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Review Article

The Role of Indigenous and Underutilized Crops in The Enhancement of Health and Food Security in Nigeria

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ABSTRACT

All over the world, a number of plant species that serve as source of food are indigenous and underutilized. Many of these food types apart from forming part of what have come to be known as functional foods, possess immense health, nutritional and economic benefits. In most rural settings, these plants help in the fight against poverty by reducing it. Indigenous and underutilized crops help in the improvement and enhancement of the health status of local populations. Nigeria has a rich resource of indigenous and underutilized crops, which possess health or physiological benefits over and above the normal nutritional value they provide. Also, indigenous or underutilized crops possess valuable micronutrients essential for human health. This paper reviews available literature on indigenous and underutilized crops in Nigeria and tries to answer the complex question regarding which of the numerous food species available should qualify as candidate crops for the future.

Keywords: *Indigenous and underutilized crops, human health, functional foods, food security, Nigeria*

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INTRODUCTION

From time immemorial, plants of different hue or type have served as food for both humans and animals. History shows that several thousands of crops have also been source of food, medicine and nutrition. All over the world today, close to ten thousand (10,000) indigenous food species are in regular use by both human and non-human animals. Again, in the last five centuries, increased interaction among different populations, coupled with the incidence of global trading**,** about twenty percent of these crop species have become globally used and now serve as basis of much of the world's agricultural activity. However, a number of the plant species that are cultivated for food across the world have largely been neglected, unrecognized or underutilized. Studies show that the intake of micronutrients contained in these crops helps in the improvement of health and in reducing the incidence of ill-health in children (aged < 5 years), and also women. Alongside the health benefits of indigenous and underutilized crops is the fact that they help to improve food security in local populations.

While market survey revealed that indigenous and underutilized crops have helped improve household income by reducing poverty, review of extant literature showed that most of the crops are rich in nutrients as they possess medicinal values. The crops are also helpful in combating malnutrition and in improving the health needs of local populations. In the past two centuries or so, there has been a dependence on a few commonly used crops or plant species. While this has helped in sustaining an ever-growing human population, it has however led to a neglect of many other species that would have aided global food security as well as the agricultural systems of the world. At the moment, a large portion of the calorie and protein needs of humanity depends on only three crops: maize, wheat and rice. This state of affairs poses great danger for humankind, requiring urgent action by all, particularly the need to promote crop diversification in world agriculture. Food security is globally constrained by several factors including the heavy reliance on very few key crops.

In Africa, over dependence on a few major crops remains a major challenge due to its potential impact and contribution to food security. In Nigeria, for example, the introduction of the Green Revolution resulted in a model of agriculture which depicted growth on concentration on a few staple or crops. From the report of FAO, it is in expanding the food base of countries, not in reducing it, that there will be growth or enhanced food productivity. For example, even though there

has been an increase in cereal production, the gains have been uneven between and within countries and regions of the world. Again, in sub-Saharan African countries, increase in cereal production in the past thirty years or so has not matched the increase in population. This has resulted in the continent remaining a great importer of the crops. In several communities in rural Africa, indigenous and underutilized crops serve as foil for other staples whether in diets or supplements. They are also fallback options in times of food crisis or shortage. These supplements or food types are palpable income earners of the people, especially the female folk. In marginal economies, where poverty and food insecurity are rife, underutilized crops also help farmers deal with negative climatic conditions and economic challenges.

Indigenous or rural populations are usually endowed with food types that are often outside of the purview or knowledge of experts or urban dwellers. These indigenous, neglected or underutilized crops that are outside the knowledge scope of agricultural or food industries are however crucial to the food and health needs of rural communities. They also play significant roles in rural agricultural growth and social development. Crop diversity is crucial to agricultural growth and food security. To further neglect them will have dire consequences not only on global agriculture but food security as well. This paper explored the potential contribution of underutilized and indigenous crops in promoting good health and enhancing food security in Nigeria. Part of the goal of the paper includes creating awareness on the importance of indigenous and underutilized crops in promoting good health as well as food security and dietary diversity in Nigeria.

