Some underutilized indigenous timber trees with high medicinal values: Its challenges and prospects

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Abstract

Underutilized species is referred to species to which little or no attention is paid by the policymakers, agricultural researchers, and plant breeders. Medicinal plants used in traditional medicine have a natural origin, are effective, and less expensive. Traditional doctors in African countries make use of plants in treating millions of people. Albizia zygia, Alstonia boonei, Tetrapleura tetraptera, Newbouldia laevis and Canarium schweinfurthii are the underutilized indigenous timber trees with high medicinal value that were discussed. Different parts of these trees like the bark, root, leaves, flower, stem, gum are used as medication in treating diverse diseases such as painful urination, epilepsy, convulsion etc. This study aims at reviewing the underutilized indigenous timber trees with high medicinal values, their challenges, and prospects. Methods are derived to increase the value chain of underutilized timber trees which can contribute to the livelihoods of smallholder farmers and other stakeholders mainly through income generation.

Keywords: Timber; Ethnomedicine; Underutilized; Economic value; Forest

1. Introduction

Nigerian forests are endowed with biodiversity (flora and fauna). Forest and trees contribute to food security and nutrition. They play a vital role in the lives of many people, there are many uses gotten from tree products such as fodder, fibers, fuels, medicine, and the use of wood for construction, fencing, and furniture [1]. It provides a safety net when crops fail when means of livelihood are challenged by economic, political, and environmental difficulties which make local people turn to forest resources for diet and income [2]. Some forest products like timber, charcoal, craft, firewood, and tree products such as fruits, nuts, oil, vegetables, and medicine generate incomes. These forest incomes contribute to the livelihood of those in the rural communities in developing countries [3]. Underutilized trees are tree species considered to be less important because of their consumption, utilization and production which are not well exploited. However, in other to add value to man and the economy, certain areas like medicine, industry, and agriculture are meant to be totally explored to eradicate poverty and hunger [4]. Timber is a natural material processed from trees. Over the years, it is used for different purposes and it is one of the oldest natural resources. It is a construction material used for ornamental and structural purposes all over the world [5]. There are up to 200,000 hardwood species and 1000 softwood species in Nigeria, only 2,300 of these species are commercially important [6]. It possess some good characteristics, a timber can split, bend, twist, shrink, and translucent. Various timbers have different properties; some are heavy, hard, soft, light, brittle, and flexible while some timbers burn more readily than others [7]. Forest industries, smallholders, stakeholders, and agricultural firms utilize some very important timber species such as Acacia mangium, Paraseriethes falcata, Swietenia macrophylla, Dalbergia latifolia, Tectona grandis, Azadirachta indica, Khaya...
Some attributes of these species include their propagation, management, germplasm, and their current market demand. The wood properties of these utilized species are generally less researched, and abandoned because they have not been commercially exploited. They are usually found in the wild forest and they can be grown as scattered trees in the garden [8]. Timber can be grouped into physical, mechanical, and seasoning properties. The physical property of timber consists of specific gravity and density. The mechanical properties determine the strength of the timber, while the seasoning properties determine its durability, elasticity, and strength by reducing the moisture content [9]. Timber is known as the wood used for joinery, carpentry, reconverted for manufacturing purposes, building materials. It is commonly used for walls, roofs, and floor frames [10]. The strength of each timber relies on the species; the effect of some growth characteristics and these characteristics varies [11]. The aim of this review is to explore some of the underutilized tree species with great medicinal potentials thereby focusing on some of the challenges hindering them and their future prospects.

### 1.1. Distribution and occurrence of the selected underutilized indigenous timber trees

The five selected indigenous timber trees occur in different regions and have diverse distribution. For instance,

**Albizia zygia** (DC.) J.F.Macbr. is a medium sized semi-deciduous tree that is widely grown in tropical Africa and grows up to 30m high [12]. It belongs to the Leguminosae-Mimosoideae family which is usually found in Gabon, Cameroon, Ghana, Kenya, Nigeria, Sudan, Tanzania, Uganda, and Republic of Congo. The plant has several names in different regions; in Nigeria, Igbo’s call it (Nyie avu), Yoruba’s call it (Ayunre), Swahili as (Nongo), and the Akans in Ghana call it (Okuro). The wood is used for veneer and plywood, boat and shipbuilding, indoor construction, vehicle bodies, and tool implements like pestle, and hoe-handles.

