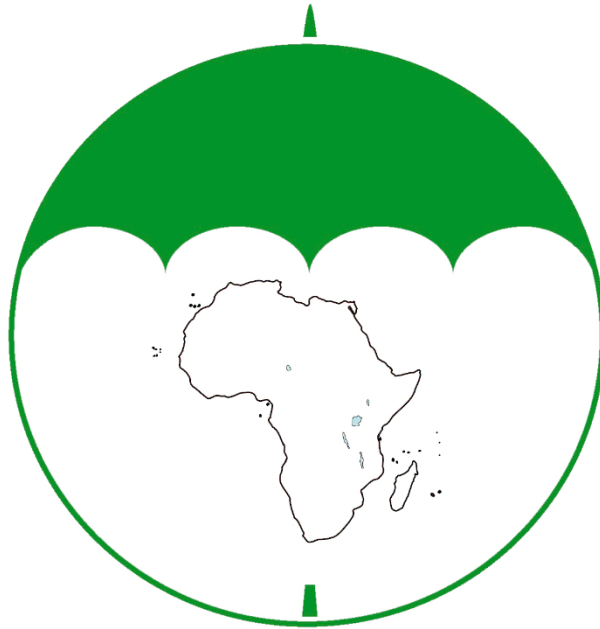


# Terms of Reference



<b>CONTRACTING ORGANIZATION</b>	<b>AFRICAN ORGANISATION FOR STANDARDISATION</b> P. O. Box 57363 - 00200, NAROBİ, KENYA 3rd Floor, International House, Mama Ngina Street Tel: +254 20 2224561/311608 E-mail: arso@arso-oran.org
<b>CONSULTANCY TERMS OF REFERENCE</b>	<b>COMPILATION OF (MONOGRAPHS) AFRICAN INDIGENOUS EDIBLE FRUITS, NUTS AND VEGETABLES INCLUDING THEIR VALUE ADDITION AND COMMERCIALIZATION</b>
<b>CONSULTANT</b>	
	<b>P. O. Box</b>
	<b>Tel:</b>
	<b>Email:</b>
	<b>Duration:</b>
	<b>Total Pay: Financial Proposal</b>

**ARSO Central Secretariat  
Nairobi, Kenya  
September 2022**

# Compilation of (monographs) African indigenous edible fruits, nuts and vegetables including their value addition and commercialization

## 1. Background

The word "indigenous" as an adjective often refers to the native, traditional or ancestral nature of an entity in a geographical location, which may or may not relate to indigenous peoples (FAO, 2021). The term 'indigenous foods' refers to plant- and animal-based foods (such as dairy) that are naturally existing and produced in specific locations and consumed as part of traditional diets (Rampa *et al.*, 2020). "Indigenous food systems (IFS)" refer to systems of cultivation, processing, storage, trade, and consumption, which are specific to particular geographic regions, and whose origins generally pre-date large-scale industrial agriculture (Keleman Saxena *et al.*, 2016). In this sense, "indigenous food systems" would include systems relying primarily on minor and/or endemic food crops (including native or underutilized species), or farmer-saved varieties of major food staples, such as corn, rice, and wheat. A traditional crop is an indigenous species native to a specific region or one that was introduced a long time ago and, due to long use, has naturalized and become part of the culture of a community (Maundu, 1997; Muthoni & Nyamongo, 2010). African indigenous vegetables are defined as 'all categories of plants whose leaves, fruits or roots are acceptable and used as vegetables by rural and urban communities through custom, habit and tradition' (Muhanji *et al.*, 2011). African leafy vegetables may be defined as species of plants that are either genuinely native to a particular region, or plant species that were introduced to that region so long ago so as to have evolved through natural processes or farmer selection (van Rensburg *et al.*, 2007). In this paper, the term indigenous and traditional food crops (ITFCs) shall carry the meaning of traditional food crops including cereals, pulses, oilseeds, nuts, fruits, vegetables, roots and tubers used by African indigenous communities.

Other terminologies used to describe indigenous and traditional crops include the following:

**Neglected crops:** *"Neglected crops are those grown primarily in their centres of origin by traditional farmers, where they are still important for the subsistence of local communities. Some species may be widely distributed around the world but tend to occupy special niches in the local ecology and in local production and consumption systems. While these crops continue to be maintained by sociocultural preferences and the ways they are used, they remain inadequately documented and neglected by formal research and conservation"* (IPGRI, 2002).

