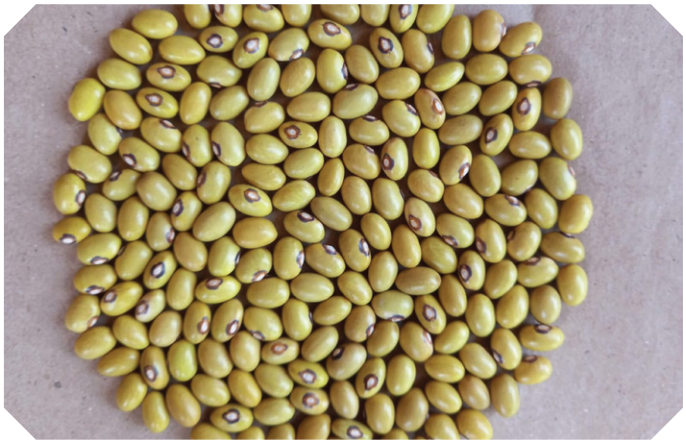
Agronomic characteristics:

Yield (t/ha)	1.05

Cultivar 23

Rosecoco yellow medium

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Rosecoco yellow medium
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Oval
Ground color of Testa	Cream
Seed Testa pattern	Striped
Color of Testa pattern	Maroon
Hilum color and type	White, protruding
Thousand seed weight (g)	Medium (389)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	Pink
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Tall-very tall (117-183)
Pod length (cm)	Medium (12)
Pods per plant	Medium (21)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	1.19



Cultivar 24

Yellow green short

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Yellow green short
Original seed source	KALRO
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Oval
Ground color of Testa	Yellow green
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White protruding, surrounded by a black ring
Thousand seed weight (g)	Medium (357)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green
Flowering plant characteristics:	
Flower color	Pink
Days to 50% flowering	Medium (35)
Maturing plant and pods:	
Plant height (cm)	Tall (125)
Pod length (cm)	Medium (10)
Pods per plant	Medium (20)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	1.19

Cultivar 25

Yellow green long

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Yellow green long
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Kidney
Ground color of Testa	Yellow green
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White protruding, surrounded by a black ring
Thousand seed weight (g)	Medium (366)
Growing plant characteristics:	
Growth habit	Bushy
Stem color	Green
Flowering plant characteristics:	
Flower color	Pink
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Short (33)
Pod length (cm)	Long (13)
Pods per plant	Low-medium (18-23)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	1.36

Cultivar 26

Zebra yellow

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Zebra Yellow
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Kidney
Ground color of Testa	Yellow
Seed Testa pattern	Striped
Color of Testa pattern	Black
Hilum color and type	White, depressed
Thousand seed weight (g)	Medium (378)
Growing plant characteristics:	
Growth habit	Bushy
Stem color	Green
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Very early (31)
Maturing plant and pods:	
Plant height (cm)	Medium (36)
Pod length (cm)	Very long (14)
Pods per plant	Medium (20)
Pod beak	Long, curved
Agronomic characteristics:	
Yield (t/ha)	0.98

Cultivar 27

Zebra black/Magwar

General information:	
Scientific name	*Phaseolus vulgaris L.*
Cultivar name	Zebra black/Magwar
Original seed source	Joy and Family Demonstration Farm, Uganda
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Kidney
Ground color of Testa	Cream
Seed Testa pattern	Striped
Color of Testa pattern	Black
Hilum color and type	White, depressed
Thousand seed weight (g)	High (456)
Growing plant characteristics:	
Growth habit	Climber
Stem color	Green-striped maroon
Flowering plant characteristics:	
Flower color	Purple
Days to 50% flowering	Early (34)
Maturing plant and pods:	
Plant height (cm)	Tall-very tall (108-144)
Pod length (cm)	Long (13)
Pods per plant	Medium-high (22-31)
Pod beak	Long, straight
Agronomic characteristics:	
Yield (t/ha)	1.40

Table 2. Distinctness table for the climber bean cultivars from the three target CSBs

Genotype	Black	Brown	Cream		Grey	Jungle green	Pale pink	Pink		Purple			Red		Tan		White			Yellow green	Grand total
	Medium	Early	Medium	Very early	Medium	Very early	Early	Early		Early		Late	Early		Early	Medium	Early	Medium	Very early	Very early	
	None	Maroon	None	Jungle green	None	None	None	Maroon		None		White	None	White	Maroon	Maroon	None	Jungle green	Black	None	
	Kidney	Oval	Oval	Oval	Oval	Oval	Oval	Kidney	Oval	Kidney	Oval	Oval	Kidney	Oval	Kidney	Kidney	Kidney	Oval	Kidney	Oval	
Glo jaber																	1				1
Jeshi green				1																	1
Kabanyarwanda													1								1
Kanyawawa					1																1
Kanyawawa green						1															1
Kanyawawa purple											1										1
Nyarateng'	1																				1
Nya-Uganda									1												1
Nyazaire/Piriton			1																		1
Nyota														1							1
Okwodo small												1									1
Rosecoco yellow long																1					1
Osuko pease small																		1			1
Pinki							1														1
Purple long										1											1
Rosecoco big/long								1													1

Genotype	Black	Brown	Cream		Grey	Jungle green	Pale pink	Pink		Purple			Red		Tan		White			Yellow green	Grand total
	Medium	Early	Medium	Very early	Medium	Very early	Early	Early		Early		Late	Early		Early	Medium	Early	Medium	Very early	Very early	
	None	Maroon	None	Jungle green	None	None	None	Maroon		None		White	None	White	Maroon	Maroon	None	Jungle green	Black	None	
	Kidney	Oval	Oval	Oval	Oval	Oval	Oval	Kidney	Oval	Kidney	Oval	Oval	Kidney	Oval	Kidney	Kidney	Kidney	Oval	Kidney	Oval	
Rosecoco medium		1																			1
Rosecoco yellow medium															1						1
Yellow green short																				1	1
Zebra black																			1		1
Grand total	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20

Table 3. Distinctness table for the bushy bean cultivars from the three target CSBs

Genotype	Large			Medium		Small		Grand total
	Striped	Mottled	Speckled	Mottled	Plain	Plain	Spotted	
	Yellow	Purple	Purple	White	Pink	Purple	Pink	
Jeshi red							1	1
Kanyawawa maroon						1		1
Nyayo purple long		1						1
Nyayo short				1				1
Okwodo big/Punda			1					1
Yellow green long					1			1
Zebra yellow	1							1
Grand total	1	1	1	1	1	1	1	7

Cowpea

Cowpea (*Vigna unguiculata*) is a highly-adaptable annual legume with diverse growth forms, sizes, and structures. As one of the oldest-cultivated crops and a native of Africa, it plays a vital role in semi-arid regions, accounting for 66% of global production, predominantly from Nigeria and Niger.

Renowned for its ability to thrive in sandy soils and under low rainfall, cowpea is a cornerstone crop for resource-limited farmers. Its nitrogen-fixing capabilities improve soil fertility, making it an excellent choice for intercropping. The plant's growth habits, ranging from erect to climbing, support its multifunctional use: protein-rich seeds for culinary applications like stews, curries, and flour; nutrient-dense leaves and pods as vegetables; and valuable forage for livestock.

However, cowpea production faces significant challenges from pests. Pre-harvest yields are threatened by the legume pod borer (*Maruca vitrata*), while post-harvest losses can exceed 90% due to infestation by the cowpea weevil (*Callosobruchus maculatus)*, severely impacting seed storage and food security.

