

Reflection on Africa's Underutilized Foods Towards a Sustainable Food System

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Received: June 15, 2022

Accepted: July 24, 2022

Online Published: August 24, 2022

doi:10.5539/jsd.v15n5p57

URL: <https://doi.org/10.5539/jsd.v15n5p57>

Abstract

Malnutrition is a big problem on the African continent, especially among children ages zero to twenty-four months up till a time that covers the 1st 1000 days of life. Expert opinion suggests that Africa could integrate more commodities into its food systems to solve this problem, especially using its underutilized food commodities. These commodities are known to thrive very well in their various ecological zones. Indigenous food commodities are nutrient-dense, but the limitation in their use have left their potential untapped. The Forum for Agricultural Research in Africa organized a webinar to seek African stakeholders' opinions on the pathway to integrating forgotten Food into the African food system. This study extracted information from the stakeholder's interaction in the webinar and used an integrative literature review method to draw inferences. The study suggests that considerable efforts are required to integrate the forgotten food commodities into the African food systems to enhance food security and sustainable agricultural livelihood. The needed actions include awareness creation on the importance of the forgotten food commodities, the establishment of a robust research program, active private sector engagement for investment into production, value chain development, and investment into commodity development infrastructures and businesses.

Keywords: underutilized food, malnutrition, food system, forgotten food, stakeholder, food security

1. Introduction

Many crop species cultivated for food are identified as underutilized, neglected, or forgotten in Africa. Forgotten foods include cultivated, semi-domesticated, wild species, and traditional varieties that have been produced and consumed for centuries or even millennia for their food, fiber, fodder, oil, and medicinal properties. However, the roles of these foods have been undervalued and their importance neglected by researchers, policy makers, and markets (AARINENA et al., 2021). Therefore, the term 'forgotten food' refers to crops and livestock commodities that are neglected or underutilized by researchers, farmers, and consumers. These crops are displaced by increasingly uniform diets fueled by mass-produced processed ingredients from the 'BIG FOUR,' wheat, maize, rice, and soybean. Nevertheless, these underutilized crop species can be used to solve the many food challenges in the continent, such as hidden hunger, food and nutritional security, and income generation for the rural poor (Magbagbeola et al., 2010).

These neglected crops are often seen as food for the poor and attached to culture with low utilization and economic importance. The production and processing of these forgotten foods is very unprofitable with high production cost; low internal rate of return, unmastered production, and processing techniques. However, these foods continue to be used in traditional ceremonies because of their attitude of conservation. Hence, new varieties are hardly developed, and knowledge of their genetic makeup and the agronomic requirement for production and utilization have not been sufficiently developed to merit commercial interests. Largely, underutilized crops are affected by cultural preferences, traditional practices, and forces of nature. As a result, these factors have subjected them to being overlooked by policymakers, researchers, and extension agents. Their neglect has made governments rarely allocate resources for their promotion and development.

The neglect of these crop species has caused their potential value to be underestimated and exploited (Dansie et al., 2012). Thus, exposing them to danger and continuous use without further research and innovation will cause them to become degraded and eaten away. These forgotten and underutilized food crops are nutrient dense (Muthamilarasan et al., 2019). Their degradation can immediately affect the rural poor's nutritional status and food

security.

Improved use of underutilized foods could bring a win to agro-biodiversity and nutrition (Adhikari et al., 2017) and fight hidden hunger. These will help provide income, jobs, and sovereignty in poor rural areas (Conti et al., 2019). Additionally, these foods adapt well to the agro-ecologies where they are found and play vital roles in rural communities' social and cultural lives. Their adaptation characteristics, especially drought tolerance, capacity to thrive on marginal soils, and climatic condition (Michael and Hassan, 2016), makes these forgotten food commodities a vital asset for food security considering the impending alteration in the climate in recent years. Nutrition is a big problem in Africa, with nearly 220 million undernourished people recorded in Africa (Bremner, 2017). This requires a rethink of the underutilized foods, the system of use, mass consumption, and for reduction of food waste and loss. A good system of use can reduce undernourishment in the continent since the underutilized foods are identified as an effective solution for addressing malnutrition.

The food system offers a wide range of interactions. It takes a deep perspective at the complete chain of issues and factors from production, processing, marketing, distribution, quality control and safety, consumption patterns, food waste management, and recycling of nutrients and other elements of environmental sustainability. Even though food and nutritional security have huge implications on the food system, the food system creates space for multiple interactions (UNEP, 2016).

The African traditional food system does not directly address the challenges faced in food and nutritional security. It provides an avenue for issues of nutritional security, food availability, and accessibility to be addressed. Figure 1 shows the linkages in addressing food insecurity in Africa.