Indigenous and Underutilized Crops

'Underutilized crops' is a phrase commonly used to describe crop species whose nutritional or dietetic utility has not been fully documented or understood. 'Indigenous crops or food' on the other hand is used to signify food types that are native to place rather than coming from a different locale. For the purposes of clarity, a food species may be underutilized in one region but not in another. Indigenous and underutilized food crops constitute the major source of food intake and nutritional requirement in most rural or traditional communities, especially in Africa. Underutilized food crops contain a very high nutrient content than is previously recognized. The term 'underutilized' has been used among other several descriptions including "orphan," "minor," "new crops," and "neglected" to represent crops species that have potential but fallen to disuse due to various reasons (Padulosi and Hoeschle-Zeledon, 2004). Aboagye *et al* (2007) described underutilized crop species as crops whose potential contribution to the national economy have not been adequately explored due to the decreased attention to their production, consumption and utilization. More specifically, underutilized crops, we are told, refer to "*those species with a potential, not fully exploited, to contribute to food security and poverty alleviation...' and that tend to have the following common features: a strong link to cultural heritage; poorly documented and researched; adapted to specific agro-ecological niches; weak or non-existent seed supply systems; traditional uses; and produced with little or no external inputs"* (Aboagye *et al.*, 2007).

All over the world, indigenous and underutilized crops promote food security, enhance nutrition and help in the generation of income for the rural poor (Godfray *et al.* 2010). However, while these crops continue to be valuable in rural communities, they have not been adequately characterized in the literature. This lack of attention has meant that their potential value has remained unexplored by researchers or experts. Indigenous and underutilized crops are nutritionally rich (Bruinsma, 2009; Tilman *et. al*, 2011; Keyzer *et al*, 2005); neglecting them, therefore, would be to erode the health benefits that are in them. In particular, it would be to deprive local populations of a rich source of food or dietary intake needed for their health sustainability.

Indigenous and underutilized crop species have been identified as valuable for sustainable agricultural productivity (Kahane *et al*. 2013). According to Chivenge *et al.* (2015), the cultivation of underutilized crops provides greater genetic biodiversity, and can potentially improve food security. Other studies have emphasized on the nutritional richness of many neglected and underutilized species, their role in promoting human health and enhancing food security (IPGRI, 2002; Flood, 2010). Stefanie & Amend (2008) point to factors such as insufficient knowledge about the potentials or useful traits of these crop species as well as low interest in agricultural research, as some of the reasons for their observed underutilization. Apart from the commercialization purpose of these often-neglected natural resources, Dansi *et al* (2012), however, argue that the potential of most indigenous crops has not been fully exploited, hence their underutilization. These crops include species that were not classified as major crops, lacking adequate research and currently experiencing low consumption and utilization (Azam-Ali, 2010).

To restate the point, neglected and underutilized crops (NUCs) are not only rich sources of food and fibre but also possess high medicinal properties. They are unrecognized, inter alia, due to poor shelf life, poor consumer awareness reputation glitches and the emphasis on popular foods in modern agricultural practices. Though they are neglected, underdeveloped or underutilized crops can help to increase the diversification of food production in the agricultural sectors of rural societies, especially in sub-Saharan Africa. And since they are rich in protein, fibre and essential amino acids, they can become new addition to our diet or menu list. NUCs have received very little or no attention from researchers and scientists; they are mainly utilized by rural households and isolated traditional communities. These crops serve as alternatives when main crops fail or are not available. It is important to mention that most of these NUCs are eco-friendly as they easily adapt to different weather or climatic conditions. They also readily fit into different cropping systems or schemes.

Health and Food Security

WHO (1948) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Here, it is crucial to mention that good health is an important component of human capital. To put it more elaborately, health is not only about the individual's physical or social fitness but about a person's, mental and psychological well-being as well.

Unlike the term 'health', the concept of food security is a recent entrant into academic literature, with its introduction into the extant literature coming as late as the 1970s. The initial conceptualization of the term was mostly concerned with food supplies, both nationally and globally. This, however, changed in the 1980s to focus primarily on accessibility to food at the household and individual levels. Since then several definitions and conceptual models have evolved. However, one striking definition of food security which is germane to the present discussion is the one which sees it in terms of having "access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (World Food Summit, 1996). Another way to define food security is to see it as the reliable access to adequate and wholesome food that meets the nutritional requirements of all people, at all times, for a healthy life (FAO, 2001). Apart from being one of the major challenges facing our world today, global food security, over the years, has been constrained by several factors including the heavy reliance on very few key staple crops, a situation that has nutritional, agronomic, economic and ecological implications (Ebert, 2014).