Cowpea red

Description of the cowpea cultivars and varieties from target CSBs

Cultivar 1

Cowpea brown

General information:	
Scientific name	*Vigna unguiculata (L.) Walp*
Cultivar name	Cowpea brown
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Kidney
Ground color of Testa	Rosy brown
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White protruding, surrounded by a black ring
Thousand seed weight (g)	Low (125)
Flowering plant characteristics:	
Flower color	Purple
Days to 50% flowering	Early (48)
Leaf type	Trifoliate with the middle leaf shorter or same in size as the basal leaves
Anthocyanin coloration	Present in the oracles, pods and leaves
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Medium (205)
Pod length (cm)	Long-very long (15-17)
Pods per plant	High (44)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	1.53

Cultivar 2

Cowpea red

General information:

Scientific name	*Vigna unguiculata (L.) Walp*
Cultivar name	Cowpea red
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB

Seed characteristics:

Seed size	Medium
Seed shape	Kidney
Ground color of Testa	Reddish brown
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White protruding, surrounded by a black ring
Thousand seed weight (g)	High (145)

Flowering plant characteristics:

Flower color	Purple
Days to 50% flowering	Early (47)
Leaf type	Trifoliate with very spiky leaves
Anthocyanin coloration	Present in the oracles
Stem color	Green

Maturing plant and pods:

Plant height (cm)	Tall (207)
Pod length (cm)	Very long (17)
Pods per plant	Very high (102)
Pod beak	Short, curved

Agronomic characteristics:

Yield (t/ha)	2.03

Cultivar 3

Cowpea white

General information:	
Scientific name	*Vigna unguiculata (L.) Walp*
Cultivar name	Cowpea white
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Kidney
Ground color of Testa	Cream
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White protruding, surrounded by a black ring
Thousand seed weight (g)	Low (109)
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Early (49)
Leaf type	Trifoliate with the middle leaf shorter or same in size as the basal leaves
Anthocyanin coloration	Present in the oracles
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Very tall (229)
Pod length (cm)	Long (14)
Pods per plant	Low (29)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	0.89

Cultivar 4

Cowpea black

General information:	
Scientific name	*Vigna unguiculata (L.) Walp*
Cultivar name	Cowpea black
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Kidney
Ground color of Testa	Black
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, protruding
Thousand seed weight (g)	Low (90)
Flowering plant characteristics:	
Flower color	Purple
Days to 50% flowering	Late (61)
Leaf type	Trifoliate with the middle leaf longer than the basal leaves
Anthocyanin coloration	Present in the oracles
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Very tall (233)
Pod length (cm)	Long (15)
Pods per plant	Low (24)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	0.91

Green grams


Local green grams


Rice beans

Green gram (*Vigna radiata (L.) R. Wilczek*), also known as mung bean, is a resilient and nutrient-dense legume with global significance, particularly in India, China, and Southern Asia, where production is highest. In Kenya, it is a staple pulse crop cherished for its roles in local diets and export markets. This protein-rich, fiber-packed superfood enhances diverse dishes, including curries, salads, soups, and desserts, while offering significant health benefits.

Highly drought-tolerant and requiring minimal water, green gram thrives in arid conditions, making it crucial for food security in challenging climates. Its nitrogen-fixing properties improve soil fertility, supporting sustainable agriculture. With its adaptability, nutritional value, and culinary versatility, green gram remains a cornerstone of global diets and a reliable crop for farmers.

Rice beans

Rice beans (*Vigna umbellata*) are a versatile, warm-season, annual legume characterized by yellow flowers and small edible seeds. This twinning plant can also function as a semi-perennial, making it suitable for diverse agricultural practices. Commonly cultivated in the upland tropics, rice beans serve as a valuable food crop and are often intercropped with staples like rice, maize, sorghum, and cowpea or grown as a stand-alone crop. In addition to their roles in human diets, rice beans are highly regarded as premium livestock fodder known to enhance milk production. The plant's foliage, green pods, immature seeds, and flowers are all palatable and readily consumed by animals.

Rice beans offer significant agronomic benefits, including nitrogen fixation in nutrient-depleted soils, effective weed suppression due to rapid establishment, and prevention of soil erosion in mixed-cropping systems. Many cultivars exhibit excellent adaptability to drier climates, thriving in regions where cowpeas perform well. They are resilient against major pests and diseases, contributing to reliable yields of easily-cooked, flavorful seeds. The dry seeds are simple to shell and store effectively for 3-4 years under cool, dry, weevil-controlled conditions. This crop's resilience, minimal maintenance requirements and multiple uses, position it as a sustainable solution for enhancing food security, improving soil health, and supporting livestock productivity.

Description of the green gram cultivars and varieties from target CSBs

Cultivar 1

Local green grams

General information:	
Scientific name	*Vigna radiata (L.) R. Wilczek*
Cultivar name	Local green grams
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Cylindrical
Ground color of Testa	Green
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, protruding
Thousand seed weight (g)	Medium-high (39-43)
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Early (48)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Tall (72)
Pod length (cm)	Medium (8)
Pods per plant	Low (59)
Pod beak	Short, curved
Agronomic characteristics:	
Yield (t/ha)	1.44

Description of rice bean cultivars and varieties from target CSBs

Cultivar 1

Lesoriadre maroon

General information:	
Scientific name	*Vigna umbellata*
Cultivar name	Lesoriadre maroon
Original seed source	Farmer from Gem Village in Siaya County
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Cylindrical
Ground color of Testa	Maroon
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, protruding
Thousand seed weight (g)	Very high (73)
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Late (77)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Very tall (187)
Pod length (cm)	Medium (8)
Pods per plant	High (221)
Pod beak	Short, straight
Agronomic characteristics:	
Yield (t/ha)	0.04

Cultivar 2

Lesoriadre green

General information:	
Scientific name	*Vigna umbellata*
Cultivar name	Lesoriadre green
Original seed source	Farmer from Gem Village in Siaya County
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Cylindrical
Ground color of Testa	Green
Seed Testa pattern	Plain
Color of Testa pattern	None
Hilum color and type	White, protruding
Thousand seed weight (g)	High (62)
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Late (77)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Very tall (190)
Pod length (cm)	Long (9)
Pods per plant	Very high (248)
Pod beak	Short, straight
Agronomic characteristics:	
Yield (t/ha)	2.07

Groundnuts

Groundnut (*Arachis hypogaea L.*), commonly known as peanut, is a globally-cultivated annual legume, with leading producers including China, India, Argentina, and several African nations. In Kenya, groundnut is a vital crop valued for its nutritional, economic, and agricultural benefits. Nutritionally, it provides protein, healthy fats, vitamins and minerals. Groundnuts can be consumed raw, boiled, or roasted, and are widely used in confections, baked goods, and flour-based products. Beyond food, the shells are repurposed for particle boards, fuel, or fillers in fertilizers and animal feed, while the haulms serve as nutritious fodder for livestock. Economically, groundnuts are a significant cash crop, sustaining livelihoods for many farmers. Agriculturally, groundnut contributes to soil fertility through crop rotation, particularly with maize. Depending on the variety, groundnuts mature within 100-150 days, making them a versatile and sustainable choice for diverse farming systems.