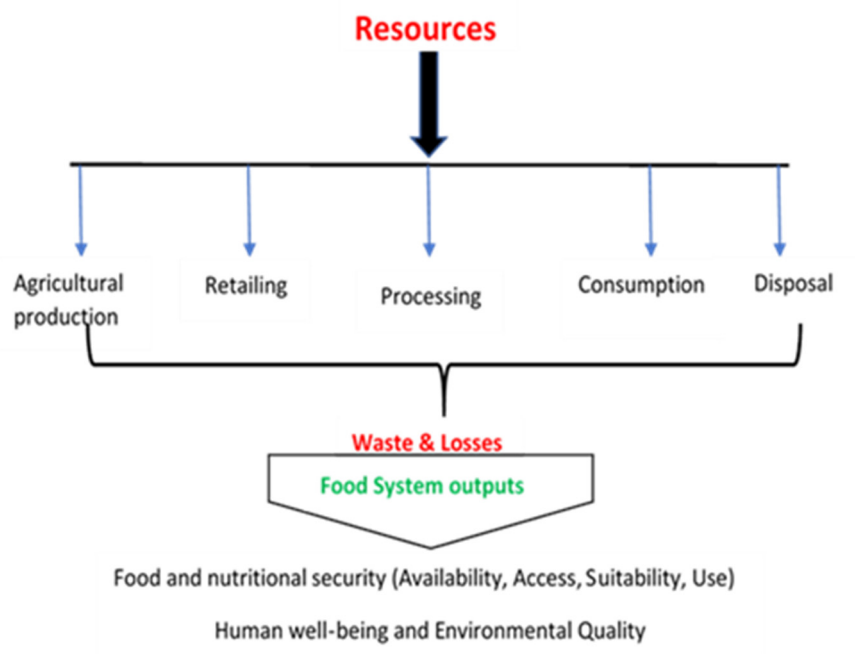


Figure 1. Implication of food system on food and nutrition security

Source: FARA, 2021

The figure above shows a direct link between the food systems, foods, and nutritional security. The food system is a whole chain of its own, from the available resources (inputs) to the various direct and indirect interactions within the approach to the output of the systems (the final consumers), leading to food availability accessibility and ultimately the nutritional security.

Attention to forgotten and underutilized food commodities has gained prominence following the efforts to develop forgotten food value chains. Some of these efforts include varietal development, agronomic practices, and processing. For the full potential of forgotten foods to be realized, collective actions are required at the global, continental, regional and national levels. These actions include awareness creation and increased communication on these foods' economic, nutritional, environmental, and cultural values. Additionally, it provides the needed

enabling environment for developing these foods through research, production for farmers, processing, value addition, and marketing for the private sector. This paper reports the opinion of Africa's agricultural research and development stakeholders on the status of forgotten and underutilized food commodities and their potential to contribute to the neo-food systems and improve food and nutritional security. Additionally, the paper seeks to i) assess the perception of forgotten foods among stakeholders in African agriculture, ii) examine the level of awareness of forgotten foods among policymakers, researchers, and extension agents, iii) explore the economic opportunities for investing in commodity development infrastructures for forgotten foods.

2. Method

This paper follows up on the developed "Africa manifesto on forgotten food" and the African community of practice (CoP) on forgotten foods hosted by FARA, which developed the action plans on the manifesto. The paper employed the use of an integrative literature-review approach which is intended to address mature topics. Snyder (2019) stated that this type of review often requires a more creative collection of data since the purpose is usually not to cover all articles ever published on the topic. Instead, the purpose is to re-conceptualize and expand on the theoretical foundation of the specific topic from different fields or research content.

The "Africa manifesto on forgotten food" was developed following the Global Forum for Agricultural Research (GFAR) call to establish a global manifesto that harmonizes manifestos from the different continental fora towards the United Nations Food Systems Summit (UNFSS) in September 2021. The development of the Africa manifesto followed a multi-stakeholder approach to ensure that the opinions of the different African agricultural stakeholder groups were taken on board. A multi-stakeholder approach allowed ownership of the manifesto and encouraged commitments to the actions for implementation by the African stakeholders.

A five-pronged method was adopted in developing the Africa manifesto; (1) Working Paper: A working paper on the state of forgotten food was created as the first step to inform the African stakeholders. (2) Stakeholders' consultation: A virtual consultation for stakeholders was organized to draw the opinion of the broad stakeholders to the draft manifesto. The working paper, the tentative manifesto document, was shared with stakeholders using the FARA Discussion group (DGroup) platform with about 35,000 active stakeholders across Africa.

Stakeholders' comments were harvested through a ten-day DGroup discussion. These comments were synthesized for inclusion in the final manifesto. (3) A webinar was organized to discuss the "Development of Africa Manifesto and Plan of Action on Forgotten foods." A poll was also organized to draw the stakeholder's opinions on the pillars of the manifesto and other proposed vital actions that should follow the manifesto. The poll served as the key stakeholder's validation instrument. (4) Manifesto harmonization: All comments from the various steps (Dgroup discussion, the webinar, and the poll) were integrated into the draft manifesto to make the final version, and a peer review was conducted to finalize the document. (5) Community of practice: FARA further set up a virtual community of practice to develop the action plans following the manifesto and craft the implementation strategy.

The literature review articles were sourced through online database searches on Google Scholar, web of science, research gate, and sci-hub limiting the search within ten years period from 2010 to 2020 as much as possible. Websites data were also extracted from international organizations such as the World Bank, IPCC, UNFCC, FAO, and UNEP. The keywords used in the search included "forgotten foods", "neglected food commodities", "malnutrition", "food system", "food and nutritional security", "Underutilized foods", "Sub-Saharan Africa", "population of malnourished", etc. The search was largely web-based, concentrated on Sub-Saharan Africa, and did not employ any form of discrimination.