Food security at the global level has largely relied on a few crops which constitute nearly half of the global need for nutrients such as proteins and calories. This reduction in global food security is a key factor limiting the choices of the rural poor with regards to their income and revenue. Addressing this problem would require a broadening of research focus to accommodate other crop species that play an important role and can help address the nutritional or dietary needs of local communities. These indigenous crops have the added advantage in that they can withstand stressful conditions and thrive in different settings or local environment thereby contributing to sustainable production at little or no cost. Ethnobotanic studies show that many of such crop species exist in various communities and they represent a vast wealth of agrobiodiversity that can contribute to enhanced incomes, good source of food and nutrition that can help societies combat hunger and diseases. However, not much research has been undertaken to understand the value of these locally important food species thereby limiting knowledge of their potential value and importance.

Indigenous, Underutilized Crops, Food Security and Health

Apart from their role in promoting food security, underutilized crops provide a means for people to improve their income especially in resource-poor countries of the world. Research has shown that there are enormous benefits derivable from these underutilized crops. Apart from helping to diversify production and consumption habits of people, they also contribute to improved health for societies. Expressed differently, indigenous or underutilized crops have multiple uses such as in medicine, ornament fabrication and food consumption. With particular reference to health, it is worth restating that underutilized crops possess hidden potentials to help fight diseases and malnutrition. It follows, therefore, that these crops should only be selected on the basis of their ability to help deal with the challenges faced by rural communities. Emphasis should therefore be placed on these species since they have a comparative advantage as sources of healthy food and also because they are affordable to the rural poor. The diverse uses of indigenous and underutilized crops offer great opportunities that can help local populations to increase their income by enhancing their financial base. In many African countries, considerable attention has not been given to the impact of less utilized crops and plant species on food security. There is limited empirical research and documentation of indigenous and underutilized plant species and their potential to enhance health and food security. This is shown in the fact that in most African countries, agricultural and food policies have focused on the old crops or food staples that have existed in pristine or primeval times. Empirical researches that have been undertaken have primarily focused on the potential of these crops without its direct impact on food security.

Explaining, for instance, the many benefits that are found in bambara groundnut, an underutilized African legume species, Muhammad (2014), remarked that the plant has a very high nutritional content in comparison to other leguminous crops. This legume crop, which is native to Africa, contains high levels of protein and minerals that make it a good candidate in the battle against ill-health and malnutrition among local populations. More importantly, the bambara legume plant has the potential to promote food security in Africa. Sprent et *al*., (2009) lists some examples of African legumes as including Acacia Senegal, cowpea and Gum Arabic. These crops, we are told, could potentially contribute to agricultural diversity, thereby decreasing the reliance on just a few crops or plant species. A number of other studies have also harped on the benefits of many neglected and underutilized crops across Africa. These studies showed that underutilized crops are rich in nutrients and could be used to enhance food security.

While the number of undernourished people from developing countries has drastically reduced since the 1990s, FAO (2014) estimated that between 2011 to 2013, the number of people who suffered from chronic hunger globally were close to one billion people. In sub-Saharan Africa alone, close to 40% of children below the age of five suffer from chronic malnutrition and other diseases. This has resulted in many of such children suffering from stunted growth. Indeed, as far back as 2008, the number of adults suffering from the problem of overweight or obesity globally is estimated at 1.4 billion. These people face the increased risks of non-communicable diseases such as cardio-vascular diseases, diabetes and cancer.

With regards to food security, policies on agriculture have largely been on how to increase productivity while not as much focus has been on increasing the nutritional value of food systems. Little attention has also been paid on understanding the health benefits of the different food types available for human consumption. Neglected, underutilized and indigenous crops could enhance dietary diversity among local populations thereby promoting the health of both rural and urban populations. The health benefits of traditional or indigenous foods are numerous. Among others, they are less harmful to people and the environment as a whole. Little is reported about the health benefits of these local foods or plants that formed the food content of local populations in

pristine times – foods that have been completely removed from our diet tables.

Importance of Indigenous and Underutilized Crops

From the foregoing, it is clear that neglected, indigenous or under-valued crops if well-harnessed, can play a great role in promoting food security not only in Africa but also globally. For example, while there are about 10000 edible plant species reported in the literature, less than five major crops supply the estimated 60% of the human energy intake in the world. The rapid increase in world population in the last twenty years has also led to an increase in world food demand.

