

SCALING UP FRUIT TREE PRODUCTION TO IMPROVE FOOD SECURITY, NUTRITION, AND THE ENVIRONMENT IN RWANDA

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KEY MESSAGES

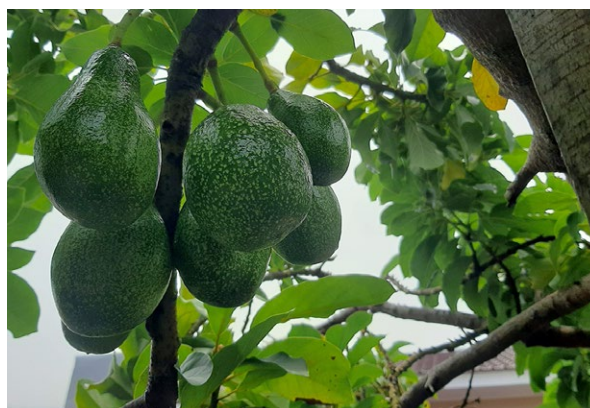
- A **diverse diet** is important for health and well-being, contributing to lower malnutrition, including micronutrient deficiency diseases (hidden hunger), as well as underweight, overweight, and associated ill health like low immune system function and non-communicable diseases. It is highlighted under Rwanda's draft Strategic Plan for Agricultural Transformation (PSTA-5) (2024 to 2030).
- Improving the production and consumption of **tree fruits** as part of local food system improvements across Rwanda can contribute to dietary diversification, while also delivering other benefits such as improved well-being, enhanced soil and landscape quality, and improved property values for households.
- The government should consider both **supply and demand side activities** as part of a plan to support the promotion of fruit tree production and consumption, for example by a) raising awareness among different individuals and groups of the benefits growing fruit trees, b) boosting domestic demand for fruit through various methods, and c) providing technical assistance on growing, harvesting, handling, and storage of fruit.



INTRODUCTION

Improving people's nutrition to drive improvements in health and well-being is a priority for Rwanda, where malnutrition in all its forms remains a significant challenge. While progress has been made on stunting rates among children under five years old, decreasing from 51% in 2005 to 33% in 2019/2020¹, rates are still too high. Another form of malnutrition prevalent in the country is micronutrient deficiency (sometimes called **hidden hunger**), driven by low dietary diversity and inadequate intake and absorption of essential micronutrients like iron, iodine, zinc, calcium, vitamin A, vitamin B6, and vitamin B12. For example, around 37% of young children (6-59 months) had iron-deficiency anaemia in 2019/2020. Overweight and obesity are further forms of malnutrition, and some 26% of women of reproductive age in Rwanda were overweight or obese in the same year¹.

A diverse diet, as highlighted under Rwanda's draft Strategic Plan for Agricultural Transformation (PSTA-5) (2024 to 2030) can help to reduce multiple forms of malnutrition and the ill health that comes hand-in-hand with it, including low immune system function and non-communicable diseases. In several studies, higher dietary diversity has been shown to reflect higher nutrient intake in individuals and households². Fruits and vegetables are an essential part of a healthy, diverse diet,



providing energy, fibre, vitamins, and minerals which help prevent deficiencies and maintain good health. Low fruit and vegetable consumption has been linked to poor health and a range of noncommunicable diseases such as coronary heart disease, strokes, type 2 diabetes, and some forms of cancer³.

Scaling up the production and consumption of fruit has the potential to reduce hunger and malnutrition in Rwanda and to contribute to socio-economic progress. Better nutrition doesn't only mean better health outcomes for vulnerable groups like infants and pregnant and lactating women, but can also help Rwanda as a nation, for instance through improved workforce and educational productivity that comes with better health. It has long been understood that improving nutrition can improve national rates of economic growth in the short and long-term⁴.

Cognizant of their intrinsic and lucrative value, the draft of the fifth Strategic Plan for Agriculture Transformation (PSTA-5) aims to increase fruit production for both export and local consumption. The plan will also promote climate resilient and disease-resistant agricultural crop and tree varieties, including fruit trees.