**NUS:** *"Acronym standing for Neglected and Underutilized Species and applied to useful plant species which are marginalized, if not entirely ignored, by researchers, breeders and policy makers; they belong to a large, biodiverse group of thousands of domesticated, semi-domesticated or wild species; they may be locally adapted minor crops as well as non-timber forest species. The 'NUS' term is a fluid one, as when a crop is simultaneously a well-established major crop in one country and a neglected minor crop in another. NUS tend to be managed with traditional systems, use informal seed sources and involve a strong gender element".* In a wider sense, the term NUS also could be used to refer to animal species. (Padulosi *et al.*, 2013).

**Orphan crops:** *"Orphan crops are defined as crops that have either originated in a geographic location or those that have become 'indigenized' over many years (> 10 decades) of cultivation as well as natural and farmer selection. The term 'orphan' has often been used to refer to crops that may have originated elsewhere, but have undergone extensive domestication locally, thus giving rise to local variations, i.e., 'naturalized/indigenized crops'".* (Mabhaudhi *et al.*, 2019)

**Underutilized crops:** *“Underutilized crops were once grown more widely or intensively but are falling into disuse for a variety of agronomic, genetic, economic and cultural reasons. Farmers and consumers are using these crops less because they are in some way not competitive with other species in the same agricultural environment. The decline of these crops may erode the genetic base and prevent distinctive and valuable traits being used in crop adaptation and improvement”.* (IPGRI, 2002).

Indigenous and traditional foods crops (ITFCs) have multiple uses within society, and most notably have an important role to play in the attempt to diversify the food in order to enhance food and nutrition security (Akinola *et al.*, 2020). However, research suggests that the benefits and value of indigenous foods within the African context have not been fully understood and synthesized. Their potential value to the African food system could be enhanced if their benefits were explored more comprehensively.

## 2. Strategic significance of African indigenous edible fruits, nuts and vegetables

Underutilized or neglected crops species are often indigenous ancient crop species which are still used at some level within the local, national or even international communities, but have the potential to contribute further to the mix of food sources than they currently do. Neglected or underutilized crops have the potential to play a number of roles in the improvement of food security that include being: (i) part of a focused effort to help the poor for subsistence and income, the majority of whom live in the rural areas; (ii) a way to reduce the risk of over-reliance on very limited numbers of major crops; (iii) a way to increase sustainability of agriculture through a reduction in inputs, such as fossil fuel-derived nitrogen fertilizers and fuel for agriculture, given the risks of the carbon footprint of agriculture on climate change; (iv) a contribution to food quality; and (v) a way to preserve and celebrate cultural and dietary diversity (Mayes *et al.*, 2012).

Key features of indigenous food crops include (Padulosi *et al.*, 2022):

- (a) *Relevant to local consumption and production systems:* being intimately linked to local food cultures, NUS are used in traditional food preparations and are associated with social and religious ceremonies and rituals.
- (b) *Adapted to agroecological niches and marginal areas:* NUS often demonstrate comparative advantages over commercial crops due to natural selection or selection carried out by local growers against biotic and abiotic stresses, which makes them perform comparatively better under low input and biological agriculture techniques.
- (c) *Resilient to climate change:* compared with commodity crops, NUS are highly adapted to biotic and abiotic stresses related to climate change, something that is being increasingly confirmed by scientific research.
- (d) *Rich in traditional knowledge:* in view of the ongoing cultural erosion affecting traditional societies, associated knowledge on NUS is being rapidly lost, which, in turn, leads to the loss of genetic diversity and continued opportunities for appreciation by consumers, especially the younger generation.
- (e) *Highly relevant in Indigenous Peoples' societies:* for Indigenous communities, NUS are the result of sophisticated trials and accumulation of experience over many centuries and generations: they are a manifestation of a systematic process that involved intricate ways of learning and accumulating experience.
- (f) *Multi-functionality and multiple benefits:* they are often able to provide people with not just nutritious food, but also valuable non-food products and ecosystem services.