In recent times, the lack of variety in food intake has negatively impacted on human health and wellbeing. Indigenous and underutilized crops can help remedy this negative trend as their intake can help provide the needed nutrients that will promote human wellbeing and good health thereby reducing the incidence of disease and malnutrition among local populations around the world. Therefore, expanding the food chain to accommodate indigenous species is an important way to enhance overall human health and wellbeing. Therefore, underutilized and indigenous crops should form an important part of people's food intake all over the world. The use of these indigenous and underutilized species will not only improve food security but human wellbeing as well. And beyond their contribution to local food availability, wild indigenous plants also help keep cultural diversity alive.

Importance of Indigenous Vegetables

Many scholarly works reveal the various benefits of African indigenous leafy vegetables (ALVs) not only as source of food or revenue but also of medicine. With particular reference to Africa, apart from the nutrient values which they have, these vegetables also serve as income earners for rural peoples as well (Ebert, 2011; Abukutsa-Onyango, 2003; Adebooye *et al*, 2005). A large number of African indigenous leafy vegetables are known to contain health improving properties. Most are used for prophylactic and therapeutic purposes by rural people. ALVs have been known to contribute greatly to the dietary as well as mineral intakes of local populations. Aside their nutrient values, African indigenous vegetables also contain substances that protect people from diseases by ensuring proper body metabolism (Smith and Eyzaguirre, 2007). The vitamins and minerals are supplied in the food consumed since they cannot be synthesized.

A list of twenty-four indigenous leafy vegetables is reported as being eaten in Southwest Nigeria alone (Adebooye *et al*, 2003). Okafor (1979 and 1983) list several other species that are also consumed in many other parts of Nigeria. Many of these are collected as wild species in their natural or growing habitats. Similarly, Kiambi and Atta-krah (2003) provide a catalogue of 115 important vegetable species that are indigenous to Africa and that also serve as veritable food species. These vegetables, apart from being edible, provide adequate minerals, protein and vitamins to the body, which help reduce the problem of malnutrition (Salami, 2011). Some species of indigenous vegetables also serve as cure for some debilitating diseases like high blood pressure, diarrhea and diabetes to mention a few. In some rural communities, these vegetables, when consumed in suitable quantity, are used as recipes for boosting immunity against diseases (Thomas, 2000). The vegetables are also usually sold in local markets and as adverted to already, could help enhance food security and serve as means for economic empowerment for the rural poor especially the women.

Although indigenous vegetables are nutritionally and medicinally valuable, Amujoyegbe *et al.* (2015) remark that they have been scientifically neglected and replaced by exotic ones that are not only inferior but lack the nutritional content of these local ones. While many households may appreciate the indigenous vegetables for their taste and nutritional value, they however quickly drop them from their menu list when household economy improves.

The Role of Underutilized Nigerian Vegetables in Promoting Food Security

Nigeria has a population of about 174 million people, thereby making it the most populous country in Africa. Close to a quarter of the country's huge population are rural dwellers who are engaged in agriculture or farm labour for income and survival. Again, a majority of these rural dwellers depend on indigenous vegetables for food, vitamins and supply of nutrients. Table (i) shows the micronutrient content of some common and indigenous vegetables.

Cultivating indigenous vegetables is economically enriching, and their consumption a good source of food and nutrition. Nutraceutical studies (Table 2), showed the quantity of anti-oxidative, anti-nutrients and bioactive components of some UIVs. Available literature revealed that the UIVs have a high amount of nutraceuticals and bioactive components that are good sources of food, nutrition and health, especially in a developing country like Nigeria. In Table 3, we see that UIVs are rich in Mg, Ca, P, Fe, Mn, Cu and Zn (Adebooye *et al.*, 2014).

Table 1:
Micronutrient content of common and indigenous vegetables

Nutrient content	Range	Tomato	Amaranth	Moringa	Sweet potato leaf
ß-carotene (mg)	0.0 -22	0.40	9.23	15.28	6.82
Vit C (mg)	1.1 - 353	19	113	459	81
Vit E (mg)	0.0 -71	1.16	3.44	25.25	4.69
Iron (mg)	0.2 – 26	0.54	5.54	10.09	1.88
Folates (mg)	2.8 –175	5	78	93	39
Antioxidant activity (TE)	0.6 - 82,000	323	394	2858	870

TE = trolox equivalent (mM TE/g FM

Source: AVRDC – The World Vegetable Center: Tainan, Taiwan, 2008

Table 2:
Antioxidative, Antinutrient and Bio-active contents of some under-utilized vegetables