Red valencia


Small groundnut

Description of groundnut cultivars and varieties from target CSBs

Cultivar 1

Black groundnuts

General information:	
Scientific name	*Arachis hypogaea L.*
Cultivar name	Black groundnuts
Original seed source	Farmer from Gem Village in Siaya County
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Cylindrical-tapered ends
Ground color of Testa	Dark purple
Seed Testa pattern	Plain
Color of Testa pattern	None
Thousand seed weight (g)	High-very high (460-528)
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Early (37)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Tall-very tall (35-50)
Pod length (cm)	Long (7)
Pods per plant	Medium (61)
Agronomic characteristics:	
Yield (t/ha)	0.04

Cultivar 2

Red valencia

General information:	
Scientific name	*Arachis hypogaea L.*
Cultivar name	Red valencia
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Spheroidal
Ground color of Testa	Red
Seed Testa pattern	Plain
Color of Testa pattern	None
Thousand seed weight (g)	High-very high (471-640)
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Late (41)
Stem color	Dark maroon
Maturing plant and pods:	
Plant height (cm)	Medium (33)
Pod length (cm)	Medium (4)
Pods per plant	Medium-very high (71-112)
Agronomic characteristics:	
Yield (t/ha)	0.52

Cultivar 3

Small groundnuts

General information:	
Scientific name	*Arachis hypogaea L.*
Cultivar name	Small groundnuts
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Short, broad
Ground color of Testa	Red
Seed Testa pattern	Plain
Color of Testa pattern	None
Thousand seed weight (g)	Low-medium (273-360)
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Early (36)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Medium-tall (34-39)
Pod length (cm)	Short (3)
Pods per plant	Very high (139)
Agronomic characteristics:	
Yield (t/ha)	0.33

Cultivar 4

Homabay red

General information:	
Scientific name	*Arachis hypogaea L.*
Cultivar name	Homabay red
Original seed source	Farmers' seed
Growth season	Long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Spheroidal
Ground color of Testa	Brown
Seed Testa pattern	Plain
Color of Testa pattern	None
Thousand seed weight (g)	High (490)
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Late (38)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Tall (42)
Pod length (cm)	Medium (4)
Pods per plant	High (87)
Agronomic characteristics:	
Yield (t/ha)	0.04

Table 4. Distinctness table for the groundnut cultivars from the three target CSBs

Characters	Seed size	Large		Medium	Small	Grand total
	Seed colour	Brown	Dark purple	Red	Red	
	Earliness	Late	Medium	Late	Early	
Cultivars	Black groundnuts		1			1
	Homabay red	1				1
	Red valencia			1		1
	Small groundnuts				1	1
	Grand total	1	1	1	1	4

Finger millet

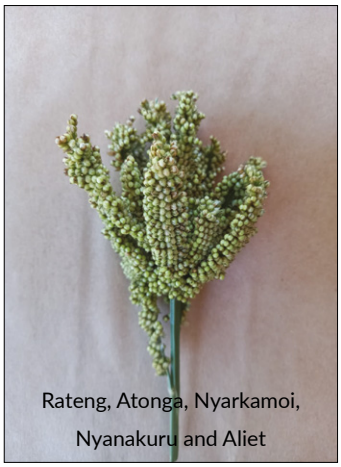
Finger millet (*Eleusine coracana*) is a resilient annual cereal crop, widely cultivated in arid and semi-arid regions of Africa and Asia, particularly by smallholder farmers. Eastern Africa, including Burundi, Ethiopia, Kenya, Rwanda, Tanzania, and Uganda, is a key production zone, with Kenya and Uganda leading globally. In Kenya, finger millet occupies approximately 65,000 ha, primarily managed by small-scale farmers.

Early planting at the onset of rains maximizes yields, and the crop can be grown as a pure stand or intercropped with maize, beans, or cowpeas. Finger millet is drought-tolerant and resilient to pests and diseases, and it is well-adapted to low-fertility soils, thriving in areas with erratic rainfall and limited storage facilities. Its straw doubles as animal feed, and its grain is in high demand for making porridge, soups, bread, cakes, and even beer.

Nutritionally, finger millet is a powerhouse, rich in calcium, iron, zinc, dietary fiber, and protein, including essential amino acids. It is gluten-free, making it ideal for children, pregnant women, nursing mothers, and individuals with diabetes or celiac disease. Regular consumption supports bone health, reduces osteoporosis risk, and strengthens immunity. Despite its benefits, finger millet faces challenges such as low yields (0.5-0.75 t/ha versus up to 4 t/ha in trials), limited breeding research, and vulnerability to the parasitic weed *Striga hermonthica* and finger millet blast – a significant fungal disease caused by the pathogen *Pyricularia grisea*, which can affect up to 80% of yields.


Oteng


Rabuor


Rateng, Atonga, Nyarkamoi, Nyanakuru and Aliet

In this project, seven farmer accessions were planted in Kibos, western Kenya, for characterization. Heritable traits were documented to identify promising accessions for future research. This data provides a foundation for developing improved cultivars and addressing the production challenges of this vital crop.

Description of finger millet cultivars and varieties from target CSBs

Cultivar 1

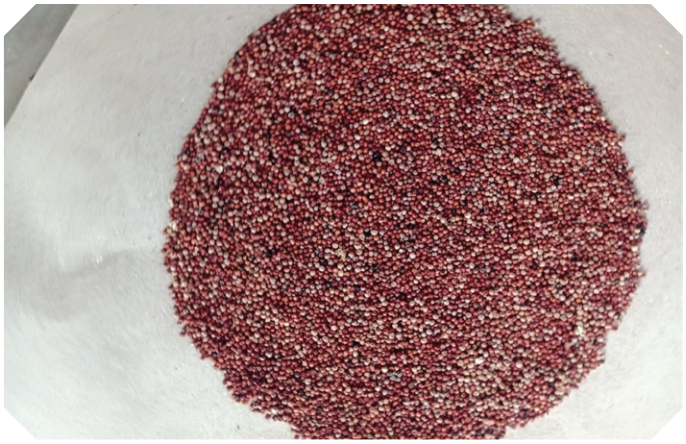
Rabuor (Chebririet)

General information:	
Scientific name	*Eleusine coracana*
Cultivar name	Rabuor (Chebririet)
Original seed source	Kapsokale CSB (Kericho County)
Growth season	Long rains
Seed source	CSB
Seed characteristics:	
Seed color	Brown
Seed shape	Circular
Thousand seed weight (g)	High (3)
Flowering plant characteristics:	
Days to 50% flowering	Early (67)
Maturing plant and pods:	
Productive tillers per plot	Very high (925)
Panicle length (cm)	Very long (13)
Finger number	High (9)
Stem lodging	High
Plant height (cm)	Tall (121)
Susceptibility to diseases	
Neck blast	Zero damage
Head blast	Up to 10% damage caused
Agronomic characteristics:	
Yield (t/ha)	1.47

Cultivar 2

Rateng' (Chepleliet)

General information:	
Scientific name	*Eleusine coracana*
Cultivar name	Rateng' (Chepleliet)
Original seed source	Kapsokale CSB (Kericho County)
Growth season	Long rains
Seed source	CSB
Seed characteristics:	
Seed color	Reddish brown
Seed shape	Circular
Thousand seed weight (g)	High (3)
Flowering plant characteristics:	
Days to 50% flowering	Early (69)
Maturing plant and pods:	
Productive tillers per plot	Very high (1,202)
Panicle length (cm)	Long (10)
Finger number	High (9)
Stem lodging	High
Plant height (cm)	Medium (109)
Susceptibility to diseases	
Neck blast	Up to 10% damage caused
Head blast	Zero damage
Agronomic characteristics:	
Yield (t/ha)	2.07



Cultivar 3

Nyanakuru (Naikuru)

General information:	
Scientific name	*Eleusine coracana*
Cultivar name	Nyanakuru (Naikuru)
Original seed source	Kapsokale CSB (Kericho County)
Growth season	Long rains
Seed source	CSB
Seed characteristics:	
Seed color	Red
Seed shape	Circular
Thousand seed weight (g)	High (3)
Flowering plant characteristics:	
Days to 50% flowering	Late (72)
Maturing plant and pods:	
Productive tillers per plot	High (774)
Panicle length (cm)	Long (11)
Finger number	Medium (8)
Stem lodging	Low
Plant height (cm)	Very tall (125)
Susceptibility to diseases	
Neck blast	Up to 25% damage caused
Head blast	Up to 25% damage caused
Agronomic characteristics:	
Yield (t/ha)	1.68