This brief, prepared for the Ministry of Agriculture and Animal Resources (MINAGRI) Rwanda, outlines the rationale behind scaling up fruit tree cultivation in Rwanda, including key nutritional properties of high potential fruits, key barriers faced by past programmes that have sought to boost fruit production and consumption in the recent past in Rwanda, and describes key recommendations for government and other partners on how to overcome these barriers.

¹ Data from DHS Statcompiler.

² See: <https://www.gainhealth.org/resources/multimedia/glossary>

³ Boeing H, Bechthold A, Bub A, et al. Critical review: Vegetables and fruit in the prevention of chronic diseases. Eur. J. Nutr. 2012

⁴ Nutrition Intake and Economic Growth: Studies on the cost of hunger. FAO. Eds. K. Taniguchi, X. Wang. Rome, 2003. Online at: <https://www.fao.org/4/y4850e/y4850e00.htm#Contents>

SUPPORTING TREE FRUIT PRODUCTION

Promoting the cultivation of diverse fruit trees such as mangoes, avocados, bananas, and citrus fruits in Rwanda holds good potential for reducing malnutrition by providing communities with a rich source of essential vitamins, minerals, and antioxidants crucial for overall health especially inflammation in the body. The current micronutrient survey in Rwanda (RDHS 2019/2020) indicated that 14% of children aged 6–59 months had elevated C-reactive protein (CRP) indicating acute inflammatory status while 31% had elevated alpha-1-acid glycoprotein (AGP) indicating chronic inflammation, and 34% had elevations in both markers indicating any inflammation⁵. Fruits and vegetables are loaded with phytonutrients, vitamins and minerals that enable the body to fight acute and chronic inflammation⁶ and therefore recommended to be consumed regularly contributing to Minimum Dietary Diversity (MDD).

Additionally, cultivating diverse and drought-tolerant fruit trees ensures a year-round harvest, guaranteeing consistent access to nutritious food even during lean seasons⁷. This steady supply of fresh fruits enriches diets with essential nutrients by providing an additional option for food, increasing dietary diversity.

Furthermore, integrating fruit tree cultivation into agroforestry systems enhances soil conservation, biodiversity, and sustainable land management practices.

Training and technical assistance can provide valuable support. By combining comprehensive agricultural and nutritional education programs with the promotion of fruit tree cultivation, we can empower communities to effectively combat malnutrition while fostering sustainable food security and resilience.

Nutritional value of the candidate fruit tree species

Scaling up the growth of diverse fruit trees in Rwanda, adaptable to nearly all agro-climatic zones, offers a significant opportunity to combat malnutrition. **Table 1** below describes some nutritional values (presence of essential vitamins, minerals, and antioxidants) of different categories of key fruit crops in Rwanda – those with **high potential** from a nutritional and (domestic) marketing perspective, as well as those with **moderate, good**, and **some potential**.

Nutritional and other benefits of indigenous fruit trees – such as *Ximenia caffra* (locally known as Amasasa), *Garcinia buchananii* (locally known as Amasarasi), and *Lannea schimperi* (locally known as Imimuna)⁸ are also worth exploring. In the recent past, traditional fruits have gone from being relatively localised to specific communities, to being widely exported and well-known globally⁹.

5 National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF. 2023. Rwanda Demographic and Health Survey 2019–20 Supplemental Report for Micronutrients. Kigali, Rwanda, and Rockville, Maryland, USA: NISR and ICF.

6 [Fighting inflammation with food - Harvard Health](#)

7 Chambers, R, and R Longhurst. 1986. Trees, Seasons and the Poor. *IDS Bulletin* 17: 44-50

8 Utilisation of indigenous fruit tree species within the Lake Victoria Basin, Rwanda. *Agricultural Science: An International Journal (AGRIJ)*, Vol 1, No. 1, 2016. <https://airccse.com/agrij/papers/1116agrij01.pdf>

9 Consider the açai berry from eastern Amazonia, which was relatively obscure outside the region before the mid-1990s; or the Goji berry, native to East Asia, that has become common as a health food in western countries since around the year 2000.