The global positioning of Africa offers a wide range of agro-ecological regions which support a wide range of fruits and vegetables (see Figure 1). In tropical America, more than 1000 fruit species are described, though only 100 are found in local markets. Asia has about 500 tropical fruit species, the Indian subcontinent about 300, with about 1200 in Africa (Paull & Duarte, 2011). Of these fruits only a few are found in local markets and fewer are exported. Ninety per cent of the export market is made up of citrus, banana and plantain, mango and pineapples. A further 5% is made up of papaya, avocado and dates. The remainder is made up of more than 20 species, ranging from breadfruit and litchi to mangosteen, passion fruit and coconut. More than 90–95% of tropical fruits are not exported from the producing country but are consumed locally. The most common tropical fruits in trade come from three major areas: Central and South America (papaya, avocado, pineapple, guava), Asia (most citrus fruits, litchi), and South and South-east Asia (banana, mango, mangosteen, durian). Only one important tropical fruit is native to Africa and that is the date, though the continent has many other tropical fruits. This indicates that despite Africa's potential for production of a wide range of fruits and vegetables, only a small fraction reaches the international markets.

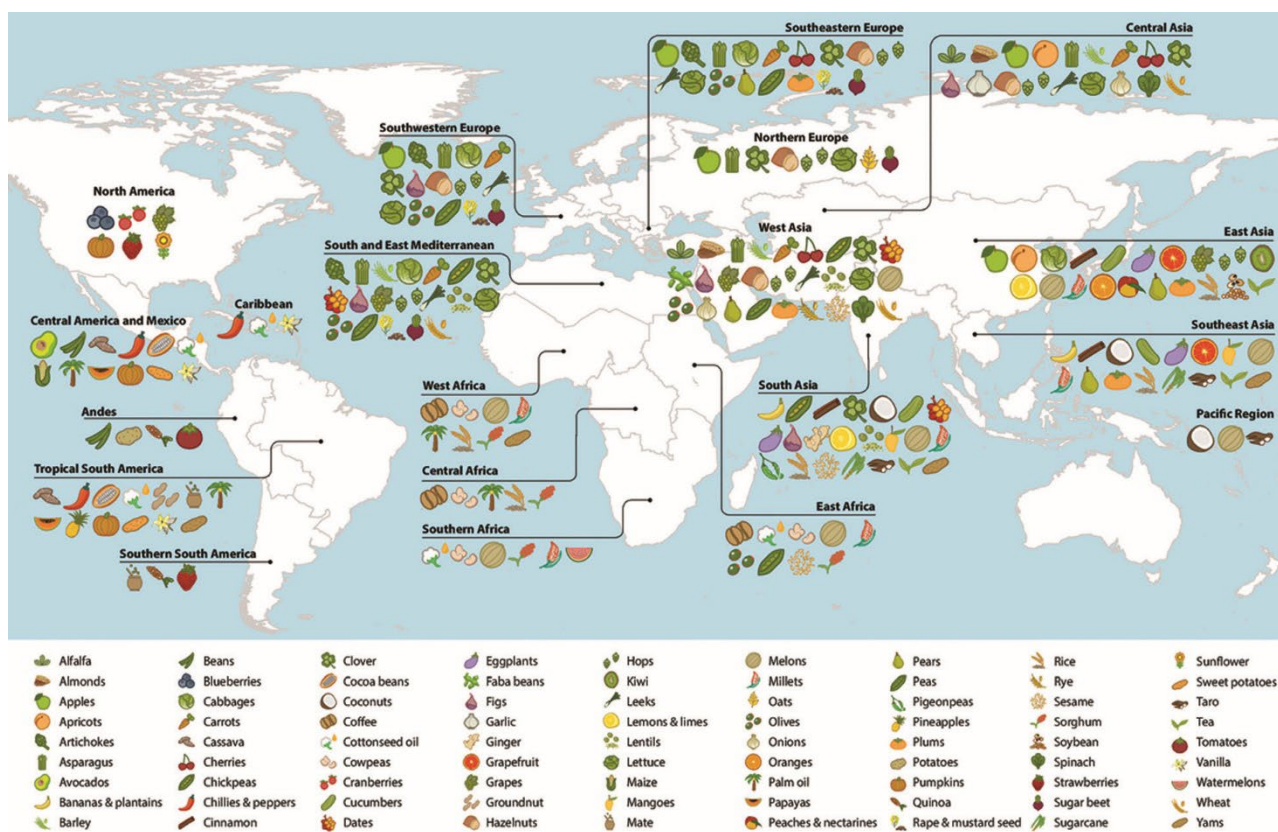


Figure 1: Primary regions of diversity of major agricultural crops worldwide (Khoury *et al.*, 2016)