2.1 Approaches to Attainment of Sustainable Food and Nutritional Security

The term food security describes the situation when all people have physical, social, and economic access to safe and nutritious foods that meet their dietary needs and food preferences for a healthy life (FAO, 1996; Barrett, 2010). This situation is affected by i) unstable social and political environments that hinder sustainable economic growth, ii) conflicts and civil strife, iii) imbalances in trade at the macroeconomic level, iv) resource constraints (natural and human), v) inadequate education, vi) gender inequality, vii) poor health, viii) natural disasters (drought, locust invasion, etc.), and ix) absence of good governance (IFPRI, 2002). These factors lead to either insufficient national food availability or impede the people's access to food.

The prevalence of malnutrition varies by region within the continent (UNICEF; WHO, and World Bank 2018). It is lowest in Northern Africa (4%) and highest in Central Africa (40%). Over 70% of the food insecure population in Africa lives in rural areas. Ironically, smallholder farmers, the producers of over 90% of the continent's food supply, make up the majority (50%) of this population (FAO, 2015). The rest of the food insecure population comprises the landless poor in rural areas (30%) and the urban poor. Agriculture accounts for around 9% of the

GDP and more than half of total employment throughout the developing world. In countries where more than 34% of the population is undernourished, agriculture represents 30% of GDP, and nearly 70% relies on agriculture for their livelihood (Pinstup-Aderezen, 2002).

2.2 Dimensions of Food Security

As noted at the World Food Summit of 1996, the four dimensions of food security comprise of availability, accessibility, stability, and utilization.

Food availability and its constituents is one of the critical determinants of food security (FAO, 2014). Aside from the availability of dietary energy, this emphasizes food adequacy and diversification to provide the macro and micronutrients needed for a healthy life.

Food accessibility denotes adequate food distribution among the population to make food physically and economically accessible. Economic affordability depends on income levels and has a bearing on food accessibility. This encompasses the availability of infrastructure, such as transportation systems.

Food utilization: Hauck & Youkhana (2008) defined utilization as a measure of the ability of a population to gain sufficient nutritional intake and absorption during a given period. Micronutrient deficiency which results from diversified poor meals, is observed physically in maternal nutritional health and child stunting (Ruel, 2003; Savy et al., 2005; Ruel et al., 2010). Food utilization can be enhanced through food handling, preparation, and storage.

Food stability covers the stability of food availability, food accessibility, and food utilization with no risks. Risk in this context refers to extreme weather conditions, energy scarcity, economic and social disruption, and poor functioning of the global markets. It is essential to have mechanisms to ensure availability, access, and usage, which are likely to change with risks. Production systems must be promoted and supported to address such risks, providing sustainable investment in rural development, and improve market governance. The common factors associated with food stability have to do with the constraints of availability and access. As crop yield is a function of growth in crop production, increasing crop yields with crop intensification can expand the harvested area (Pangaribowo et al., 2013).

2.3 The Scope of Food Security

Overpopulation, climate change, and urbanization are the three areas that impact food security. In regions where food demand exceeds supply due to overpopulation, high levels of hunger and disease are realized (Ericksen, 2008). The lack of water and continued grazing stress the ecosystem, as seen in some areas of sub-Saharan Africa, causing the collapse of the ecosystem and a threat to the food security situation. (Homann et al., 2008; Solomon et al., 2007). The lack of nutrition resulting from limited food sources impairs health (Wakabi, 2006) by causing immune suppression, making the population more prone to illness. Given this, urbanization and the low labor cost have heightened rural-to-urban migration and thus causing overpopulation in the urban areas. As a cause, land for food production is depleted, and there's a failure to produce basic food (Satterthwaite et al., 2010).

2.3.1 Gender-Related Issues on Food Security

In Sub-Saharan Africa, a great representation of female teenagers aged between 15 and 19 years are suffering from anemia and weight insufficiency. In contrast, their male counterparts suffer less from these diseases. Malnutrition-related diseases are among the numerous inequalities between the sexes, as revealed by UNICEF (Degbe, 2011).

A study on the eating habits of teenagers in the south of Ethiopia reported that about 25% of the females face food insecurity, whereas it is 16% of the case of males. This indicates that under normal circumstances, there is a disparity between the health of females and males in the face of difficult access to healthy foods (Degbe, 2011). Notably, it is a matter of concern since women play a vital economic role in the community. They constitute a significant proportion of the number of workers who cultivate land- 45% in the classical case of Ethiopia. (Welteji, D. 2018).

2.3.2 The Prevalence of Hidden Hunger

According to von Grebmer et al. (2013), hunger refers to the distress associated with a lack of food. The Food and Agriculture Organization (FAO, 2013) defines food deprivation, or undernourishment, as the consumption of less than 1,800 kilocalories a day to live a healthy and productive life. Further, focusing on food components, hidden hunger is undernourishment resulting from the intake and absorption of low levels of vitamins and minerals, which do not sustain good health and development especially among female children. Poor diet, increased micronutrient needs at various life stages, such as pregnancy and lactation, and health problems (diseases, infections, or parasites) are the causes from the lack of these elements comprising zinc, iodine, and iron (von Grebmer et al. 2013). The micronutrient deficiencies are called hidden hunger because the clinical signs of the deprivation typically remain

unidentified unless in severe cases (FAO, 2014).

Africa, particularly the south of the Sahara, has been identified as a hotspot for the prevalence of hidden hunger (von Grebmer et al., 2013). Hidden hunger is linked to a shift from traditional diets based on minimally processed foods to highly processed food lacking macronutrients. They are observed in a phenomenon known as the "triple burden" of malnutrition—undernourishment, micronutrient deficiencies, and obesity (Pinstrup-Andersen 2007).