**Alstonia boonei** De Wild is a tropical plant grown in several parts of Africa and south Asia; it is a large deciduous tree up to 45m tall belonging to the Apocynaceae family. It is commonly known as “ogbu-ora” by the Igbo tribe, “ukhu” by Hausa people and “ahun” in the Yoruba tribe of Nigeria [13]. The wood is used for construction and carving. It is known as a good source of timber that can be exported.

**Tetrapleura tetraptera** (Schumach. & Thonn.) Taub is a robust perennial and deciduous tree of 20 to 25m in height. The plant has grey-brown color with smooth-rough bark. It has four longitudinal wing-like pods nearly 3cm broad. The generic name comes from a Greek word meaning ‘four ribs’ referring to the ribbed fruit. The specific epithet means four-winged [14]. The plant belongs to the family of Fabaceae-Mimosoideae and a native to Africa [15]. *T. tetraptera* is known to be nutritious. The fruits are used in the cooking of soup, porridge for nursing mothers to get rid of postpartum contraction. It also helps in managing leprosy, convulsion, rheumatism, and inflammation [16]. The heavy and hardwood of this species are used for carving, the building poles, tool handles, and pestles [17].

**Newbouldia laevis** (P. Beauv.) Seem is commonly known as a Boundary tree or Tree of life. It can be found in tropical Africa, with a height up to 7-8 meters. It belongs to the Bignoniaceae family [18] and widely distributed across west and central Africa. It is also recognized in African folk medicine in treating cough, treating sexually transmitted diseases, breast cancer, constipation, fever, stomach ache, and toothache [19]. *N. laevis* is known for its medicinal value as antimicrobial, antioxidant, anti-inflammatory, wound healing properties, analgesic, and anti-fungi [20-21]. Different names are attributed to this plant by various tribes, in Hausa as (Aduruku), Yoruba as (Akoko), Igbo as (Ogirisi) and Edo as (Ikimi) [22]. The wood is used for making boundaries [23].

### Table 1 Overview of the five selected underutilized indigenous timber species.

| Scientific Name      | Family                  | Common Names                  |
|----------------------|-------------------------|-------------------------------|
| Albizia zygia        | Fabaceae (Mimosoideae)  | Silk tree or Sirs             |
| Alstonia boonei      | Apocynaceae             | God’s tree or Stool wood [28].|
| Tetrapleura tetraptera | Fabaceae – Mimosoideae | Aidan tree or Gum tree        |
| Newbouldia laevis    | Bignoniaceae            | Boundary tree or ’Tree of Life [29].|
| Canarium schweinfurthii | Buceraceae             | Africa Elemi                   |

*Canarium schweinfurthii* Engl. is a big tree with a straight and long bole of 50m or more. It is widely spread around Africa [24]. It belongs to Buceraceae family and commonly found in large quantities in Pankshin, Plateau State of Nigeria. Its
fruition period is usually between April to September. The fruits are of two varieties with different shapes, short round and long spiral shape from which flowers develop. The flower has a dark green color and gets clustered at the end of the twig [25]. Different products are derived from *C. schweinfurthii* which are timber, medicine, fuelwood, gum and resin. The wood is used for decorative veneers, plywood, joinery, parquetry, and furniture components [26]. Pulp and seeds of the fruit are a good sources of vitamin C, used as a flavor in non-beverages and snacks [27].

2. Benefits associated with the five selected indigenous timber trees

The listed underutilized timber species have diverse medicinal potentials. However, necessary attention was not given in terms of policies that would tackle the multifaceted problems affecting their effective use. These tree species have diverse use aside been used as timber. Some of these benefits are discussed below:

2.1. Ethno-medicinal uses

Medicinal plants are the main sources of many drugs in the modern world and the majority of the indigenous medicinal plants are used as food and spices. These medicinal plants are of utmost importance to the health of people and their communities. Plant parts such as leaf, flower, fruit, seed, tuber, and root are used for different medicinal purposes. They have some physiological component which has been exploited by traditional medical practices in treating a diverse ailments [30]. Ethno medicine is the application and the use of phytomedicine by native people of different ethnic origin. All over the world, various cultures depend on indigenous medicinal plants as the first need for their primary health [31]. Traditional medicine has become important and is globally known, it has been researched that 25% of modern medicines are derived from plant tested and used by traditional medical practitioners [32].