Cultivar 4

Nyarkamoi (Cherurkemoi)

General information:	
Scientific name	*Eleusine coracana*
Cultivar name	Nyarkamoi (Cherurkemoi)
Original seed source	Kapsokale CSB (Kericho County)
Growth season	Long rains
Seed source	CSB
Seed characteristics:	
Seed color	Red
Seed shape	Circular
Thousand seed weight (g)	High (3)
Flowering plant characteristics:	
Days to 50% flowering	Late (73)
Maturing plant and pods:	
Productive tillers per plot	Medium (570)
Panicle length (cm)	Long (11)
Finger number	Low (7)
Stem lodging	Low
Plant height (cm)	Very tall (129)
Susceptibility to diseases	
Neck blast	Zero damage
Head blast	Up to 10% damage caused
Agronomic characteristics:	
Yield (t/ha)	1.61

Cultivar 5

Aliet (Chemukuliet)

General information:	
Scientific name	*Eleusine coracana*
Cultivar name	Aliet (Chemukuliet)
Original seed source	Kapsokale CSB (Kericho County)
Growth season	Long rains
Seed source	CSB
Seed characteristics:	
Seed color	Reddish brown
Seed shape	Circular
Thousand seed weight (g)	Very high (4)
Flowering plant characteristics:	
Days to 50% flowering	Very late (74)
Maturing plant and pods:	
Productive tillers per plot	High (707)
Panicle length (cm)	Very long (12)
Finger number	Low (6)
Stem lodging	Low
Plant height (cm)	Very tall (125)
Susceptibility to diseases	
Neck blast	Zero damage
Head blast	Zero damage
Agronomic characteristics:	
Yield (t/ha)	0.75

Cultivar 6

Atonga (Matongo)

General information:	
Scientific name	*Eleusine coracana*
Cultivar name	Atonga (Matongo)
Original seed source	Kapsokale CSB (Kericho County)
Growth season	Long rains
Seed source	CSB
Seed characteristics:	
Seed color	Reddish brown
Seed shape	Ovate
Thousand seed weight (g)	Low (2)
Flowering plant characteristics:	
Days to 50% flowering	Early (68)
Maturing plant and pods:	
Productive tillers per plot	Very high (936)
Panicle length (cm)	Short (8)
Finger number	Medium (8)
Stem lodging	High
Plant height (cm)	Tall (114)
Susceptibility to diseases	
Neck blast	Up to 10% damage caused
Head blast	Up to 10% damage caused
Agronomic characteristics:	
Yield (t/ha)	1.93

Cultivar 7

Oteng' (Chepnyaliliet)

General information:	
Scientific name	*Eleusine coracana*
Cultivar name	Oteng' (Chepnyaliliet)
Original seed source	Kapsokale CSB (Kericho County)
Growth season	Long rains
Seed source	CSB
Seed characteristics:	
Seed color	Reddish brown
Seed shape	Circular
Thousand seed weight (g)	High (3)
Flowering plant characteristics:	
Days to 50% flowering	Early (70)
Maturing plant and pods:	
Productive tillers per plot	Very high (964)
Panicle length (cm)	Short (9)
Finger number	Medium (8)
Stem lodging	Intermediate
Plant height (cm)	Medium (109)
Susceptibility to diseases	
Neck blast	Zero damage
Head blast	Zero damage
Agronomic characteristics:	
Yield (t/ha)	3.0

Table 5. Distinctness table for the finger millet cultivars from the three target CSBs

Characters	Plant height	Medium		Tall		Very tall			Grand total
	Time to 50% flowering	Early		Early		Late		Very late	
	Number of panicle fingers	High	Medium	High	Medium	Low	Medium	Low	
Cultivars	Aliet (Chemukuliet)						1	1	1
	Atonga (Matongo)				1				1
	Nyanakuru (Naikuru)					1			1
	Nyarkamoi (Cherurkemoi)					1			
	Oteng' (Chepnyaliliet)		1						
	Rabuor (Chebririet)			1					
	Rateng' (Chepleliet)	1							1
	Grand total	1	1	1	1	1	1	1	7

Maize

Maize is the leading cereal crop in sub-Saharan Africa, serving as a staple food for approximately 50% of the population, predominantly grown by small-scale farmers within mixed agricultural systems. These systems often lack essential inputs like fertilizers, improved seeds, irrigation, and sufficient labor.

In Kenya, maize plays a critical role in food security and the national economy, forming the dietary foundation for millions. It is a versatile crop, providing carbohydrates, protein, iron, vitamin B, and essential minerals. Beyond human consumption – as roasted green maize or within porridge and pastes to – it serves as livestock feed and is used industrially for biofuels, starch, and oil extraction. With about 1.5 million hectares under cultivation, Kenya produces an average of 3 million metric tons of maize annually, achieving a national mean yield of 2 t/ha.


Nyamilambo


Red maize


Popcorn yellow

Description of the maize cultivars and varieties from target CSBs

Cultivar 1

Nyamilambo

General information:	
Scientific name	*Zea mays L.*
Cultivar name	Nyamilambo
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Horse-tooth
Seed color	White
Thousand seed weight (g)	High (498)
Flowering plant characteristics:	
Flower color	Cream
Days to 50% pollen shed	Medium (57)
Days to 50% silking	Medium (60)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Very tall (299)
Ear height	Tall (129)
Agronomic characteristics:	
Yield (t/ha)	4.4

Cultivar 2

Nyamula

General information:	
Scientific name	*Zea mays L.*
Cultivar name	Nyamula
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Horse-tooth
Seed color	Yellow
Thousand seed weight (g)	Medium (399)
Flowering plant characteristics:	
Flower color	Cream
Days to 50% pollen shed	Medium (56)
Days to 50% silking	Medium (59)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Tall (267)
Ear height	Medium (106)
Agronomic characteristics:	
Yield (t/ha)	3.28

Cultivar 3

Popcorn yellow

General information:	
Scientific name	*Zea mays L.*
Cultivar name	Popcorn yellow
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Ellipsoid cone
Seed color	Yellow
Thousand seed weight (g)	Low (168)
Flowering plant characteristics:	
Flower color	Cream
Days to 50% pollen shed	Late (62)
Days to 50% silking	Late (65)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Tall (257)
Ear height	Medium-tall (112-133)
Agronomic characteristics:	
Yield (t/ha)	1.86

Cultivar 4

Rachich

General information:	
Scientific name	*Zea mays L.*
Cultivar name	Rachich
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Spheroid
Seed color	Purple and yellow
Thousand seed weight (g)	High (430)
Flowering plant characteristics:	
Flower color	Cream
Days to 50% pollen shed	Medium (57)
Days to 50% silking	Medium (59)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Medium-tall (232-267)
Ear height	Short-medium (91-109)
Agronomic characteristics:	
Yield (t/ha)	2.66

Cultivar 5

Red maize

General information:	
Scientific name	*Zea mays L.*
Cultivar name	Red maize
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Large
Seed shape	Horse-tooth
Seed color	Red
Thousand seed weight (g)	High (402)
Flowering plant characteristics:	
Flower color	Cream
Days to 50% pollen shed	Medium (59)
Days to 50% silking	Late (62)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Tall-very tall (277-300)
Ear height	Medium (118)
Agronomic characteristics:	
Yield (t/ha)	3.89

Cultivar 6

Yellow maize

General information:	
Scientific name	*Zea mays L.*
Cultivar name	Yellow maize
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Medium
Seed shape	Spheroid
Seed color	Dark yellow
Thousand seed weight (g)	Medium (336)
Flowering plant characteristics:	
Flower color	Cream
Days to 50% pollen shed	Early (48)
Days to 50% silking	Early (50)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Medium-tall (214 -271)
Ear height	Medium (100)
Agronomic characteristics:	
Yield (t/ha)	2.51