### 3. Problem Statement

Underutilized horticultural plant species with under-exploited potential for contribution to food security, health (nutritional and/or medicinal), income generation and environmental services. In many parts of Africa, growing both domesticated and wild fruit species on farms diversifies the crop production options of small-scale farmers and can bring significant health, ecological and economic revenues (Fanzo *et al.*, 2013). Dozens of indigenous fruit tree species (IFTs), although relatively unknown in global markets, are locally of large importance for food/nutrition security and income generation and it has been demonstrated that many wild fruit species from different African regions

have a high potential for undergoing domestication followed by successful on-farm production and commercialization (Akinnifesi et al., 2008; Cemansky, 2015; Fanzo et al., 2013).

African indigenous vegetables (AIVs) have been part of the food systems in sub-Saharan Africa for generations. The region is a natural habitat for more than 45,000 species of plants, of which about 1,000 can be eaten as green leafy or fruit vegetables that happen to be the mainstay of traditional diets (Muhanji et al., 2011; Nono-Womdim et al., 2012; NRC (U.S.), 2006; Shackleton et al., 2009). The potential for AIV commercialization is favourably high due to the following factors: (i) low production costs (e.g. use of locally available manure); (ii) few pests and diseases compared to exotic vegetables like kales; (iii) fast rate of maturity (within 1–3 months, farmers start harvesting); (iv) high consumer demand, high prices, and availability of a ready and growing market, providing a business opportunity (Muhanji *et al.*, 2011).

A significant number of horticultural products are sold direct as fresh produce as in the case of cut flowers and some fruits and vegetables. However, most fresh fruits and vegetables are only edible for a very short time and will rot unless they are promptly and properly preserved. The rotting process can be postponed by adding preservatives, optimizing storage conditions, or applying modern techniques. Preservation also assures a stable market to farmers and horticulturists and enables them to expand their production without fear of a fall in demand (Sharangi & Datta, 2015). Preservation is a process of keeping food materials in an altered condition for a long time without impairing their quality to the utmost extent, with the objectives to preserve fruits and vegetables at the stage of maximum palatability, taste, colour, flavour, quality, and nutritive value; to check wastage of local or seasonal surplus; to make the product available for a longer period even in places where it is not produced; to preserve food materials during transit from producer to consumer; and to facilitate handling of food materials, which is done primarily through various methods of packaging.

While the preservation of fruits and vegetables serves to maintain fruits and vegetables in a state of minimal modified freshness, the current focus is to attain fruit and vegetable processing activities for one or other of the following reasons: (i) diversification of the economy, in order to reduce present dependence on one export commodity; (ii) government industrialization policy; (iii) reduction of imports and meeting export demands; (iv) stimulate agricultural production by obtaining marketable products; (v) generate both rural and urban employment; (vi) reduce fruit and vegetable losses; (vii) improve farmers' nutrition by allowing them to consume their own processed fruit and vegetables during the off-season; (viii) generate new sources of income for farmers/artisans; (ix) develop new value-added products (Dauthy, 1995).

Fruit and vegetable processing can be as basic as grading, washing, cooling, peeling, blanching, size reduction, freezing, dehydration, canning, minimal processing, and sustainability. African exports of horticultural and processed agricultural products are growing in line with the major shift towards these products in world markets (Emiko & Will, 2016). Continued growth in these exports may be vitally important for expanding returns from African agriculture and for increasing its overall exports. Agricultural exports from Africa include a much larger share of bulk agricultural exports than is the norm on world markets where processed products have come to dominate. This calls for a re-orientation toward exporting value-added horticultural products which is the current drive in many other developing and developed countries. For example, in India only about 2.2 % of the total fruits and vegetables produced are processed as compared to countries like the USA (65 %), Malaysia (83 %), the Philippines (78 %), France and Brazil (70 % each), etc (Sharangi & Datta, 2015).