In Africa, the medicinal potentials of plant medicine are well known by the rural dwellers [33]. Indigenous knowledge of the medicinal plant by indigenous people is to use plants to maintain health, improve, prevent, diagnose or treat physical and mental illnesses. Medicinal plants are used in treating the spiritual origin of disease and the physical symptom. Medicinal plants have curative properties due to the presence of different compositions of various chemical substances present which are known as the secondary plant metabolites. These secondary metabolites are alkaloids, glycosides, flavonoids, essential oils etc.

### Table 2 Ethnomedicinal uses of various parts of the selected timber species

| Scientific name       | Plant part | Disease conditions treated with the medicinal plants                                                                 |
|-----------------------|------------|-------------------------------------------------------------------------------------------------------------------|
| *Albizia zygia*       | Root       | The ground root is added to food to treat Cough and as an expectorant [12].                                          |
|                       | Stem       | The methanol stem bark extract of *A. zygia* is a painkiller [34] and is also potent against *Plasmodium falciparum* K1 strain and *Trypanosoma brucei rhodesiene*. |
|                       | Leaves     | Leaves and stem are used in the treatment of boils, diarrhoea, male sexual impotence, oedema, and fracture [35].       |
|                       | Bark       | The bark is used as an antidote, aphrodisiac, purgative, stomachic, and vermifuge.                                  |
| *Alstonia boonei*     | Root       | The root is used for people suffering from rheumatism to relieve rheumatic pain and other types of pains               |
|                       | Stem       | The stem bark is an antivenom for snakebite and also used in traditional medicine to treat painful urination, insomnia, and chronic diarrhea [36]. |
|                       | Leaves     | The leaves are used in reducing any swellings [37].                                                               |
|                       | Bark       | The bark is used in treating measles and snakebite [37].                                                           |
| *Tetrapleura tetraptera* | Root   | Extract of the root is used in treating leprosy and many infectious diseases that affect the arm, legs, skin, and some nerves. |
|                       | Stem      | The stem and bark can be used for the treatment of hypertension and for checking oxidation levels of hypertensive patients. |
|                       | Leaves    | The leaves are used in managing convulsion.                                                                          |
|                       | Bark      | The bark extract serves as a curative effect on dyslipidemia [38].                                                   |
| Newbouldia laevis | Root | Decoction of the roots with *Alstonia boonii, Jatropha curcas* are used for treating epilepsy [39]. |
| | Stem | The stem bark decoctions are used for children in treating convulsions, epilepsy etc. [40]. |
| | Leaves | Decoction of the leaves is used in treating sore eye, ear pain [41], used against dental caries [42]. |
| | Bark | The bark is chewed and swallowed for diarrhea, toothache, and pains generally [43]. |

| Canarium schweinfurthii | Root | Roots are used against adenitis |
| | Stem | The bark of the stem decoction is used as a remedy for stomach pain, colic, and roundworms. |
| | Leaves | The leaves are used as stimulants against diarrhea, constipation, fever, malaria etc. [44]. |
| | Bark | The bark of *C. schweinfurthii* is crushed and used for preventing or treating leprosy attack. |

### 2.2. High Economic value

The underutilized timber species holds a great diversity and a vast value of indigenous knowledge. The indigenous timber species contribute to the livelihood and profitability of commercial farmers. The species which are geared to the market will generate cash income and therefore can call on external inputs and the ability of modern technologies to transform plants into various finished products, and their storage life gives chances to use and advertise these products derived from the specie.

### 2.3. As a construction or landscaping material

Timber, which is also wood is a versatile, flexible, and complex building material for constructing houses, companies, and insulating material and it is quite abundant in Nigeria [45-46]. There is an increase in the request for timber which is unlimited in Nigeria. Preserving woods helps in the durability, and long-lasting of timber by adding chemicals.

### 3. Challenges affiliated with unplugging the prospect of the selected indigenous timber trees

The challenges promoting underutilized timber species are due to certain factors such as;

#### 3.1. Fund

Lack of funding in the majority of the institutions is a major factor limiting research, sensitization, developments and popularization of underutilized species. The private and public sectors must also contribute to promoting, and developing these plant species [4].

