2026

Target Food Product Profile

Gari-Eba



RTB Breeding

RTB foods

Gates Foundation

IITA Transforming African Agriculture

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ENSA

Breeding Root, Tuber, and Banana (RTB) varieties that better serve user and consumer preferences will lead to greater varietal adoption in RTB value chains. This will help to further boost RTB-linked livelihoods and food and nutrition security, and reduce drudgery.

The RTB*foods* project designed and implemented a participatory gendered interdisciplinary methodology with RTB researchers and regional stakeholders. This has contributed to **identifying key traits and characteristics required for RTB food products, in terms of processing and consumption**. **New high-throughput phenotyping tools** for assessing RTB food product quality and preferences have been developed and deployed for use by breeders and food scientists. These validated new traits are already being incorporated into breeding programmes. The project has developed product profiles covering the complete range of RTB food products. Furthermore, the previously unknown and often stereotyped African gastronomy is emerging as a 'African nouvelle cuisine' which will benefit from RTB varietal quality improvements. The RTB*foods* project was supported by the Bill & Melinda Gates Foundation, and ended in 2023, and the work is now embedded within the RTB Breeding Initiative.

This Target Food Product Profile (TFPP) for **Gari-Eba** is being translated into market-driven breeding initiatives to develop new, end-user-focused cassava varieties, which is significantly boosting their adoption.

Product Identity

Gari-Eba is a starchy staple food product made from fermented, torrefied cassava (*Manihot esculenta* Crantz). The product is consumed in West Africa, specifically in Nigeria, and in certain parts of Ghana, and Central African countries. Preparation of gari granules is the first step in making gari-eba. Gari also known as "Garri", "Garry", "Rale" or "Tapioca" is creamy- white or yellow granular cassava flour with a slightly fermented flavor. Gari processing involves cassava peeling and grating to obtain a mash which is fermented, dewatered, crumbled, sieved and roasted to obtain the pre-gelatinized granulated gari. Palm oil is added either on grating or on grated mash, or on frying. Fermentation takes around 6–48 hours before or after dewatering for 5–7 hours. The second operation takes 1–3 days in order to obtain either a natural or an oily fermented mash. The final gari product can be white (without oil) or yellow (with oil addition, or from biofortified yellow-flesh cassava). Adding palm oil can boost the price of gari and extend its shelf life. **Gari is usually consumed in the uncooked form, or dispersed in cold water and drunk directly with sweeteners, groundnuts, and fish, or cooked into a paste called "Eba"** or sprinkled on cooked cowpea beans in some Africa countries like Benin Republic, Nigeria, and Togo. Eba is the consumer end-product made by sprinkling gari into a bowl or pot of boiled water and stirring until a homogeneous gelatinous dough is formed and provides the desired texture. **Eba is generally unseasoned. Its taste is a mixture of sweet and sour, and its texture is both pliable and sticky**. Vegetable soups, stews, and fish or meat are the perfect accompaniment for it.



Roasting process of gari production
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Exploration of good quality traits for Gari-Eba

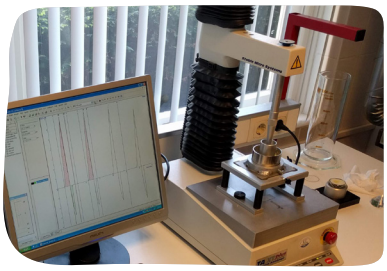
In order to obtain the best product quality and rank traits in order of importance, a gendered map of characteristics demanded by food-chain actors was achieved through a multidisciplinary methodology. These actors included cassava farmers, processors/cooks and consumers of gari-eba. By including gari-eba processors in a participatory diagnosis of processing, and consumers in rural and urban areas in consumer testing, more appropriate gendered food-product profiles for gari in Cameroon and Nigeria and for gari-eba in Nigeria by IITA and NRCRI have been developed. Several key end-user preferences for gari-eba quality traits have been identified[1-4], but these have not been traditionally included in breeding pipelines. At harvest of the raw root, the quality traits consider high yield, good root size/shape, high dry matter, and multiple uses of cassava. Almost all cassava varieties available can be used for making gari through different processing techniques. Low quality cassava roots can be processed into acceptable gari. Women preferred cassava roots that have matured for 6 months or more. During processing, **minimal processing-drudgery** traits (including ease of peeling), **non-discoloration** and **high product yield** are preferable. Ease of peeling can reduce the grating time of the roots. Strong or fibrous roots are undesirable due to their increased strength, pressure, and time to peel. **Consumer preferences of gari and eba are widely variable due to ethnic groups and regions.** Generally, a good gari is characterized by color (white or yellow), taste (mild sour, sweet, or very sour), the uniformity and size of granules (uniform and not powdery; small or big), appearance (cleanness/low fibers, no lumps, shininess, smoothness), texture in hands and mouth (dryness, resistance to chewing, high density), good aroma and flavor, and properties when used (e.g. swelling capacity when soaked, firmness or elasticity when cooked). A high-quality eba is due to its texture during cooking and eating stages, which can be **easy to swallow, smooth, not sticky, elastic (stretchy), soft, firm, and moldable**. Eba **appearance** (shiny, no lumps, no dirt), **taste** (a little sweet, sour, cooked taste) and **aroma** are all important for consumers.