Table 6. Distinctness table for the maize from the three target CSBs

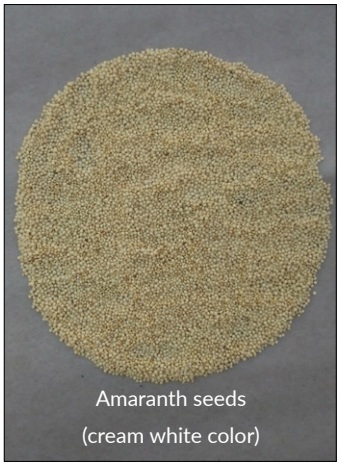
Genotype	Large				Medium			Small	Grand total
	Red		White	Yellow	Dark yellow	Purple	Yellow	Yellow	
	Late	Medium	Medium	Medium	Early	Medium	Medium	Late	
Nyamilambo		1				1			
Nyamula maize			1				1		
Popcorn yellow maize					1	1			
Rachich				1			1		
Red maize	1					1			
Yellow maize			1			1			
Grand total	1	1	1	1	1	1	1	1	6

TLVs

TLVs are integral to global cuisines, offering immense nutritional, economic, and cultural benefits. These versatile crops, often annuals, are essential for promoting health, sustainability, and agricultural resilience.

TLVs are crucial because they promote:

- Nutrition: Packed with essential vitamins and minerals, TLVs support balanced and healthy diets.
- Resilient farming: Thriving in diverse agro-ecological zones, they strengthen adaptable farming systems.
- Resource efficiency: Requiring minimal water and space, TLVs align with sustainable, small-scale agricultural practices.
- Economic boost: Cultivation enhances local food security and provides income for farmers
- Cultural preservation: TLVs uphold culinary traditions and safeguard cultural heritage.
- Sustainability: Incorporating TLVs into agro-ecological practices promotes biodiversity and reduces dependence on synthetic inputs, contributing to long-term agricultural health.


Amaranth seeds (cream white color)


Amaranthus viridis (Terere)


Amarath leaves (golden seed)


African kales

Description of the African kale cultivars and varieties from target CSBs

Cultivar 1

African kales purple stem

General information:	
Scientific name	*Brassica oleracea*
Cultivar name	African kales purple stem
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Round
Ground color of Testa	Grey
Seed Testa pattern	Plain
Color of Testa pattern	None
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Very late (76)
Stem color	Purple
Maturing plant and pods:	
Pod length (cm)	Short (4.3)
Pods per plant	Low (127)
Plant height (cm)	Tall (125)
Agronomic characteristics:	
Yield (t/ha)	0.08

Description of the amaranth cultivars and varieties from target CSBs

Cultivar 1

Amaranth leaves (golden seeds)

General information:	
Scientific name	*Amaranthus spp.*
Cultivar name	Amaranth leaves (golden seeds)
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Very small
Seed shape	Oval
Ground color of Testa	Gold
Seed Testa pattern	Plain
Color of Testa pattern	None
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Early (48)
Stem color	Green-striped maroon
Maturing plant and pods:	
Plant height (cm)	Tall (146)
Agronomic characteristics:	
Yield (t/ha)	1.55

Cultivar 2

Amaranth seeds (cream white)

General information:	
Scientific name	*Amaranthus spp.*
Cultivar name	Amaranth seeds (cream white)
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Very small
Seed shape	Round
Ground color of Testa	Cream white
Seed Testa pattern	Plain
Color of Testa pattern	None
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Late (60)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Tall (166)
Agronomic characteristics:	
Yield (t/ha)	1.96

Cultivar 3

Terere

General information:

Scientific name	*Amaranthus viridis*
Cultivar name	Terere
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB

Seed characteristics:

Seed size	Very small
Seed shape	Round
Ground color of Testa	Black
Seed Testa pattern	Plain
Color of Testa pattern	None

Flowering plant characteristics:

Flower color	Yellow
Days to 50% flowering	Late (59)
Stem color	Green

Maturing plant and pods:

Plant height (cm)	Very tall (192)

Agronomic characteristics:

Yield (t/ha)	0.35

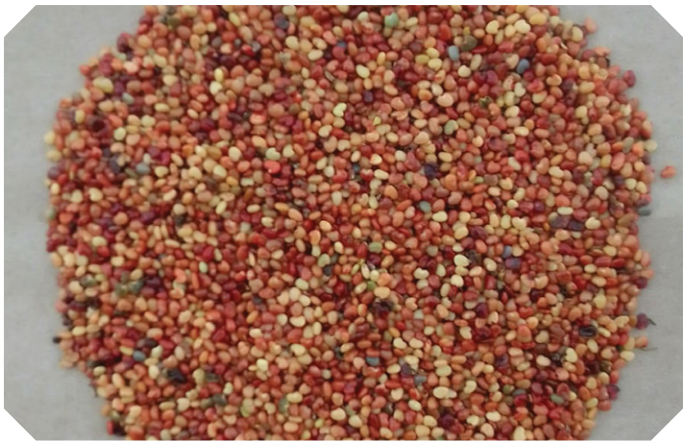
Description of the black nightshade cultivars and varieties from target CSBs

Cultivar 1

Black nightshade (Madongo)

General information:	
Scientific name	*Solanum nigrum*
Cultivar name	Black nightshade (Madongo)
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Oval
Ground color of Testa	Cream white
Seed Testa pattern	Plain
Color of Testa pattern	None
Flowering plant characteristics:	
Flower color	White
Days to 50% flowering	Late (55)
Stem color	Green
Maturing plant and pods:	
Plant height (cm)	Tall-very tall (80-97)
Agronomic characteristics:	
Yield (t/ha)	1.01

Description of the rattlepods cultivars and varieties from target CSBs



Cultivar 1

Crotalaria bitter (small leaves)

General information:	
Scientific name	*Crotalaria retusa*
Cultivar name	Crotalaria bitter (small leaves)
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Heart-shaped
Ground color of Testa	Red
Seed Testa pattern	Plain
Color of Testa pattern	None
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% pollen shed	Late (61)
Stem color	Green
Maturing plant and pods:	
Pod length (cm)	Short (5)
Pods per plant	Very high (127)
Plant height (cm)	Tall (118)
Agronomic characteristics:	
Yield (t/ha)	0.35

Cultivar 2

Crotalaria sweet (large leaves)

General information:	
Scientific name	*Crotalaria retusa*
Cultivar name	Crotalaria sweet (large leaves)
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed size	Small
Seed shape	Heart-shaped
Ground color of Testa	Cream
Seed Testa pattern	Plain
Color of Testa pattern	None
Flowering plant characteristics:	
Flower color	Yellow
Days to 50% pollen shed	Early (54)
Stem color	Green
Maturing plant and pods:	
Pod length (cm)	Long (7)
Pods per plant	High-very high (79-101)
Plant height (cm)	Very tall (135)
Agronomic characteristics:	
Yield (t/ha)	2.34

Description of the jute mallow cultivars and varieties from target CSBs

Cultivar 1

Jute mallow (Apoth 1 – small, dull leaves)

General information:	
Scientific name	*Corchorus olitorius*
Cultivar name	Jute mallow (Apoth 1 – small, dull leaves)
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB

Seed characteristics:	
Seed size	Very small
Seed shape	Triangular
Ground color of Testa	Grey
Seed Testa pattern	Plain
Color of Testa pattern	None

Flowering plant characteristics:	
Flower color	Yellow
Days to 50% flowering	Early (45)
Stem color	Green

Maturing plant and pods:	
Pod length (cm)	Long (8)
Pods per plant	Very high (138)
Plant height (cm)	Tall-very tall (135-141)