Vegetables	Total carotenoids (mg/100gDM)	Total Phenolics (GAE/100gDM)	Tannins (mg/100gDM)	Flavonoids (CE eq. /100g)	Phytate (mg/100 DM)
V. amygdalina (Bitter leaf)	31.2	43.4	48.5	61.2	3.6
T. occidentalis (Ugu)	26.4	42.6	60.4	66.5	3.2
A. viridis (tete atetedaye)	24.2	61.8.	49.4	40.4	3.1
T. cucumerina (fruit) snake tomato	252.1	504.2	253.1	107.2	1.4
C. crepidoides (Ebolo)	24.1	38.6	55.6	54.3	4.2
S.macrocarpon (igbagba)	36.8	66.4	53.6	50.6	2.0
S. biafrae (woorowo)	22.4	50.4	58.4	44.6	2.4
C. pepo (Elegede)	46.2	38.1	55.3	59.2	4.0
S. scabrum (ogunmo)	23.2	63.2	54.2	45.6	1.2
S.nigrum (odu)	20.0	70.4	64.3	50.7	2.6

Common/Local names are in parenthesis
Source: Sustainable Production and Utilization of Underutilized Nigerian Vegetables to Enhance Rural Food Security: Project Number 106511 (001-004). Final Technical Report. Location of Study: Nigeria. August 2014. https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/53592/IDL-53592.pdf

Table 3:
Macro- and micro-nutrient contents of some under-utilized vegetables (mg/ 100g dry weight).

Vegetables	N	P	K	Ca	Mg	Fe	Mn	Zn	Cu
S. biafrae	2745	300	2300	2230	750	81.1	36	4.71	1.2
S.macrocarpon	2047	675	1892	544	592	30	33	7.96	1.61
S. nigrum	2165	687	2146	2145	663	32	37	3.81	1.85
A. viridis	3284	496	2348	4864	1252	36	23	5.41	2.21
Telfaria occidentalis	2755	636	2032	396	1065	65	18	0.85	1.90
Solanum scabrum	2439	831	4555	860	380	28	36	5.3	2.24

Source: Sustainable Production and Utilization of Underutilized Nigerian Vegetables to Enhance Rural Food Security: Project Number 106511 (001-004). Final Technical Report. Location of Study: Nigeria. August 2014. https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/53592/IDL-53592.pdf

Health and nutritional benefits of some underutilized and indigenous crops in Nigeria

There are many crops that are used as food in Nigeria. Some of these food crops are valued because of their leaves, fruits, seeds or stem. Among the abundance, there are some that have more value in terms of food. Many of them are under-utilized. Apart from the fruits of a plant, the leaves, stem or flowers are also valuable as food yet they are not being used. Listed below are some of the Nigerian food crops that provide two or more edible raw materials:

Cassava leaves: The leaves are very nutritious and particularly contain an appreciable amount of protein and micronutrient content.

Sweet potato leaves: The leaves however are not so popular but are delicious to eat. The leaves are called Ewe Anamo by the Yoruba, Akwukwo Nduku by the Igbo and Ganyen Dakali by the Hausa. Sweet potato leaves are super rich in Vitamins especially the B6, C, and B2. Although the leaves of sweet potatoes can be a bit bitter, it is not as bitter as Kale. They can be cooked like spinach.

Cocoyam: Cocoyam leaves (Ewe koko, Ganyen gwaza, Akwukwo Ede) are also edible. The most popular dish (perhaps one of a few) featuring the cocoyam leaves is the Ekpan Nkukwo. Utilization of the leaves is still very low.

African Yam bean: This is an under-utilized food crop found in Nigeria. Though not a common food crop, it is worthy of mention because of its potential to enhance human health. The African Yam bean produces both a legume – beans and a tuberous root – yam. It contains a high amino acid content compared to cowpea, pigeon pea and Bambara groundnut. Though not easily found in urban markets, the crop is particularly useful in reducing malnutrition and can serve as a food security crop. However, if no action is taken, this food crop which is already endangered would become extinct

Garden egg: Garden egg: Garden egg is a traditional fruit used in traditional activities as well as an everyday fruit in Nigeria. It contains a lot of phytochemicals that are beneficial

to human health. Apart from the fruit, the leaves, known in local parlance as *igbo*, *yalo* or *mkpuru anara*, the fruit serves as a delicacy for people. Garden egg vegetables are also used to prepare the 'egusi soup', a popular broth eating by Nigerians.