Consumer testing of gari © Dominique Dufour- CIRAD

A trait evaluation toolbox to support breeding superior cassava varieties for enhanced adoption for Gari-Eba







Textural (left) and sensory (right) evaluation of gari © Dominique Dufour- CIRAD

For the first time, food technologists and social scientists can now assist breeders with quantifiable thresholds in terms of biophysical and sensory scores for overall preference for each measured trait. A toolbox of standard operating procedures (SOPs) for texture and sensory characterization for fresh cassava has been developed. Ease of peeling, dry matter (DM), starch and sugar can be determined in fresh cassava roots. For a high-throughput screening of cassava clones, near infrared reflectance spectroscopy (NIRS) has been applied for quantification of DM in fresh grated cassava. For gari and eba products, our team has developed a variety of approaches to evaluate quality attributes. Instrumental texture profile analysis (IPTA) of eba has been devised for evaluation of **hardness, adhesiveness, cohesiveness, springiness, gumminess, chewiness, and resilience** using the texture analyzer. A sensory texture profile analysis (STPA) has been designed for assessment of eba **color** (white, gray, and cream); **texture by hand** (hardness, smoothness, moldability, stickiness); and **taste** (sourness, sweetness, and smoothness). The sensory characteristics of eba can be reliably estimated from instrumental measurements[4]. This can provide a medium-throughput protocol for more rapid screening of cassava genotypes for breeding consumer-preferred products. Color measurement with a chromameter has been adapted as a medium-throughput screening tool for grated fresh cassava roots, gari, and eba samples. NIRS has been calibrated for eba color and textural properties (hardness, adhesiveness, and cohesiveness)[4]. This high-throughput tool is highly promising for integration into a cassava breeding program, particularly for screening a large population.

Improved cassava varieties suitable for making gari-eba in Benin, Cameroon and Nigeria, based on consumer preference and instrumental data, have been evaluated by IITA and NRCRI teams. Some improved cassava genotypes exhibited strong performance in terms of color, texture, taste and aroma. Instrumental phenotypic tools have been applied to evaluate fresh root qualities, and color, functional, and textual attributes of gari and eba products made from landraces and advanced cassava genotypes[5]. Notable **genetic effects were detected for eba color parameters, hardness, and gumminess**. Genotypes with a **higher DM content are more likely to have a softer and sticky eba dough**. Inclusion of these traits in cassava breeding programs is recommended for increasing the adoption of improved cassava varieties with acceptable gari and eba product quality.

Developing molecular markers for identifying genes of interest can be achieved through our approaches based on the preferences of gari-eba users and consumers. Identifying and assessing candidate genes controlling desirable cassava quality traits can enhance cassava selection and efficiency through genomic-assisted breeding. **Combinations of instrumental food quality assessments, and high-throughput phenotyping tools, together with advanced genomics approaches in cassava selection pipelines will enhance discovery of the new elite cassava varieties**. This will comprehensively address stakeholder preferences across the entire gari-eba value chain. The work will significantly boost adoption rates of new varieties and make them more attractive in the market.