#### 4. Objectives for the Study on African indigenous edible fruits, nuts and vegetables

- (1) Identify and document African indigenous edible:
  - (a) Fruits
  - (b) Nuts
  - (c) Vegetables
- (2) Develop an inventory of the indigenous crops including their distribution range, parts used and products commonly derived from the plant in a tabular format as shown in Table 1.

**Table 1: Inventory of African indigenous edible fruits, nuts and vegetables**

No	Taxon	Common crop name	Distribution	Used plant parts	Uses and products
1	Musa acuminata; M. acuminata X balbisaniana	Banana; Plantain	Burundi, Cameroon, DR Congo, Ethiopia, Ghana, Guinea, Kenya, Malawi, Mali, Mozambique, Nigeria, Rwanda, Sierra Leone, Somalia, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe, etc	Fruit	Dried banana, dried chips, starch, fried chips, jam, clarified juice, fruit bar, flour, alcoholic beverages, jelly, etc

- (3) Please provide clear illustrations of the crops through your own original photographs or copied photographs from other sources which are bibliographically referenced in respect of copyright regulations.
- (4) Please elaborate the trade and economic significance of the crop and its potential for expanded trade if promoted and value added.
- (5) What are their environmental production requirements?

Well referenced highlight on the environmental conditions in which the crops perform well. Please indicate adaptations to biotic and abiotic stress conditions of the crops.

- (6) What is the geographical distribution of the crop?

A map showing the geographical distribution of the crop from an authoritative source shall be inserted

- (7) What are the guidelines for their primary production? What are the agronomic practices pertaining to optimal performance of the crops?

This includes, but is not limited to the various impacts of different fertilization schemes (organic or chemical fertilizers, doses and frequencies of applications), soil tillage regimes (tillage vs. no tillage), irrigation practices (doses and frequencies of water supply, waterlogging), planting densities, crop pests and diseases, crop protection strategies and products, and harvesting modes (e.g., rooting, cutting, leaf picking) on growth, regrowth (when applicable), and overall yield are important factors to take into account throughout the breeding process. What are the common crop diseases and crop protection methods and products?

The agronomic practices may be accompanied by illustrations to promote better understanding.

- (8) What are the value added products, their procedures, hygiene, quality and marketing requirements?

This section shall demonstrate the procedures for value added products obtained or potentially obtainable from the various indigenous African crops. Bearing in mind that the products might be localized and traditionally processed, the consultant shall explore the areas of improvement to achieve hygiene, quality, safety and market compliance of the value-added products.

It is recommended that the consultant combines process charts for product development as aids to understand the process and product pictorials as a means of enhancing comprehension. Example is given in Figure 2.