Table 1: Tree fruits with different potential in Rwanda and their main nutritional qualities

Potentiality	Common Name, Scientific Name	Local Name	Notable Nutrients Present
High potential (available and widely consumed)	Avocado, <i>Persea americana</i>	Avoka	Healthy fats, fibre, and antioxidants
	Tamarillo (tree tomato), <i>Solanum betaceum</i>	Ikinyomoro	Vitamin C, antioxidant compounds, calcium, phosphorus, potassium and iron, sugars, organic acids, pectin's and flavonoids.
	Passion fruit, <i>Passiflora edulis</i>	Amatunda	Vitamin C, dietary fibre, Vitamins B2,3,6,
	Guavas, <i>Psidium guajava</i>	Amapera	Vitamin C and dietary fibre
	Papaya, <i>Carica papaya</i>	Ipapayi	Carotene, Folic acid and Vitamin C
	Mango (both traditional and improved varieties), <i>Mangifera indica</i>	Umwembe	Traditional mango: Vitamin C carotenes and fibre.
Good potential (available, not widely consumed)	Small banana <i>Musa paradisiaca</i>	Kamaramasenge	Polyphenols, vitamin B6 (pyridoxine), vitamin B7 (biotin), manganese, vitamin C, fiber, copper, potassium, magnesium, and vitamin B5 (pantothenic acid). They also contain happy hormones serotonin, dopamine, and norepinephrine.
	Citrus/ Orange, Citrus limon	Indimu/ Amacunga	Vitamin C, Potassium, and fibre
	Jackfruit, <i>Artocarpus heterophyllus</i>	Igifenesi	Vitamin C, Potassium, Vitamin B6, dietary fibre & carotene and minerals
Some potential (new trees suggested: potential for cultivation)	Soursop, <i>Annona muricata</i>	Coeur de boeuf (keri de befu)	Phytonutrients, Vitamin C, B6, and potassium
	Pomegranate, <i>Punica granatum</i>	Available but no appropriate name in Kinyarwanda (Fruits considered as inedible)	Potassium and fibre, phytonutrients, Vitamin K, choline
Some potential (new trees suggested: potential for cultivation)	Jumblums, <i>Syzygium cumini</i>	available but no appropriate name in Kinyarwanda (Fruits considered as inedible)	Vitamin C, anthocyanins and flavonoids
	Sapota, <i>Manilkara zapota</i> ^a	Not available in Rwanda	Iron, Folate, vitamin C, Pantothenic acid, copper
	Custard apple, <i>Annona reticulata</i> ^a	Not available in Rwanda	Antioxidants and vitamin C
Some potential (new trees suggested: potential for cultivation)	Amla, <i>Phyllanthus emblica</i> ^a	Not available in Rwanda	Vitamin C and antioxidants

Notes: ^a These fruit trees are not yet grown in Rwanda but could be introduced. The different categories of potential are qualitative, based on the authors opinion and rough assessment of the popularity of the fruit trees, their suitability for growing in Rwanda, and their marketability in domestic settings.

Further benefits and appeal of fruit trees

In many locations, especially in urban and peri-urban areas, ornamental trees are favoured. There is potential to encourage people and institutions to choose fruit trees instead of ornamentals when planting, landscaping, and planning decisions are being taken. There is also potential in some instances to replace ornamental trees with fruit trees. These actions could be part of the wider push for more fruit trees including in communal areas. **Table 2** describes the usefulness and benefits of fruit trees compared to ornamental trees.