2.4 Evolution of Food Commodities in Africa: African Food Crop

African food crops are grown locally on a small scale, often resistant to local diseases and pests, withstand environmental stress, and adapt well to the local climate. These crops have a significant characteristic of providing nutritional, medicinal, economic, social-cultural, and ecological benefits (Suleyman, 2014). However, these crops have been given less or no attention (going on extinct) due to humanitarian factors ranging from cultural values, human perceptions (poor people's food or famine food), and lack of consumer awareness about their benefits (Akinola, 2020).

2.4.1 Systemic Elements for Food Introduction

Over the past decades, the world has been under dynamic change resulting in high levels of urbanization. Urbanization has been rapid in Sub-Saharan Africa (SSA) for at least 60 years, and income growth has increased dramatically since the late 1990s (Tschirley, 2013). This income growth is evident in the five percent (5%) increased urbanization in Sub-Saharan Africa during the twentieth century (Lupien and J. R 1997). Accordingly, the consumption pattern of the world has changed drastically, and the African continent is not an exception. Sharma et al. (2018) described consumption patterns as a set of foods that a group of people can observe. It is usually influenced by religion, norms, values, location, and available resources. A study by Suleyman (2014) identified some major vital factors causing low patronage of African food crops and, consequently, change in consumption patterns in Africa. These included: the stigmatization of African food crops, globalization of the world food system, impact of modern agriculture, Western/formal education, lack of intergeneration knowledge transfer, and changes in lifestyle due to urbanization. Also, studies have identified five major trends associated with a shift in consumption patterns for African food systems. i) Population growth, ii) costs in bringing new land under cultivation, iii) rising global demand for livestock products, iv) decline in grain productivity in breadbasket regions, and v) income growth with high demand for food (Cassman et al., 2010; Grassini et al., 2013; Chamberlin et al., 2014). However, this review has identified four major factors believed to have been associated with the changes in consumption patterns in African food systems.

2.4.2 Urbanization

A shift in a population, usually from rural to urban, influencing the growth of cities and towns, is termed urbanization. The development of megacities (cities with populations of over 10million), and small towns are significant evidence of urbanization in the African continent. No wonder sub-Saharan Africa houses half of the world's ten fastest-growing economies (Kearney, 2014). Migration has been very rapid across the African continent over the past three decades. In one way or the other, urbanization has had a more significant impact on the consumption pattern of migrants due to the exposure to a new variety of foods. Again, growth in the African middle class, which is a characteristic of urbanization, has contributed significantly to the change in the consumption pattern of the African food systems. Studies have shown that Africa's population is about 1.023 billion, with over 60 percent being below 25 years as of 2016 (World Bank Data 2016).

2.4.3 Increase Income

Nutritional energies of low-income countries (developing countries) are obtained from carbohydrates with little contribution from fats and protein. Therefore, a change in economic growth (increase in income) influences food consumption patterns; an increased income resulting in a proportional increase in food availability does not affect the actual consumption (Gerbens-Leeneset et al., 2010). The change in purchasing power is usually accompanied by either increased or decreased income. As the income level increases, there is typically an exposure of the population to different lifestyles, causing changes in the standard of living which eventually alters the taste and preferences of the population. The demand for "fast foods or street foods" in recent times has been so rapid across the African continent.

Additionally, there is a rapid transition from consuming traditional African foods to more commercially available, ready-to-eat foods. Consumption of fast foods is associated with the medium socio-economic category (middle class). A study by Van Zyl M in 2010 indicated that about half of the study participants (earning less than \$714.29) spend 4% (\$28.57) monthly on fast foods in Johannesburg.

2.4.4 Globalization

Globalization, in this case, is a term used to describe the growing interdependence of the world's economies, cultures, and populations resulting from the advance in inter-trade in goods and services, technology, people, etc., among countries (Kolb, 2018). Generally, organizations/farmers are focused on products/food commodities that will be accepted by all rather than producing for the minority (producing a local commodity that a small faction will only accept). This has caused some form of biases as much attention has been driven to some selected crops (wheat, rice, and maize), and the effect has forced the local foods to a state of going extinct/ being underutilized. It is estimated that about 80-90% of the world's dietary requirements are obtained from about 12-20 species (Chivenge et al., 2015). Also, the world's connectivity has been at its highest peak for this century than ever. This is due to the increased technological progress and advancement in international cooperation. Many countries, especially in Africa, have gained access to exotic foods, and the quest to explore these foods has led to the abandoning of the local foods.

2.4.5 Multi-Stakeholder Partnerships

According to Brouwer et al. (2019), a stakeholder is one who can affect, or is affected by, decisions about an issue that concerns them. Therefore, a Multi-Stakeholder Partnership (MSP) is the process of interactive learning, empowerment, and participatory governance to be collectively innovative and resilient when faced with emerging risks, crises, and opportunities in a complex and changing environment. Herens et al., (2022) further suggest that different stakeholders need to be engaged to allow the alignment of actions across sectors for the system transformation. Notably, the sustainability of MSPs is critical. However, barriers and challenges hindering the effectiveness of MSPs to be more adaptive in food systems include poor coordination problems, multiple national policies, lack of continuity, and unclear structure and rules (Hospes and Brons, 2016).

