2026

Target Food Product Profile

Matooke



RTB Breeding

RTB foods

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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 an '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 **Matooke** is being translated into market-driven breeding initiatives to develop new, end-user-focused cooking banana varieties, which is significantly boosting their adoption.

Product Identity

Matooke is a staple food in the Great Lakes region of Eastern Africa. It is made from highland cooking bananas (*Musa* spp. Group AAA–EA), a fruit crop endemic to the East African highlands. More than 30 million people in both the rural and urban areas of the Great Lakes region of Eastern Africa consume Matooke as part of their main meal. Consumption is particularly high in Uganda. Matooke is traditionally made from mature green East African highland cooking bananas. The fruit is ready to harvest when i) the banana skin changes color from dark green to pale green, ii) the fruit-surface ridges change from angular to round, iii) the dried flower parts at the banana fingertips fall off, and iv) the top-most leaves begin to dry out. Once harvested, the clusters are removed from the bunch, fingers separated and peeled by first cutting off the tips at each end and removing the peel by cutting along the length of the skin from the upper tip to the lower end. To avoid damaging the banana's flesh, the process is done with utmost care using a knife. The peeled fingers can either be washed or unwashed and then wrapped in banana leaves to form a bundle. The bundle is then placed in a saucepan, water is added, and it is steamed. Cooking time is between 1.5 hours and 2 hours and serving temperature is around 75°C. When cooked, **matooke is characterised by a unique flat taste and aroma, golden yellow color and a soft texture.** These characteristics constitute the unique quality described as **'tookeness'**, originating from the term 'Matooke'. Matooke can be served with or without soups and stews. In most areas, women are responsible for its preparation, but men are also involved in some instances, particularly in the commercial sector.



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Exploration of good quality traits for Matooke



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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 banana farmers, processors/cooks and consumers of matooke. By including matooke processors in a participatory diagnosis of processing, and consumers in rural and urban areas in consumer testing, a more appropriate gendered food-product profile for matooke has been developed. Several key end-user preferences of matooke quality traits have been identified[1]. Through gender assessment, geographical and gender differences have not proved to exert significant influences on trait preferences. Both men and women farmers prefer **big bunches, big fingers with a light green peel color and a yellowish pulp color.** Traders prioritize large fingers, large bunches, greater maturity, a shiny, light-green peel, attractive appearance (fresh, appealing, good finger formation) and compact bunches/fingers as important characteristics preferred by their customers. Women are much more involved in preparing household meals. They dislike too long or large fingers because they are difficult to handle when peeling, and they ranked pulp color more highly than men. At the peeling stage, important characteristics include **easy to peel, straight fruits, soft peel, soft pulp, yellowish pulp color and low sap content.** During washing, matooke processors prefer varieties with a little sap. Too much sap alters the color of both pulp and mashed food. However, for steaming and simmering, no specific characteristics are important. Important characteristics of high quality steamed mashed matooke for end-users include **soft texture, good aroma, yellow color, good 'matooke' taste, and compactness** (holding together when mashed). Varieties that lack these characteristics are often rejected. Characteristics that are not liked include a hard texture, matooke that is too soft or watery, a pale pulp color and a flat taste. Varieties with such characteristics are often rejected.

A trait evaluation toolbox to support breeding superior banana varieties for enhanced adoption of Matooke





Sensory panel evaluation of matooke quality traits © 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 matooke has been developed. Instrumental textural profile including hardness, adhesiveness, and cohesiveness, have been evaluated using texture analyzer. The sensory parameters including appearance (color and homogeneity of the color), texture in the mouth (firmness, moistness and smoothness), texture by touch (hardness, moldability and stickiness), taste, impression and aroma, have been assessed by matooke consumers[2]. Consumer preference assessments corroborate quantitative laboratory assessments of matooke characteristics including moldability, hardness of touch, softness of touch and yellowness) .

Quantitative descriptive analysis (QDA) and consumer acceptance assessments have been conducted by matooke users, comprising farmers, traders, and consumers[3]. Qualitative user-preferred characteristics: **bunch, finger, color** and **texture**, have been translated into quantitative measurements for a high-throughput screening of a large number of genotypes. For bunch size, the desirable threshold for users is 15–34 kg in weight. The banana fingers should not be too big or too long as preferred by women processors. The acceptable length of fingers is 12–23 cm with a straight or slightly curved shape. Hardness measured by penetration using a texturometer on cooked matooke, is predictive of sensory indicators such as firmness, smoothness in the mouth, moldability in the hand, and moistness in the mouth. The user-acceptable level of hardness for matooke is between 2.0 and 5.0 newtons. Matooke with a **low amylose content** tends to have a soft texture. Most acceptable genotypes have an amylose content quantity between 130 and 325 g per kg of matooke. The color of raw and cooked matooke is the most important appearance trait for all users. The yellow color of the steamed matooke influences consumers' opinions of its taste, softness, and willingness to choose the product with particular color. Color can be handily evaluated by a chromameter and applied as a high-throughput screening. Instrumental color measurement highly correlates with the color of matooke assessed by consumers. The yellowness of raw pulp measured by a chromameter can accurately predict the yellowness of the steamed matooke. Textural and color properties have high laboratory and field correlations.