Amaranth (*Amaranthus* spp.): This is a highly popular vegetable in Nigeria. Amaranthus leaves are differently referred to as ***t****ete, inine* or *aleyefo* by locals. Amaranth seeds are rich in nutrients. They can be popped or ground into flour or eaten as snack or cereal.

Baobab: This plant is indigenous to Northern Nigeria. Ground baobab leaves are used to prepare the *miyan kuka*, a popular dish eaten by people in Northern Nigeria. The fruits are edible and usually consumed by local peoples.

Horse radish tree/drumstick tree (Moringa): This is the popular moringa tree, which has become a sort of cure-it-all for various sicknesses and diseases. The moringa plant has also come to assume a mythical status not only in Nigeria or Africa but in various parts of the world. The literature is awash with reports on the nutritional and dietary value of the moringa plant. The common claim is that every part of the moringa plant is valuable either as food or medicine. The moringa roots, leaves and seeds are said to be valuable sources of food and micronutrients. They can serve as treatment for various diseases and sicknesses such as tumors, abdominal pain and skin rashes to mention a few. Moringa is said to have a high nutrient density. It contains not only antioxidant properties but also antibiotic, anti-trypanosomal and antispasmodic properties amongst others. Even the pods of the plant are said to possess healing powers and potency. Processed moringa is recommended as stimulant in HIV/AIDS treatment (Hartwell, 1969; Burger *et al.,* 2002; Ebert, 2011). In Nigeria, moringa seeds are eaten as nuts, and the leaves, when ground, are used as supplements in children's diets, and for pregnant or lactating mothers. Moringa flowers can be converted into salad or used as sauce for soup or drink (Duke, 2013 and Bosch, 2004). It is said to be a good treatment for severe or acute malnutrition (Duke, 2013; Jilcott *et al.* 2010).

Moringa is rich in oil, generally known as ben oil. The oil is non-drying, resists rancidity, and is used for cooking and lubrication. It is also valuable in the cosmetic industry (Duke, 2013). It is good for purification of drinking water and to flocculate contaminants (Fahey *2005*; Bosch, 2004). Apart from the potential of moringa to help fight hunger and malnutrition especially in resource poor parts of the world, it can be an income enhancer for smallholder farmers and rural dwellers as well.

But apart from the benefits mentioned above, moringa has other uses as well. In the literature, it is reported that a fully grown moringa plant can serve as a windbreak for buildings (Jahn *et al.*1986). In parts of Africa, Latin or Northern America, the moringa plant is grown as an ornamental tree and is used for beautification purposes (Jahn *et al.* 1986). And in a world of climate change and concern for the ecosystem, moringa has the potential to help in the promotion of a sustainable environment in the world.

Oil Palm tree: This is a cash crop from which the red oil (also known as palm oil) is produced. The oil palm tree or plant is also a source of palm kernel oil, which is produced by heating or frying the palm kernel nut, which itself is edible. Palm oil is different from the palm kernel oil in composition. It contains 80% saturated fats as against the 50% found in the palm oil. Palm oil is one of the most popular cooking oils in Nigeria.

African Black Pepper (***Uziza***): The African black pepper (from Latin *piper* pepper) produces the black pepper seed that is used as spice in African cuisine. The leaves, which are highly popular in the southern part of Nigeria, are used in the flavouring of soup or broth. *Uziza* (African black pepper) contains piperine and other phytochemicals that are anti-inflammatory agents. Piperine is a white crystalline alkaloid $C_{17}H_{19}NO_3$ that is the chief active constituent of pepper.

Conclusion

The benefits of indigenous and underutilized food crops are quite numerous. The most apparent benefit is that they are a source of food for people. Again, apart from helping to promote food security for societies, indigenous and underutilized foods also possess immense health, nutritional and economic benefits. For a country like Nigeria, for example, it is imperative that government formulates policies that would make the cultivation of these crops an integral part of the agricultural system. Again, community-based interventions are required to encourage local peoples to continue making underutilized foods part of their staple or basic ingredient of diet. Part of the goal of food policy in a society is the promotion of health and the wellbeing of the people.

It is clear by now that there is a rich biodiversity in Nigeria. Indigenous and underutilized crops are food crops that can be cultivated to enhance health and promote food security in the country. Understanding the unique strengths of indigenous and underutilized foods will require a robust policy on agriculture that would make these food types an essential part of the people's dietary intake. Achieving this goal will require not only government effort but continued research governance frameworks that will underscore the value of indigenous and underutilized foods or crops.

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