2.4.6 Modern Agriculture

Over the past decades, the agricultural system in sub-Saharan Africa has seen a facelift but still requires more action. As such, farmers have begun to adapt to the new farming methods in this era of climate change. These new technologies include drones, artificial intelligence, automation, blockchain technologies, genetic editing, vertical farming, etc. In the quest to employ these new technologies, farmers are restricted to using exotic crops since these technologies work appropriately on them. Furthermore, extensive research, easy access, and availability of exotic food crops are forcing the African crops into extinction. Unlike the African crops, the extensive research on exotic crops has provided much information, most importantly, nutritional and health benefits to the consumer, which usually influences their choice. Again, the availability of different varieties and hybrids of exotic crops allows the consumers to choose a diverse variety of the same crop. These pose a limitation to, if not all, most African food crops, hence resulting in the shift in consumption pattern across the continent.

2.5 Importance of Africa Indigenous Crop Commodities

Adaptation

Today's agricultural system is highly affected by the impact of climate change. African agriculture has not been left out; this is evidence of some parts of sub-Saharan Africa being identified as a hotspot because of their exposure to multiple stressors (Müller et al. 2014). It is imperative to put a measure that will help curb the menace affecting African indigenous crops. According to Noble et al. (2015), there has been much attention on adaptation action (incremental adaptation and transformative adaptation). Gradual adaptation is an attempt that aims at addressing proximate causes by building resilience in specific systems and ranges from climate-smart, land and water management, etc. Transformative adaptation emphasizes broader and systematic change by focusing on the underlying roots of vulnerability. It goes from access to market, bargaining, information, water, and land resources (Stöber et al., 2017). It is, therefore, necessary that these adaptation measures be scaled onto the development of African indigenous crops.

2.5.1 Nutritional Advantages

Undernourishment and malnutrition are persistent challenges, especially in sub-Saharan Africa and the African continent. In 2016, undernourishment in sub-Saharan Africa was 222 million against 181 million in 2010, suggesting the continuous rise in undernourishment and malnutrition (FAO, 2018). According to the Second WHO Global Nutrition Policy Review, diet counseling, nutritional labeling, development, and issuing of dietary guidelines and digital campaigns are some of the few measures that can help recede malnutrition in Africa. However, the African continent lacks the necessary regulatory bodies that promote healthy foods (Frieden, 2010).

Africa must fall back on its underutilized indigenous crops to address this nutritional problem. The African indigenous foods exist in huge numbers ranging from crops (cereals, fruits, vegetables) and animals. It is worth

knowing that national studies on priority indigenous vegetables, thus, mineral analysis, effects of cooking and blanching on vitamins (A and C), analysis for oxalates, sun drying on vitamins, etc. (Mathenge, 1997), proved to be successful than that of exotic crops. For instance, if you contrast the nutrient in jute mallow with the major exotic leafy vegetable such as cabbage (*Brassica spp*) and lettuce (*Lactuca sativa*), you will realize that the nutritional value of jute mallow is more affluent and higher (FARA, 2021). Again, fonio, the heritage grain of the African continent, has proven to possess more and higher nutrients than rice (*Oryza sativa*) (Lost crops of Africa, 1996; Healthline.com). Furthermore, indigenous crops are a bank of macro and micro-nutrients when consumed. Hence, the reliance on African indigenous foods will go a long way to bridging the region's nutrition gaps.

2.5.2 Sustainability for Culture

Globally, every region has a unique traditional practice embraced by a class of people or a particular community. The food system is one of the significant traditional cultures that gives the identity of some cultural heritage. The indigenous foods used to be popular and culturally known as native varieties. Nonetheless, following the dietary transition because of urbanization, increased income, etc., these food crops are being highly replaced by refined sugars, refined fats, oils, and meats leading to the loss of the cultural heritage of the African region (Nelson et al., 2019).

2.5.3 Economic Impacts

The value chain activities associated with indigenous crops are mainly carried out by the smallholder farmers in many parts of Africa. Attention to the value chain of these indigenous but commercial crops could positively impact household income and livelihood (Bharucha and Pretty 2010). Some selected indigenous crops have recently gained attention as they are becoming attractive foods for a wealthier society (Weinberger, 2007). This is a steppingstone for the commercialization of the African indigenous crops. Over the years, the African indigenous crops have received a negative tag, forcing them to be rejected by the international market. Change in appearance (proper packaging, labeling, etc.) and improvement in the value chain (processing) of these crops will elevate their acceptability and preference for consumption (Maseko et al., 2017). There exist considerable potential untapped resources for African indigenous crops. Embracing this opportunity could go a long way toward increasing the economic growth and wealth of the various countries and the continent.

3. Results

In this section, outputs from the stakeholder consultation webinar as well as the results from the integrative literature review are presented. The results, statistical evaluations, and possible reasons for accepting neglected and or forgotten foods back into the African agricultural food systems are reported.

3.1 Stakeholders' Reflection on Underutilized Foods

Since everyone eats food, and foodstuffs are distributed across huge areas, any cognition connected to agriculture, in the end, affects an extensive and scattered range of consumers. The complexity of agricultural land use, food system, and food production allows different organizations to have commercial and regulatory interests in the entire value chain of agriculture, its success, failures, and possible health effects. All the actors along these value chains need to be considered potential participants or critical participants in assessing agriculture and its related issues. These all fall under the big umbrella called "agricultural stakeholders," who then partake in decision making, policy formulations, and other associated dialogues to help strengthen and boost production and productivity in the sector to enhance food security, job creation, and income. Table 1 below shows the type of stakeholders in agriculture, their roles within the food system, and their involvement in the agricultural sector.