Key Publications

[1] Ndjouenkeu et al., 2021. From cassava to gari: mapping of quality characteristics and end-user preferences in Cameroon and Nigeria. *Int. J. Food Sci. Technol.*, 56(3), 1223–1238. https://doi.org/10.1111/ijfs.14790

[2] Awoyale et al., 2021. A review of cassava semolina (gari and eba) end-user preferences and implications for varietal trait evaluation. *Int. J. Food Sci. Technol.*, 56(3), 1206–1222. https://doi.org/10.1111/ijfs.14867

[3] Ngoualem Kégah & Ndjouenkeu, 2023. Gari, a cassava (*Manihot esculenta* Crantz) derived product: review on its quality and their determinants. *J. Food Qual.,* 2023, 7238309. https://doi.org/10.1155/2023/7238309

[4] Alamu et al., 2024. Establishing the linkage between eba's instrumental and sensory descriptive profiles and their correlation with consumer preferences: implications for cassava breeding. *J. Sci. Food Agric.*, 104(8), 4573–4585. https://doi.org/10.1002/jsfa.12518

[5] Aghogho et al., 2024. Exploring genetic variability, heritability, and trait correlations in gari and eba quality from diverse cassava varieties in Nigeria. *J. Sci. Food Agric.*, 104(8), 4860–4871. https://doi.org/10.1002/jsfa.12889

Aghogho et al., 2026. Associating cassava root and gari-eba quality traits with consumer preferences: Implications for breeding. *J. Agric. Food Res.*, 29, 103037. https://doi.org/10.1016/j.jafr.2026.103037



Target Food Product Profile of Gari-Eba

Cassava is a key RTB food security crop in African, Asian, and Latin American countries



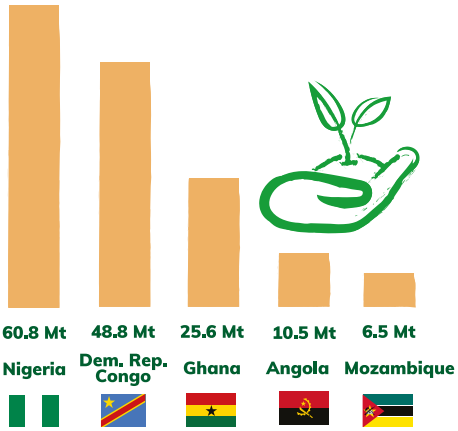
326
million tons

Global annual cassava production

- 64% Africa
- 28% Asia
- 8% Latin Ameria

Source: FAOSTAT, 2022

Top 5 cassava producers in Africa



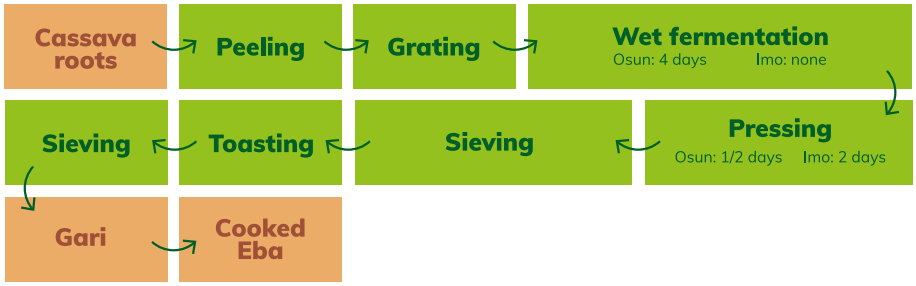
Consumption forms and main consumers of Gari-Eba in Africa[2]



Eaten raw gari and cooked as eba:
Côte d'Ivoire, Ghana, Togo, Nigeria, Republic of Benin,

Eaten gari as snacks :
Burkina Faso, Cameroon, Mozambique

Gari-Eba preparation



Preferences of farmers, producers, processors, and consumers gari-eba

Raw cassava

- High yield
- Multiple end uses of roots
- Good root size/shape
- High dry matter
- Heavy weight (maturity)
- White flesh color

During processing

- Easy to peel
- High dry matter
- Non-discoloration
- High production yield

Ready-to-eat Gari

- Dryness, shininess, smoothness,
- Uniform and non-powdery granules
- Low fiber and no lumps
- Homogeneous color white or yellow
- Sweet or sour taste (depending on area)
- Feels slight resistance to chewing

Ready-to-eat Eba

- Easy to swallow
- Smooth, not sticky, elastic/ stretchable, soft
- Firm and moldable.
- Appearance (shiny, no lumps, no dirt)
- Taste (little bit sweet, sour, cooked taste)

Key priority traits for development of cassava varieties for Gari-Eba

Gari - dryness, white/ yellow color, shiny/attractive appearance, uniform granules, and taste

Eba - smoothness, firmness, stickiness, stretchability, and moldability

As a result of our work, new traits are being integrated into the cassava breeding pipeline. Moving forwards, this will significantly boost adoption rates and performance of new cassava varieties.

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For more information about Gari-Eba, please see https://rtbfoods.cirad.fr/

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