Agronomic characteristics:	
Yield (t/ha)	1.24

Cultivar 2

Jute mallow (Apoth 2 – large, shiny leaves)

General information:

Scientific name	*Corchorus olitorius*
Cultivar name	Jute mallow (Apoth 2 – large, shiny leaves)
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB

Seed characteristics:

Seed size	Small
Seed shape	Triangular
Ground color of Testa	Grey
Seed Testa pattern	Plain
Color of Testa pattern	None

Flowering plant characteristics:

Flower color	Yellow
Days to 50% flowering	Very late (72)
Stem color	Green

Maturing plant and pods:

Pod length (cm)	Short (6)
Pods per plant	High (117)
Plant height (cm)	Medium (90)

Agronomic characteristics:

Yield (t/ha)	0.37

Description of the spiderwisp cultivars and varieties from target CSBs

Cultivar 1

Spider plant

General information:

Scientific name	*Cleome gynandra*
Cultivar name	Spider plant
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB

Seed characteristics:

Seed size	Small
Seed shape	Round
Ground color of Testa	Black
Seed Testa pattern	Plain
Color of Testa pattern	None

Flowering plant characteristics:

Flower color	White
Days to 50% flowering	Very early (24)
Stem color	Purple

Maturing plant and pods:

Pod length (cm)	Long (12)
Pods per plant	High (71)
Pod beak	Long, straight
Plant height (cm)	Tall (105)

Agronomic characteristics:

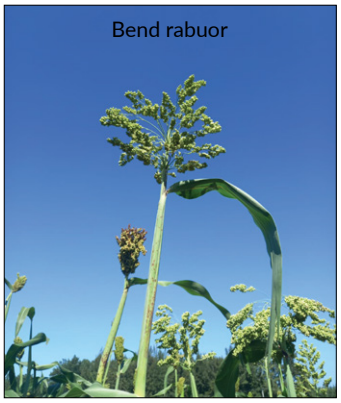
Yield (t/ha)	0.39

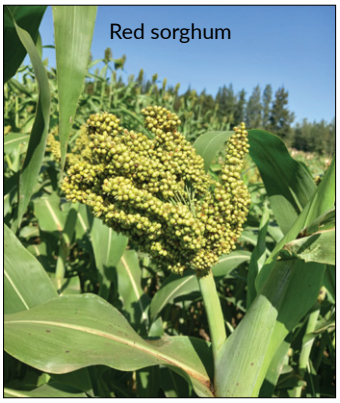
Sorghum

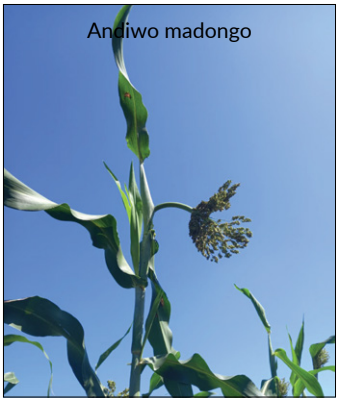
Sorghum (*Sorghum bicolor (L.) Moench*) ranks as the second most important cereal in sub-Saharan Africa after maize and serves as a critical staple for over 300 million people in Africa and Asia. Known for its exceptional adaptability, sorghum thrives in arid and semi-arid regions, tolerating extreme conditions, such as high temperatures, drought, and waterlogging. It contributes over 65% of carbohydrate needs and 39% of daily caloric intake in developing economies, highlighting its global significance as a food crop. Beyond household consumption (47% in sub-Saharan Africa), sorghum supports diverse industries, including brewing, livestock feed, biofuels, and molasses production.

Sorghum's resilience extends across tropical, sub-tropical, and temperate regions, growing in environments unsuitable for other cereals, from sea level to altitudes above 2,000m. When grown in optimal conditions – fertile, well-drained soils, moderate rainfall during its vegetative phase, and temperatures between 20–30°C – its yield potential with improved cultivars can reach 3-5 t/ha.

In Kenya, sorghum is predominantly cultivated in drought-prone areas of the eastern, Nyanza, western, and coastal regions. Western Kenya, which produces over 70% of the country's sorghum, faces significant challenges with acidic soils (pH ≤ 5.5) and low phosphorus levels (2-5 mg P/kg, far below the optimal 10-15 mg P/kg). These constraints contribute to Kenya's low average yield of 1 t/ha, starkly contrasting with the 4.3 t/ha achieved in developed nations.


Bend rabuor


Red sorghum


Andiwo madongo

Description of the sorghum cultivars and varieties from target CSBs

Cultivar 1

Boke

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Boke
Original seed source	The Genetic Resources Research Institute (GeRRI)
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Red
Thousand seed weight (g)	Low (17)
Flowering plant characteristics:	
Days to 50% flowering	Medium (72)
Midrib color	Red
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Very tall (282)
Productive tillers per plot	Very high (116)
Plant lodging	Medium
Seed threshability	Intermediate
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Zero damage
Fall Armyworm	Zero damage
Agronomic characteristics:	
Yield (t/ha)	0.39

Cultivar 2

Nyalang'o

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Nyalang'o
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Red
Thousand seed weight (g)	High (25)
Flowering plant characteristics:	
Days to 50% flowering	Early (71)
Midrib color	Red
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Medium (197)
Productive tillers per plot	High (53)
Plant lodging	Low
Seed threshability	Excellent
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Up to 10% of the plant leaves damaged
Fall Armyworm	Up to 25% of the plant leaves damaged
Agronomic characteristics:	
Yield (t/ha)	2.24

Cultivar 3

Kajimbo riat

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Kajimbo riat
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Brown
Thousand seed weight (g)	Medium (21)
Flowering plant characteristics:	
Days to 50% flowering	Medium (72)
Midrib color	White
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Very tall (307)
Productive tillers per plot	Medium (48)
Plant lodging	Medium
Seed threshability	Excellent
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Up to 10% of the plant leaves damaged
Fall Armyworm	Up to 10% of the plant leaves damaged
Agronomic characteristics:	
Yield (t/ha)	2.3

Cultivar 4

Migogo otho e dero

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Migogo otho e dero
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Red
Thousand seed weight (g)	Medium (22)
Flowering plant characteristics:	
Days to 50% flowering	Late (79)
Midrib color	Red
% ground cover at heading	Intermediate (50-70)
Maturing plant and pods:	
Plant height (cm)	Very short (142)
Productive tillers per plot	Low (39)
Plant lodging	Low
Seed threshability	Intermediate
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Up to 25% of the plant leaves damaged
Fall Armyworm	Up to 10% of the plant leaves damaged
Agronomic characteristics:	
Yield (t/ha)	1.02

Cultivar 5

Andiwo madongo

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Andiwo madongo
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Red
Thousand seed weight (g)	Very high (31)
Flowering plant characteristics:	
Days to 50% flowering	Late (78)
Midrib color	Red
% ground cover at heading	Intermediate (50-70)
Maturing plant and pods:	
Plant height (cm)	Very tall (311)
Productive tillers per plot	Medium (49)
Plant lodging	Medium
Seed threshability	Good
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Up to 25% of the plant leaves damaged
Fall Armyworm	Up to 40% of the plant leaves damaged
Agronomic characteristics:	
Yield (t/ha)	1.27

Cultivar 6

Andiwo matindo

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Andiwo matindo
Original seed source	GeRRI
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Reddish brown
Thousand seed weight (g)	Low (18)
Flowering plant characteristics:	
Days to 50% flowering	Very late (87)
Midrib color	Red
% ground cover at heading	Intermediate (50-70)
Maturing plant and pods:	
Plant height (cm)	Very tall (301)
Productive tillers per plot	Low (38)
Plant lodging	High
Seed threshability	Intermediate
Susceptibility to diseases:	
Midge head feeder	Up to 25% damage caused
Anthracnose	Zero damage
Fall Armyworm	Zero damage
Agronomic characteristics:	
Yield (t/ha)	0.83