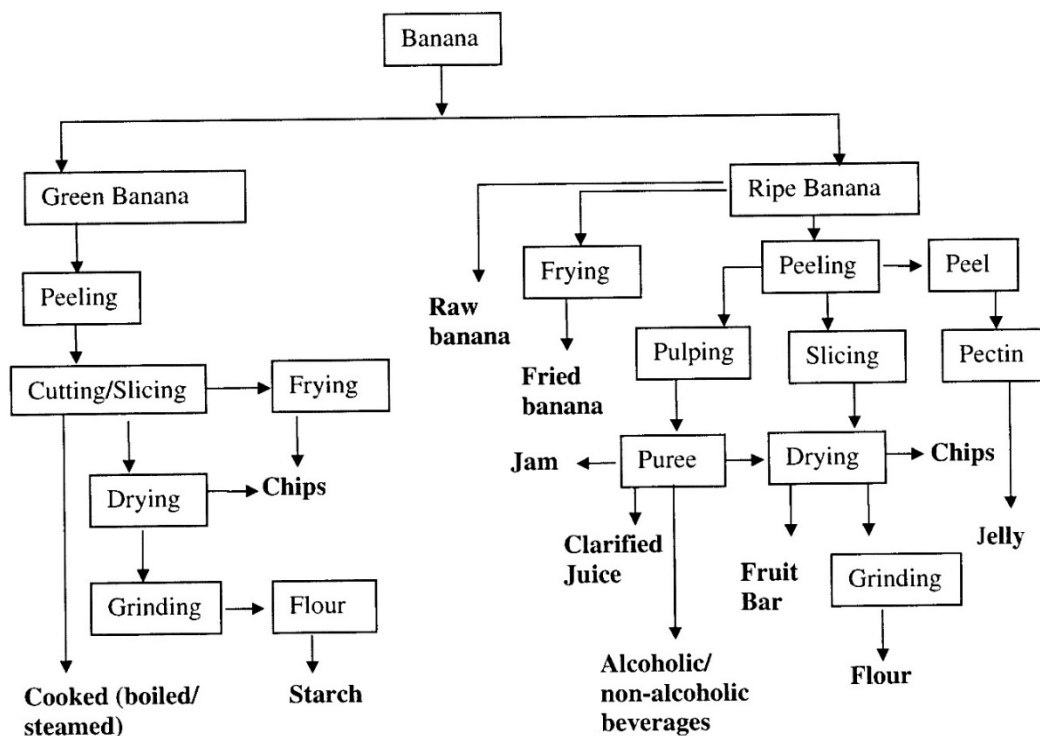


Figure 2: Flow chart of various processed and unprocessed products derived from banana (Mohapatra *et al.*, 2011)

- (9) What is the potential for standardization and conformity assessment of the primary and value-added products?

From a selection of the most significant value-added products, the consultant shall establish the criteria for the products to have standards and conformity assessment procedures established to facilitate certification and trade facilitation. If the value-added products are composites, this shall be illustrated clearly.

## 5. Nature of the Compilation

The consultant shall prepare the compilation in the form of a compendium of monographs with sufficient details and illustrations of high clarity/resolution.

## 6. Value Addition Procedures

Value addition procedures shall be the core deliverables of the consultancy. The guidance provided in the preceding sections shall be utilized in addition to the best industry practices obtained from authoritative referenced sources. The value addition shall lead to standardization and certification of the products for placing in the market.

## 7. Implementation Methodology and Assignment Duration

In undertaking the tasks described above, the consultants will employ a combination of desk research, review of research articles and publications and telephone or web interviews with relevant stakeholders.

The consultancy shall be for a period of 6 months and the key deliverables are outlined below:

- Output 1: Inception report outlining the understanding of the task, issues to be addressed, methodology and sources of information; an annotated outline of the study (within 3 weeks after signing the contract)
- Output 2: Draft Compilation (by the end of month 3)
- Output 3: Final Compilation incorporating feedback from the validation workshop (by the end of month 6)
- Output 4: PowerPoint Presentation

## 8. Consultant Qualifications

- At least a Master's degree or equivalent in Agriculture, Biological Sciences, Food Sciences, or related areas.
- Track record of research and publication in the area of scope of this assignment.
- Minimum of 5 years of professional experience working in Agriculture, Biological Sciences, Food Sciences, or related areas.
- Proven working experience on standardization and /or value addition will confer distinct advantage.
- Demonstrated involvement in policy formulation in the agricultural value chains, as well as experience working with governments of the AU Member States and other relevant stakeholders is an asset.
- For this specific job opening fluency in English and/or French is required. Knowledge of the other is an asset.

## 9. Application process

Interested and qualified consultants should submit their applications for African indigenous edible fruits, nuts and vegetables, the application should include the following:

1. A CV and demonstration of accomplishment of similar assignments



2. A technical proposal for implementing the assignment highlighting the consultant understanding of the scope of the work, methodology of Exclusivity and Availability for the duration of the assignment.
3. An outline of the Compilation (monographs) of African indigenous edible fruits, nuts and vegetables
4. Financial proposal for completing the assignment highlighting the cost and its breakdowns.

## 10. Payment Schedules

The total payment shall be paid in two instalments as follows:

40% upon delivery of Draft Compilation (by the end of month 3).

60% upon delivering the Final Compilation and PowerPoint Presentations at the end of six months.

Formal application shall be done latest by **18th November 2022 before 5:00 p.m.**

Applications should be addressed to:

**Secretary General**

**African Organisation for Standardisation (ARSO) Central Secretariat**

**International House 3rd Floor**

**P.O. Box 57363-00200 Nairobi-Kenya**

**Tel. +254-20-2224561, +254-20-311608**

Preferably by e-mail to: [info@arso-oran.org](mailto:info@arso-oran.org), [arso@arso-oran.org](mailto:arso@arso-oran.org) and [arsopit@arso-oran.org](mailto:arsopit@arso-oran.org)



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