For high-throughput screening of new matooke populations/genotypes, prediction protocols of physico-chemical, texture and dry matter of fresh East African highland cooking bananas have been developed using near-infrared spectroscopy (NIRS). Hyperspectral imaging analysis has been calibrated on color, and on starch grain size and shape. Developing molecular markers for identifying genes of interest can be achieved through our approaches based on the preferences of steamed matooke users and consumers. Identifying and assessing candidate genes controlling desirable matooke quality traits can enhance banana selection and efficiency through genomic-assisted breeding. **Applying the instrumental qualitative trait assessments (for bunch, pulp color and texture) in combination with high-throughput screening, and advanced genomics technologies in East African highland cooking banana selection pipelines, will enhance discovery of new elite cooking banana varieties.** This will comprehensively address stakeholder preferences across the entire matooke value chain. The work will significantly boost adoption rates of new varieties and make them more attractive in the market.

Key Publications

[1] Akankwasa et al., 2021. The East African highland cooking bananas 'Matooke' preferences of farmers and traders: Implications for variety development. *Int. J. Food Sci. Technol.*, 56(3), 1124–1134. https://doi.org/10.1111/ijfs.14813

[2] Akankwasa et al., 2024. Analysis of association of sensory and laboratory assessments for quality and consumer acceptability of steamed East Africa highland bananas. *J. Sci. Food Agric.*, 104(8), 4709–4721. https://doi.org/10.1002/jsfa.13043

[3] Nowakunda et al., 2024. East African highland cooking banana: towards an efficient selection of hybrids with user-preferred food quality traits. *J. Sci. Food Agric.*, 104(8), 4551–4560. https://doi.org/10.1002/jsfa.13070

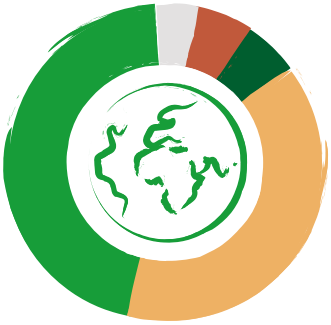
Kisenyi et al., 2026. Nutritional and sensory characteristics of local and hybrid East African Highland cooking bananas: Implications for breeding programs. *JSFA Rep.*, 6(9), 363–380. https://doi.org/10.1002/jsf2.70064

Khakasa et al., 2024. Sensory characterization of the perceived quality of East African highland cooking bananas (matooke). *J. Sci. Food Agric.*, 104(8), 4907–4914. https://doi.org/10.1002/jsfa.12606



Target Food Product Profile of Matooke

As an important type of banana, East Africa highland bananas provide a key RTB food security crop in Africa, Asia, and Latin America.



21.4
million tons

Global highland bananas & ABB group production

- 46% Asia
- 40% East Africa
- 6% Central and West Africa
- 6% Latin Ameria
- 2% Others

Top 5 Highland bananas & ABB group producers in Africa

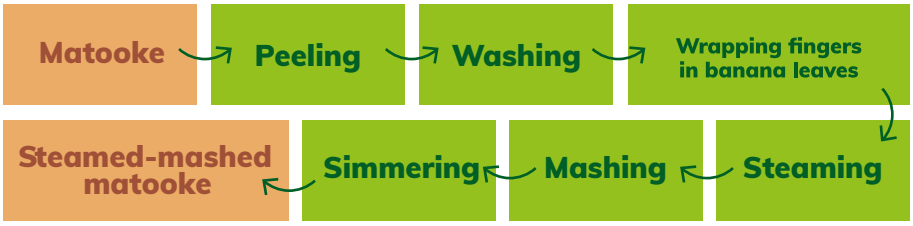




3.1 Mt	2.7 Mt	1.3 Mt	1.0 Mt	0.6 Mt
Uganda	United Republic of Tanzania	Rwanda	Burundi	Dem. Rep. Congo

Source: Lescot (2020)

Matooke Preparation



Preferences of farmers, producers, processors, and consumers of matooke

Raw bananas

- Big bunch
- Big fingers
- Peel color and appearance
- Pulp color
- Tip color maturity

During processing

- Creamy pulp color
- Easy to peel
- Big fingers
- Soft peel
- Straight fingers
- Relatively low sap

Ready-to-eat matooke

- Soft texture (smooth mouthfeel)
- Good smell
- Deep yellow color
- Good matooke taste
- Uniform texture

Key priority traits for development of East African highland cooking banana varieties for matooke:

- **Big bunches**
- **Long straight or slightly curved fingers**
- **Matooke yellowness**
- **Matooke soft texture**

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

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For more information about Matooke, please see https://rtbfoods.cirad.fr/

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