Cultivar 7

Nyakatai

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Nyakatai
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Brown
Thousand seed weight (g)	Medium (22)
Flowering plant characteristics:	
Days to 50% flowering	Early (70)
Midrib color	White
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Tall (271)
Productive tillers per plot	Medium (48)
Plant lodging	Medium
Seed threshability	Excellent
Susceptibility to diseases:	
Midge head feeder	Up to 10% damage caused
Anthracnose	Up to 10% of the plant leaves damaged
Fall Armyworm	Up to 25% of the plant leaves damaged
Agronomic characteristics:	
Yield (t/ha)	2.09

Cultivar 8

Nyamongo oyie

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Nyamongo oyie
Original seed source	GeRRI
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Brown
Thousand seed weight (g)	Medium (21)
Flowering plant characteristics:	
Days to 50% flowering	Late (76)
Midrib color	White
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Tall (277)
Productive tillers per plot	High (50)
Plant lodging	Medium
Seed threshability	Good
Susceptibility to diseases:	
Midge head feeder	Up to 10% damage caused
Anthracnose	Zero damage
Fall Armyworm	Zero damage
Agronomic characteristics:	
Yield (t/ha)	1.82

Cultivar 9

KARI Mtama 4

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	KARI Mtama 4
Original seed source	KALRO
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Brown
Thousand seed weight (g)	Medium (21)
Flowering plant characteristics:	
Days to 50% flowering	Early (70)
Midrib color	White
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Tall (277)
Productive tillers per plot	Medium (40)
Plant lodging	Medium
Seed threshability	Good
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Up to 10% of the plant leaves damaged
Fall Armyworm	Zero damage
Agronomic characteristics:	
Yield (t/ha)	2.12

Cultivar 10

Athanyra

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Athanyra
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Cream white
Thousand seed weight (g)	High (28)
Flowering plant characteristics:	
Days to 50% flowering	Medium (71)
Midrib color	Light yellow
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Medium (205)
Productive tillers per plot	High (56)
Plant lodging	Low
Seed threshability	Excellent
Susceptibility to diseases:	
Midge head feeder	Up to 10% damage caused
Anthracnose	Up to 25% of the plant leaves damaged
Fall Armyworm	Up to 40% of the plant leaves damaged
Agronomic characteristics:	
Yield (t/ha)	1.36

Cultivar 11

Bend rabuor

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Bend rabuor
Original seed source	GeRRI
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Brown
Thousand seed weight (g)	Medium-high (19-25)
Flowering plant characteristics:	
Days to 50% flowering	Early (69)
Midrib color	Light yellow
% ground cover at heading	Poor (30-50)
Maturing plant and pods:	
Plant height (cm)	Very tall (291)
Productive tillers per plot	Very low (29)
Plant lodging	High
Seed threshability	Good
Susceptibility to diseases:	
Midge head feeder	Up to 10% damage caused
Anthracnose	Up to 40% of the plant leaves damaged
Fall Armyworm	Up to 10% of the plant leaves damaged
Agronomic characteristics:	
Yield (t/ha)	1.07

Cultivar 12

Ochuti makwar

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Ochuti makwar
Original seed source	Farmers' seed
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Reddish brown
Thousand seed weight (g)	High (29)
Flowering plant characteristics:	
Days to 50% flowering	Late (78)
Midrib color	Red
% ground cover at heading	Intermediate (50-70)
Maturing plant and pods:	
Plant height (cm)	Very tall (321)
Productive tillers per plot	Medium (47)
Plant lodging	High
Seed threshability	Excellent
Susceptibility to diseases:	
Midge head feeder	Up to 10% damage caused
Anthracnose	Zero damage
Fall Armyworm	Up to 10% of leaves damaged
Agronomic characteristics:	
Yield (t/ha)	0.72

Cultivar 13

Bend rachar

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Bend rachar
Original seed source	GeRRI
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Cream white
Thousand seed weight (g)	High (27)
Flowering plant characteristics:	
Days to 50% flowering	Very early (64)
Midrib color	White
% ground cover at heading	Intermediate (50-70)
Maturing plant and pods:	
Plant height (cm)	Very tall (296)
Productive tillers per plot	Low (38)
Plant lodging	Low
Seed threshability	Intermediate
Susceptibility to diseases:	
Midge head feeder	Up to 25% damage caused
Anthracnose	Up to 25% of the plant leaves damaged
Fall Armyworm	Up to 40% of the plant leaves damaged
Agronomic characteristics:	
Yield (t/ha)	1.18

Cultivar 14

Red sorghum

General information:

Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	Red sorghum
Original seed source	GeRRI
Growth season	Short and long rains
Seed source	CSB

Seed characteristics:

Seed color	Red
Thousand seed weight (g)	High (25)

Flowering plant characteristics:

Days to 50% flowering	Very early (66)
Midrib color	Red
% ground cover at heading	Good (>70)

Maturing plant and pods:

Plant height (cm)	Short (166)
Productive tillers per plot	High (54)
Plant lodging	Low
Seed threshability	Good

Susceptibility to diseases:

Midge head feeder	Zero damage
Anthracnose	Zero damage
Fall Armyworm	Up to 10% of the plant leaves damaged

Agronomic characteristics:

Yield (t/ha)	3.44

Cultivar 15

GBK 044626

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	GBK 044626
Original seed source	GeRRI
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Brown
Thousand seed weight (g)	High (25)
Flowering plant characteristics:	
Days to 50% flowering	Medium (71)
Midrib color	White
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Tall (302)
Productive tillers per plot	Medium (40)
Plant lodging	Medium
Seed threshability	Good
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Up to 10% of the plant leaves damaged
Fall Armyworm	Zero damage
Agronomic characteristics:	
Yield (t/ha)	1.79

Cultivar 16

GBK 044669

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	GBK 044669
Original seed source	GeRRI
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	White
Thousand seed weight (g)	High (28)
Flowering plant characteristics:	
Days to 50% flowering	Early (70)
Midrib color	Light yellow
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Short-medium (174-195)
Productive tillers per plot	High (70)
Plant lodging	Low
Seed threshability	Intermediate
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Up to 10% of the plant leaves damaged
Fall Armyworm	Up to 25% of the plant leaves damaged
Agronomic characteristics:	
Yield (t/ha)	2.12

Cultivar 17

GBK 044672

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	GBK 044672
Original seed source	GeRRI
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Brown
Thousand seed weight (g)	High (25)
Flowering plant characteristics:	
Days to 50% flowering	Late (74)
Midrib color	White
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Very tall (301)
Productive tillers per plot	Medium (49)
Plant lodging	Medium
Seed threshability	Good
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Up to 10% of the plant leaves damaged
Fall Armyworm	Zero damage
Agronomic characteristics:	
Yield (t/ha)	1.55

Cultivar 18

GBK 051768

General information:	
Scientific name	*Sorghum bicolor (L.) Moench*
Cultivar name	GBK 051768
Original seed source	GeRRI
Growth season	Short and long rains
Seed source	CSB
Seed characteristics:	
Seed color	Red
Thousand seed weight (g)	Medium (21)
Flowering plant characteristics:	
Days to 50% flowering	Very early (67)
Midrib color	Red
% ground cover at heading	Good (>70)
Maturing plant and pods:	
Plant height (cm)	Short (163)
Productive tillers per plot	High (55)
Plant lodging	Low
Seed threshability	Good
Susceptibility to diseases:	
Midge head feeder	Zero damage
Anthracnose	Zero damage
Fall Armyworm	Zero damage
Agronomic characteristics:	
Yield (t/ha)	2.84