Table 2: A comparison of fruit trees and ornamental trees across various aspects

Aspects	Ornamental Trees	Fruit Trees
Aesthetic Appeal	Often chosen for their beauty and visual appeal.	While they can be visually appealing, their primary focus is on fruit production rather than aesthetics.
Seasonal Interest	May offer seasonal blooms or foliage changes for visual interest informing the change of season.	Besides seasonal blooms, they provide fruit, offering a different kind of seasonal interest.
Wildlife Habitat	Can provide habitat for birds and insects, depending on species.	Fruit trees attract a variety of wildlife, including birds, bees, and other pollinators. Some animals may also be drawn to feed on the fruit.
Shade and Cooling	May provide shade but usually not as dense or large as fruit trees.	Fruit trees can provide ample shade, which can help cool outdoor spaces during hot weather.
Edible Benefits	Generally, no edible benefits from ornamental trees.	Produces edible fruits that can be harvested and consumed by humans and wildlife.
Maintenance Requirements	Typically, low maintenance once established.	May require more maintenance, including pruning, fertilizing, and pest control, to ensure healthy fruit production.
Environmental Impact	Enhances air quality and contributes to overall environmental aesthetics.	As well as enhancing air quality and aesthetics, can contribute to local food production, reducing the carbon footprint associated with food transportation.

BARRIERS PREVENTING SCALE-UP OF FRUIT PRODUCTION AND CONSUMPTION

The Government of Rwanda and partners have experience of seeking to promote fruit tree production and consumption, both directly and indirectly. Efforts have included dedicated operations such as the Ministry of Agriculture’s Three Fruit Trees per household campaign launched in 2019, as well as general tree-planting promotions like the one Acre Fund’s TUBURA-Tree campaign, or broader supportive programmes such as the Rwanda Sector Support Programme (RSSP) and the Kayonza Irrigation and Integrated Watershed Management Project (KIIWP)¹⁰.

Despite these efforts, more could be done to promote optimal fruit tree production and consumption. Several critical barriers have been identified as hindering optimal fruit tree adoption (**Table 3**).

¹⁰ Ministry of Agriculture and Animal Resources and APEFA (Action pour la Protection de l’Environnement et la Promotion des Filières Agricoles). April 2024. Program Proposal “Five Fruit Trees Per Household.” Republic of Rwanda.

Table 3: Critical barriers identified preventing adoption of fruit tree growing across Rwanda

Critical Barrier	Brief Description
Initial Maintenance Challenges	Growers in receipt of young fruit seedlings struggle to provide the necessary early maintenance, including watering, pest control, and applying organic fertilizers. This inability to meet the initial care requirements can result in a high mortality rate for vulnerable young trees.
Agroecological Incompatibility	In the past, seedlings have been distributed to areas that are not agroecologically suitable, leading to poor survival rates of fruit trees.
Quality of Seeds and Seedlings	Challenges in sourcing high-quality planting materials that are well-suited to Rwanda's context have had negative implications for the resilience of fruit trees to pests, diseases, and local climatic conditions.
Limited Technical Knowledge	Farmers and others along the supply chain lack technical knowledge on the proper maintenance and management of fruit trees, and the handling, transportation, processing etc of some fruits.
Land Availability Constraints	Particularly in urban areas, the scarcity of accessible land presents an obstacle for farmers and households interested in fruit tree cultivation.
Low Demand from Consumers	This is driven in part by people's lack of awareness of the nutritional benefits of eating fruit, which translates to a limited interest in fruit tree cultivation and consumption.

Source: Authors construction, drawing on information from Ministry of Agriculture and Animal Resources and APEFA (Action pour la Protection de l'Environnement et la Promotion des Filières Agricoles). April 2024. Program Proposal "Five Fruit Trees Per Household." Republic of Rwanda

These barriers highlight the need for a multi-pronged approach, with actions along the supply chain from quality input development and land considerations, to improving producer and consumer knowledge of key aspects of fruit production and consumption, to support both supply and demand.

RECOMMENDATIONS

Together with partners, MINAGRI should develop a plan with SMART targets (Specific, Measurable, Achievable, Relevant, and Time-Bound) to scale up planting of fruit trees in the country, to boost the domestic availability and consumption of fruits, and to explore options for expanding the export of fruit. This plan should include actions on both supply and demand side to create a positive feedback, whereby greater demand drives greater supply and the reverse. Elements of such a plan ought to address the critical barriers identified in Table 3, and may include:

At policy level

- **Government Policies:** Establish coherent policies that encourage healthier food choices while discouraging unhealthy options to improve food environments and address areas lacking diverse, nutritious options, especially for children. This may involve changing the balance of taxes and subsidies, restricting the advertising of unhealthy food while encouraging advertising of healthy options, nutrition education in health and education settings etc.
- **Public Awareness Campaigns:** Collaborate with private-sector stakeholders, development partners, and consumer groups to create innovative demand-generation campaigns targeting younger generations. These campaigns should promote fruits as desirable snacks, potentially replacing less nutritious options like crisps and sweets.
- **Indigenous Fruit Trees Recognition:** Recognize Indigenous Fruit Trees (IFTs) as sustainable species with nutritional, medicinal, and economic value. Prioritize research on their domestication and cultivation, while promoting indigenous knowledge and enhancing marketability.