Table 1. Types of agricultural stakeholders

Type of stakeholder	Field/Area of participation (examples)	Roles
Farmers and their agents	Landowners, farmworkers, farmers' associations	Direct beneficiaries of policies, innovations, and risk response (e.g., loss of income, new technologies) Victims of exposure; risk management and reduction;
Agricultural input suppliers and services	Agro-input manufacturers and seed suppliers, and transport companies	Potential victims/beneficiaries' innovation and technologies, risk responses, and risk management
Food processors and distributors	Food processors, wholesalers and retailers, and transport companies (distributor, importers, and exporters)	Potential victims/beneficiaries of risk response and receivers of product innovations and market regulatory management and policies
Continental, regional & national/ health protection agencies	Food and Drugs Authorities (FDA), Public health institutions, food standards agencies, regional/ local health boards, and environmental health departments	Food regulation boards, risk management/regulation, risk communication, and standardization
National ministries	Ministries of agriculture, ministries of environment, ministries of science & educations ministries responsible for regulatory and standardization of products and local authorities & task forces	Risk management and regulation, security and protection of food products, inputs, etc.
International agencies	Directorates for Agriculture, Environment, Health Funders, and Partners; (EC/ EU, IFAD, AU/AUC, WHO, FAO, GCIAR, FARA, AFAAS and SROs, etc.)	Provision of research, Policy drafts, research coordination, risk management, and regulation; risk communication and awareness creation and lobbyists for action
NGOs	Pesticide action groups, organic farming groups, animal welfare groups	Risk communication; representatives of victims of exposure
Others	1) Rural residents; 2) National and local media; 3) Scientists (epidemiologists, toxicologists, environmental scientists), 4) Academia	1) Victims of exposure; 2) risk communication; 3) risk analysis, risk communication, potential beneficiaries of risk response; 4) research, problem identifications, and technology generations.

Source; <http://www.integrated-assessment.eu/> (defining the stakeholders)

As shown in Table 1, stakeholders play an essential role in the African food system, and they provide both inputs (in all their forms) and serve as the consumers of the final products (outputs). Hence the need to consult them on issues of forgotten and underutilized food commodities in Africa. While engaging with the broad stakeholders in agriculture based on table 1 for their validation of forgotten foods and what should be contained in the African manifesto, multiple discussions were held, and feedback was collated. Table 2 summarizes the response from over 2,000 stakeholders.

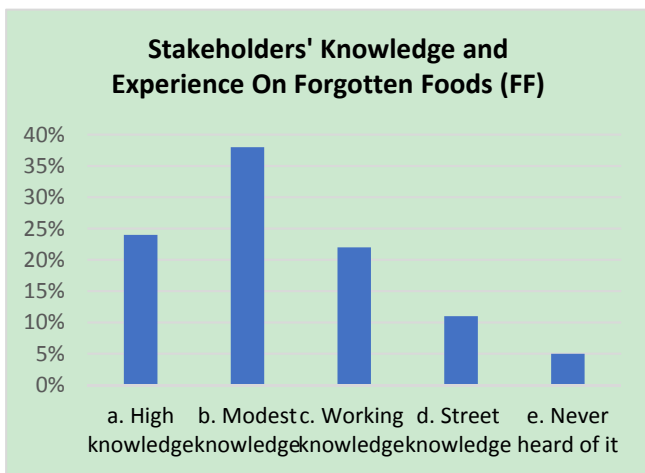
Table 2. Stakeholders' opinion on Africa manifesto on forgotten foods

Discussion Questions on FARA D-group	Key messages from Stakeholders
There is evidence of the benefits of the forgotten foods and the need to harness their contributions to Africa's agricultural development, food, and national security. In your own opinion, what are the big things that should constitute Africa's manifesto for the development of forgotten food?	<ol style="list-style-type: none"> 1. Awareness creation. 2. Research into forgotten foods, especially their (biodiversity, nutrition, and importance in Climate-Smart Agriculture (CSA). 3. Research their value chain. 4. Engage local knowledge repositories on the range of issues regarding these forgotten foods. 5. Incorporate indigenous production systems of these foods into the broad agricultural and scientific cultivation system and other production practices. 6. Household dynamics need to be the front burners of research. They play a significant role aside from the environmental and economic factors that led to the neglect of these food species.
The need for a coherent research and innovation system is indicated in the working papers. In your opinion, how should Africa organize this research program?	<ol style="list-style-type: none"> 1. The research should be organized in an integrated AR4D and involve all stakeholders. 2. A multi-stakeholder partnership approach to research should be encouraged. 3. The FARA – SRO – NARI – CSOs approach should be encouraged and enhanced. This should actively involve Universities and students. 4. Generate regional and geographical data and information on forgotten foods. 5. The use of the Innovation System approach where; a multi-stakeholder partnership in which all the stakeholders, such as farmers, researchers, transporters, input suppliers, credit providers/institutions, marketers and consumers, processors, etc., participate in a platform.
A coherent research and development program will require a suitable funding mechanism; Government funding for research in Africa is dysfunctional. In your opinion, what are the unique funding mechanisms for vital research and development?	<ol style="list-style-type: none"> 1. Writing a continental and regional fund proposal for research by African NARS and NARES through FARA and the Sub-regional Organizations (SROs) to be submitted to donors, Continental Organizations such as Africa Union (AU). 2. The public sector, private sector, and multilateral funding mechanisms are needed. 3. Funding by international organizations with minimal or no contribution from beneficiary country governments in Africa. 4. Funding mechanism that will involve all the stakeholders along the food value chain. 5. Government tax allocations for country-based research.