Table 7. Distinctness table for the sorghum from the three target CSBs

Genotype	Brown								Cream white			Red			Reddish brown				Grand total
	Early			Medium				Very late	Medium		Very early	Medium		Very early	Late		Medium		
	Medium	Tall		Medium	Tall		Very tall	Tall	Medium	Short	Tall	Short	Tall	Medium	Short	Very short	Very tall		
	Loose erect primary branches	Loose erect primary branches	Loose erect primary branches	Loose erect primary branches	Loose drooping primary branches	Very loose drooping primary branches	Half broomcorn	Half broomcorn	Loose erect primary branches	Semi-loose drooping primary branches	Very lax panicle, typical of wild sorghum	Semi-loose drooping primary branches	Loose erect primary branches	Semi-compact elliptic	Semi-loose drooping primary	Half broomcorn	Semi-loose drooping primary branches	Semi-loose drooping primary branches	
Andiwo madongo													1	1					1
Andiwo matindo						1								1					1
Athanyra							1							1					1
Boke										1					1				1
GBK 044626					1										1				1
GBK 044669								1							1				1
GBK 044672				1										1					1
GBK 051768									1					1					1
Kajimbo riat					1									1					1
Kari mtama 4			1												1				1

Genotype	Brown								Cream white			Red			Reddish brown				Grand total
	Early			Medium				Very late	Medium		Very early	Medium		Very early	Late		Medium		
	Medium	Tall		Medium	Tall		Very tall	Tall	Medium	Short	Tall	Short	Tall	Medium	Short	Very short	Very tall		
	Loose erect primary branches	Loose erect primary branches	Loose erect primary branches	Loose erect primary branches	Loose drooping primary branches	Very loose drooping primary branches	Half broomcorn	Half broomcorn	Loose erect primary branches	Semi-loose drooping primary branches	Very lax panicle, typical of wild sorghum	Semi-loose drooping primary branches	Loose erect primary branches	Semi-compact elliptic	Semi-loose drooping primary	Half broomcorn	Semi-loose drooping primary branches	Semi-loose drooping primary branches	
Migogo otho e dero											1			1					1
Nyakatai			1											1					1
Nyalang'o										1				1					1
Nyamongo oyie	1													1					1
Ochuti makwar												1		1					1
Bend rabuor		1												1					1
Bend rachar								1						1					1
Red sorghum											1				1				1
Grand total	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	18

Nutritional values

Farmer cultivars are known to have low grain yields compared to improved varieties. Nonetheless, they generally have better yield stability and nutritional value advantages over the modern varieties. Grain quality analysis of randomly sampled cultivars and varieties in the catalogue as well as market samples, consistently showed that farmer cultivars had higher iron (Fe) and zinc (Zn) content compared to improved varieties (Tables 1 and 2). The iron and zinc contents data from the crops analyzed were comparable to the published data [5], [6], [7], [8].

Table 8. Summary of iron and zinc content in the seed of the farmers' cultivars and improved varieties

Crop	Average of Zn-mg/Kg				Average of Fe-mg/Kg			
	Cultivar	# Samples	Variety	# Samples	Cultivar	# Samples	Variety	# Samples
Beans	26.15	8	19.68	1	96.20	8	59.88	1
Finger millet	22.66	7	18.40	3	74.14	7	53.68	3
Green grams	28.32	1			60.60	1		
Rice bean	27.42	2			76.02	2		
Groundnuts	21.99	4			34.76	3		
Maize	25.46	6	22.11	4	39.00	5	34.46	4
Sorghum	21.10	7	20.36	3	53.50	7	78.44	3
TLVs*	29.66	13			97.17	8		
Mean Fe & Zn & # samples	25.34	48	20.14	11	66.42	41	56.62	11

Table 9. Iron and zinc content in the seed of the cultivars and improved varieties tested

Crop	Average of Zn-mg/Kg				Average of Fe-mg/Kg			
	Cultivar	# Samples	Variety	# Samples	Cultivar	# Samples	Variety	# Samples
Beans	26.15	8	19.68	1	96.20	8	59.88	1
Kanyawawa purple	24.36				141.36			
Nyayo purple long	23.40				50.52			
Nyazaire/Piriton	21.96				56.40			
Nyota – improved			19.68				59.88	

Crop	Average of Zn-mg/Kg				Average of Fe-mg/Kg			
	Cultivar	# Samples	Variety	# Samples	Cultivar	# Samples	Variety	# Samples
Okwodo small	28.56				154.56			
Pinki	36.72				130.44			
Purple long	28.92				78.36			
Yellow green short	30.84				125.16			
Zebra yellow	14.40				32.76			
Finger millet	22.66	7	18.40	3	74.14	7	53.68	3
Aliet (Chemukuliet)	21.96				70.68			
Atonga (Matongo)	19.56				46.92			
KAK Wimbi 1 – improved			17.04				56.88	
KAK Wimbi 3 – improved			21.72				40.08	
Nyanakuru (Naikuru)	15.84				85.08			
Nyarkamoi (Cherurkemoi)	20.40				60.36			
Oteng' (Chepnyaliliet)	38.28				114.00			
P224-improved			16.44				64.08	
Rabuor (Chebririet)	22.44				95.16			
Rateng' (Chepleliet)	20.16				46.80			
Green grams	28.32	1			60.60	1		
Local green grams	28.32				60.60			
Rice bean	27.42	2			76.02	2		
Lesoriadre green	26.16				66.48			
Lesoriadre maroon	28.68				85.56			
Groundnuts	21.99	4			34.76	3		
Black groundnuts	32.28							

Crop	Average of Zn-mg/Kg				Average of Fe-mg/Kg			
	Cultivar	# Samples	Variety	# Samples	Cultivar	# Samples	Variety	# Samples
Homabay red	18.84				26.40			
Red valencia	16.68				20.76			
Small groundnuts	20.16				57.12			
Maize	25.46	6	22.11	4	39.00	5	34.46	4
507 – improved			18.36				43.20	
ADV 230W – improved			20.04				21.84	
Haraka 101 – improved			24.84				33.00	
Nyamilambo	27.96				63.96			
Nyamula	23.28				47.64			
Popcorn yellow	21.96				31.56			
Rachich	46.20							
Red maize	17.88				30.00			
Tembo – improved			25.20				52.44	
Yellow maize	15.48				21.84			
Sorghum	21.10	7	20.36	3	53.50	7	78.44	3
Andiwo Madongo	15.36				30.72			
Bend rabuor	21.12				39.72			
Boke	15.48				45.48			
Gadam – improved			27.72				78.24	
GBK 044669	25.80				54.36			
Kajimbo Riat	15.12				29.76			
Kari Mtama 1 – improved			18.00				126.60	
Kari Mtama 4 – improved			15.36				30.48	
Nyalang'o	34.92				131.52			
Ochuti Marakwar	19.92				42.96			

Crop	Average of Zn-mg/Kg				Average of Fe-mg/Kg			
	Cultivar	# Samples	Variety	# Samples	Cultivar	# Samples	Variety	# Samples
TLVs	29.66	13			97.17	8		
African kales green stem	35.28				95.16			
African kales purple stem	42.84				114.24			
Amaranth viridis (Terere)	27.84							
Amaranth cream white	26.40				121.32			
Amaranth golden seed	17.04							
Black nightshade madongo	28.20							
Cowpea black	22.32				39.36			
Cowpea brown	39.12				121.80			
Crotalaria bitter – small leaves	33.00							
Crotalaria sweet – large leaves	27.00				103.44			
Jute mallow large shiny leaves	30.48				89.88			
Jute mallow small leaves	33.00							
Spider plant	23.04				92.16			
Mean Fe & Zn & # samples	25.34	48	20.14	11	66.42	41	56.62	11

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