#### 3.2. Marketing and Information of underutilized plant species

Almost all plant species have medicinal value. Information and knowledge about the medicinal and nutritional values of the underutilized plant species are limited. Underutilized plant species have poor marketing because of the inability to afford them, also no knowledge on how to access the location of the plant species. Strong publicity and awareness should be created to market, the underutilized species products for end-users are in order for farmers to also benefit from the sale of the plant species [4].

#### 3.3. Little research and Innovation

Little or inadequate research has been done in harnessing the potential of the underutilized timber trees and there is often incoherent evidence available to support the development of research activities of particular timber trees [47]. This situation could be attributed to a lack of clear research goals and limited innovation.

#### 3.4. Deforestation or illegal felling

Illegal cutting of trees is a common activity and this in no small measure has also contributed to the underutilization of some of our forest timbers. Unemployment rate, food insecurity, and poverty rate, all these are ascribed to the
unselective cutting of trees by the younger ones. Hence, there is a need for investment in the propagation and establishment of plantations for these selected timber trees as well as the enactment and effective implementation of rules and regulations against illegal logging.

4. Prospects of unlocking the potentials in selected indigenous timber trees

The keys to unlock the potentials rest in our ability to harness their multiple uses. The social and economic useful traits present in the underutilized species should receive appropriate attention. The chains linking farmers up to final end-users play a critical role in securing revenues to rural communities and thus fueling the very mechanism that will maintain the diversity of these species in the field.

4.1. Promoting the usage of parts of timber trees for health benefits

In some developing countries, it is noticed that the yardstick for having a stable health is through the use of medicinal plant [48]. Traditional African medicine is the sum of total practices, measures of ingredients with different procedures used by Africans that enable them to guards against disease. Many people use plants with medicinal value as an alternative therapy despite the availability of modern medicine. There is an increase in the use of medicinal plants in the industrialized societies that is been traced to the extraction and development of different drugs, as well as chemotherapeutics from such plant and the locally used herbal plants [49].

4.2. Promoting a useful value chain for the selected indigenous timber tree

To promote a successful value chain on the selected underutilized timber trees, some things need to be considered which are; awareness of environmental factors, increased research, addressing challenges, needs and opportunities related to promoting calls for active collaboration with local communities, and mainstreaming gender-sensitive approaches. Organizations of farmers, and traditional seed systems can assist in organizing programs that will promote the effectiveness and relevance of the underutilized species. Development processes, researcher's steps, and stakeholders from smallholder farmers to policymakers must be consulted and must participate in the open processes.

4.3. Application of technologies for the development of selected indigenous timber tree

Provision of modern technological infrastructural amenities which includes state of heart storage facilities, modern processing machinery, and mechanized cultivation tools are all necessary. The advantages of these technologies are taking sustainable renewable resources by changing waste materials into a useful product, and this helps in their durability.

4.4. Encourage collaboration in researching, promoting, conserving and sustainability of underutilized indigenous timber species

The agricultural sector has to identify and recognized the importance of indigenous underutilized timber species so as to conserve and protect the traditional knowledge about them for future generations, thereby, encouraging the farmers to undergo training and other groups along the value chains in managing soil health, producing quality seeds, booking and good marketing [50]. Attention should be given to the underutilized species by researchers to ensure that these species are no longer ignored. Monitoring, documentation on-farm conservation and international policies for trading will help coordinate to promote underutilized species at different areas, and levels. Lack of Interaction across sectors like (agriculture and education) and some other groups like (farmers, researchers, and decision-makers) hinder the potentials of the underutilized indigenous timber species. Collaborative platforms, processes and method that will facilitate strategic synergies among national, regional, and international networks need to be supported and encouraged [50].

5. Conclusion

Forest and trees are important sources of products for people's needs. Exploring the potentials of these selected indigenous timber species are better methods of sustainable development goals. Domesticating, exploring, and commercializing this indigenous timber species can be social, and economically significant. Underutilized indigenous timber species have untapped potential that helps rural communities and small-scale farmers by improving their incomes and medicinal value. Continuous usage of this underutilized timber makes them competitive. The conservation and sustainable use of underutilized indigenous timber species is hampered by inappropriate rural development policies and programs that focus on a limited number of commodities. The use of underutilized timber can alleviate pressure on overexploited timber species, and increase the economic viability of responsible forest management.
Imploring smallholder farmers in rural and urban areas to be aware of the benefits of using the underutilized indigenous species, also policymakers and scientists need to promote and protect these underutilized species.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest. All the authors consent to the content of the manuscript.

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