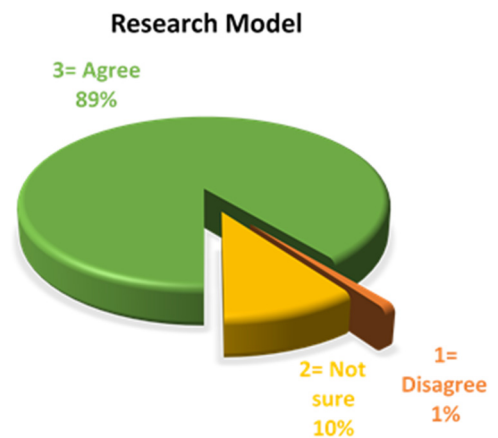
Source: Africa Manifesto d-group discussion

Figure 2a shows the opinion of stakeholders' knowledge and experience on forgotten foods in Africa. About 38% of the stakeholders who took the poll reported to have modest knowledge of forgotten foods in Africa. However, nearly 25% showed to have high knowledge of FF commodities in Africa and 22% had working knowledge of forgotten foods. In all a total of 85% of the stakeholders are not new to these forgotten food commodities in Africa.

This could be partly due to the current issue of hidden hunger in the continent. The stakeholder group Source:



African Manifesto on FF webinar, 2021



Source: African Manifesto on FF webinar, 2021

Figure 2b: Research model for forgotten foods

Figure 2a: Stakeholders' knowledge of Forgotten Food confirmed that reintegrating these food commodities into the current food system could help fight hidden hunger among the increasing population in Africa. In figure 2b, the stakeholders' opinions on the research models for forgotten foods in Africa were sorted, which indicated 89% of stakeholders agreeing that research model should follow the Innovation Systems Approach. This may include an innovation platform as the multi-stakeholder engagement framework and the implementation instrument. Ten percent of the respondents were unsure of the model to adopt, while 1% disagreed.

Forgotten foods commodities stand the chance of being well adapted in Sub Saharan Africa (SSA) if needed attention and research programs are channeled appropriately into their directions. Hence, we identified a key research element that could boost the level of adaptation of forgotten foods in SSA. These research elements include 1) Varietal improvement; 2) Agronomic integration into farming systems; 3) Food processing and development of new food products; 4) Development of a seed system and germplasm conservation; 5) Market research. These elements were classified by the stakeholders based on their level of importance. Figure three ranks all the elements as "highly important, as shown. Figure three gives a presentation of the results obtained from the stakeholder's response.

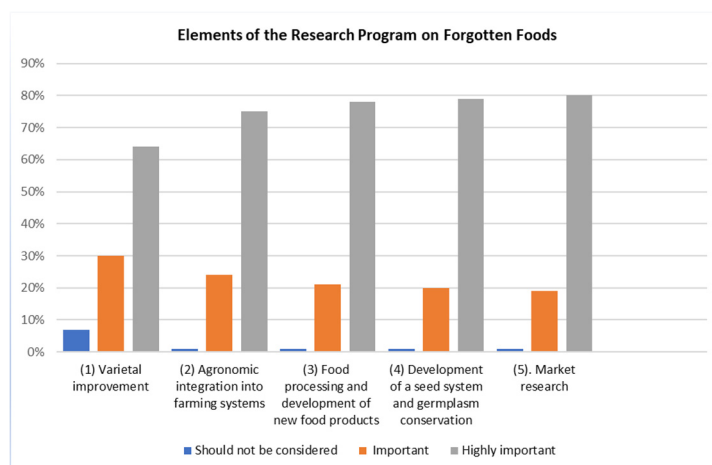


Figure 3. Elements of the research programme for FF in Africa

Source: African Manifesto on FF webinar, 2021

In figure 3 above, varietal improvement of these forgotten foods recorded highest, showing that when forgotten food commodities are accepted into the current food system, varietal improvement will make them be able to adapt

to other geographical locations where they could be multiplied. Agronomic integration and food processing were also considered high, as forgotten food commodities were reported to have potentials to increase food security in the African continent if only, they are prioritized. Again, market research for the commodities was ranked important. This was due to the growth in the middle class and the taste of the urban population. The growth in the middle class has huge implication on the adaptation of these food commodities as they are mostly considered food for the poor. Hence, the need to explore the potential market availability for these commodities and the role of the agribusiness potentials for the youth and women who may trade the commodities.

To effectively identify the issues related to forgotten foods in Africa, there must be a robust research coordination system. The system will allow better coordination to achieve results and promote the use of these underutilized food commodities to achieve a food secured continent and to reduce dietary related issues. To increase food security in Africa, especially among the rural poor (most vulnerable) to food security the agricultural stakeholders agreed that research coordination on forgotten and underutilized food commodities in Africa should follow the continental arrangement comprising FARA, AFAAS, SRO, and the National System architecture using subsidiary principles. FARA is known for its continental multi-stakeholders' engagement capacity. The general stakeholders endorsed this, as in figure 4 below.

Many of the stakeholders (86%) agreed with this coordination architecture, as 12% of the respondents were not sure of any coordination architecture. Only 2% of the total respondents disagreed entirely with this coordination mechanism.