- **National Zoning and Planning Regulations:** Develop regulations that favor planting fruit trees over purely ornamental options in public, private, and conservation areas where appropriate.
- **National Government Food Procurement:** Ensure government food procurement processes (e.g., school meals, hospital meals) regularly include diverse fruits, thereby stimulating demand and providing suppliers with predictable markets.

At community level

- **Community Engagement:** Encourage community fruit tree planting, care, and ownership in diverse settings, including schools, public spaces, and wetland buffer zones.
- **Local Zoning and Planning Regulations:** Develop regulations that favor planting fruit trees over purely ornamental options in public, private, and conservation areas where appropriate.
- **Local Government Food Procurement:** Ensure government food procurement processes (e.g., school meals, hospital meals) regularly include diverse fruits, thereby stimulating demand and providing suppliers with predictable markets.

At smallholder farmer or producer level

- **Guidelines and Tools Development:** Support the creation of guidelines, manuals, and training resources for smallholders and small enterprises focused on fruit cultivation, harvesting, storage, and food preparation.
- **Support for Smallholders:** Assist smallholders in growing fruit trees on their land and invest in small-scale community facilities to enhance post-harvest handling and minimize fruit losses.
- **Training and Resources:** Provide training, techniques, and technology to smallholders for preserving nutrients and extending the shelf life of perishable fruits. This includes:

- | | |
|--------------------------------|---|
| a) Budding/grafting. | e) Insect pest management. |
| b) Handy tools and implements. | f) Harvest and storage practices. |
| c) Transplantation. | g) Processing and culinary use of fruits. |
| d) Agronomic practices. | |

CONCLUSION

Tree fruit expansion holds significant potential for reducing malnutrition in Rwanda including among vulnerable populations such as women and children. Additional benefits of the planting of fruit trees include that farmers cultivating fruit trees can enjoy another source of income. Strong community-owned fruit tree programmes also bring valuable social and environmental benefits, while having fruit more readily available and accessible in markets will help to drive demand and innovation – for instance around fruit-containing food products.

Given the clear benefits of improved fruit production and consumption in Rwanda, we urge MINAGRI, the Ministry of Environment (MINIRENA), and other partners to collaborate and work together on this important mission of establishing a sustainable, profitable and healthier fruit production and consumption plan of action for the Rwandan people.

ANNEX 1: Selected fruit trees found in Rwanda



Citrus/ Orange, Citrus limon, Indimu/Amacunga



Guavas, *Psidium guajava*, Amapera



Papaya, *Carica papaya*, Ipapayi



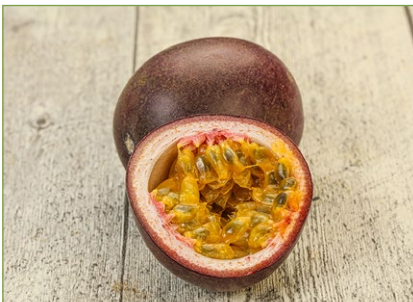
Mango (both traditional and improved varieties), *Mangifera indica*, Umwembe



Avocado, *Persea americana*, Avoka



Tamarillo (tree tomato), *Solanum betaceum*, Ikinyomoro



Passion fruit, *Passiflora edulis*, Amatunda



Pomegranate, *Punica granatum*, (no local name)



Jackfruit, *Artocarpus heterophyllus*, Igifenesi



Sour sop, *Annona muricata*, Keri de befú



Small Bananas, *Musa paradisiaca*, Kamaramasenge

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