Figure 4. Research coordination system for FF in Africa

Source: African Manifesto on FF webinar, 2021

3.2 The implication of Undernutrition and the Success of Actions

Undernutrition is one of the common issues among children up to 24 months (first 1,000 days) in Sub-Saharan Africa. It contributes to high premature death among children and comorbidities within the population. In SSA, these have led to the adjustment in children's feed formulations and mothers' diet, contributing to a shift from indigenous foods and leading to the adaptation of unconventional foods. The abrupt and drastic climate change affects food supply and, consequently, worsens undernutrition levels and links it to poverty. The food system provides activities that do not favor underutilized and indigenous foods; hence, they are missing and unsorted.

Undernutrition in its various forms is primarily a chronic condition confronted in Africa in the past decades. While food and nutrition security require several factors complementary to food security, the effects of their efforts on the continent are low. Different conceptual frameworks were drawn in the past to deal with food and nutrition security. These frameworks address drivers and determinants of food and nutrition security at multiple levels of aggregation. A distinction between drivers affecting food and nutrition status and drivers impacting the stability of this status was formulated at the individual and household levels. Gender norms have also been identified as a cross-cutting determinant relevant to food and nutrition security dimensions. Food prices were seen to play a significant role in food and nutrition security both at the national and international levels shown in figure 3. So, market research of food supply and demand drivers were identified as solutions for the short and long run of forgotten food commodities should they be successfully integrated into the current African food system. Furthermore, the economic approach describes the channels through which both micro-and macro-level policies are related to food and nutrition security in Africa.

The nexus of the research coordination system is vital for a safe food secure continent as alluded to by the general stakeholders' group. Despite the challenges noted in managing Multi-Stakeholder Partnerships, such as poor

coordination problems, multiple national policies, lack of continuity, and unclear structures and rules, the stakeholders emphasized the need for research to be organized in an integrated AR4D manner. As such, a multi-stakeholder partnership approach to research should be encouraged to generate regional and geographical data and information on forgotten foods.

4. Conclusion and Recommendations

Many crop species cultivated for food in Africa are underutilized, neglected, or forgotten in the agriculture research and development space. However, their improved use could bring a win to agro-biodiversity and nutrition in the continent. It was noted that the African traditional food system does not directly address the challenges faced in food and nutritional security. Therefore, the Forum for Agricultural Research in Africa sought to, i) assess the perception of forgotten foods among stakeholders in African agriculture, ii) examine the level of awareness of forgotten foods among policymakers, researchers, and extension agents, iii) explore the economic opportunities for investing in commodity development infrastructures for forgotten foods.

Key stakeholders were brought together to develop an Africa manifesto on forgotten food and an African community of practice (CoP) on forgotten foods hosted by the Forum for Agricultural Research in Africa. Therefore, this paper sought to exemplify the outcome of stakeholder reflections on underutilized foods toward a sustainable food system. The five-pronged methodology adopted for data collection and reflection allowed the researchers to collect primary and secondary data on the subject matter. This process included, i) development of a working Paper, ii) carrying out a virtual stakeholders' consultation through a ten-day DGroup discussion, iii) Convening a webinar with poll questions on the "Development of Africa Manifesto and Plan of Action on Forgotten foods," iv) Harmonization of the manifesto and v) setting up a community of practice.

The results showed that the indigenous production systems of these foods should be incorporated into the broad agricultural and scientific cultivation system. Feedback from stakeholders also suggests that the use of the Innovation System approach is critical, with funding mechanisms for public-private sector partnerships. This is pegged on the fact that the production and processing of forgotten foods are noted to be very unprofitable with high production costs. The foods are termed forgotten because of their low internal rate of return, and unmastered production and processing techniques. Additionally, gender norms and food prices are seen to play a significant role in food and nutrition security both at the national and international levels. Given this, market research for these commodities is ranked important and varietal improvement is recorded highest. Ultimately, the linkages of the research coordination system and private sector actors are vital for a safe food secure continent.

Given the findings from the study from the broad stakeholder engagement and the literature review, the researchers recommend that researchers, policymakers, breeders, and governments should increase efforts towards improving neglected food commodities in the various regions in SSA, as most of them are nutrient dense. It is necessary to identify why those foods are underutilized, neglected, or forgotten. The new generation of entrepreneurs should also consider product diversification of the forgotten food commodities in SSA and increase value addition, marketing, and processing of these food commodities. As such, the use of the Innovation System approach is recommended. A multi-stakeholder partnership approach involving farmers, researchers, transporters, input suppliers, credit providers/institutions, marketers, consumers, and processors, among other value chain actors, should be adopted. The FARA – SRO – NARI – CSOs approach with the active participation of universities should be encouraged to create a coherent research and development program and a suitable funding mechanism.

Notably, what is neglected or forgotten in one location may not be overlooked in another. Therefore, improved use of such food commodities should be adapted from where it is not considered 'forgotten'. Farmers should be incentivized to cultivate what is termed as 'forgotten' in their various locations. There is a need for a stronger market reorientation on some of these crops, such as sorghum and millet, which are gradually surviving in some of the regions where they were previously neglected. Additionally, product developers should consider blending some of these neglected crops or using them as substitutes for the main product to exploit their potential. Generally, further in-depth research is required to determine the socio-economic impacts of increasing education, knowledge, and advocacy on neglected crops. This study also recommends increased advocacy and policy formulation to ensure that the forgotten foods receive the much-needed attention towards a resilient and sustainable food system in Africa.

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