Technical paper

Some endangered plants producing edible fruits and seeds in Southeastern Nigeria

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Abstract — Introduction. Although some of the non-formal food items consumed in Southeastern Nigeria are exotic, the indigenous products are becoming increasingly popular. There is also a growing interest among scientists in various disciplines to conduct research on nutritional, medicinal, industrial and other uses of the less studied and largely indigenous plants. Unlike the exotic fruits and seeds literature on the purely indigenous species is scanty. This paper is aimed at the documentation of some of the readily identified species producing fruits and seeds, which are considered to be endangered. **Materials and methods**. Selected plants producing edible fruits and seeds and considered to be endangered in Southeastern Nigeria were compiled in a list. Mature forms of the fruits and seeds were covered by means of color photographs and further categorized according to their families, growth habits, state of domestication, local names and methods of utilization. **Results and discussion**. Thirty plant species belonging to 19 families were recorded. The list includes 19 trees, 3 shrubs, 4 climbers and 2 rhizomatous monocots. About 27% of the species listed enjoy some degree of cultivation, while about 70% may still be found protected or wild. Up to 16% are still harvested only from the wild plants. The factors predisposing most of the species to extinction would be: loss of habitat due to deforestation and other forms of population pressure on the ecosystem; lack of interest in tree planting due to rather long gestation periods of existing genetic stock; increasing pressure and demand from few surviving stands; unsustainable harvesting methods. **Conclusion**. *Ex situ* conservation strategies, genetic and other tree improvement studies, encouragement of home garden and village forest settlement practices, and the introduction of incentives for tree planting are recommended strategies for conservation and sustainable production of the highly prized indigenous edible fruit and seeds in the area.

Nigeria / endangered species / inventories / wild plants / domestication

Espèces produisant des fruits et des graines comestibles, menacées dans le sud-est du Nigéria.

Résumé — Introduction. Bien que certaines plantes produisant des aliments non communs consommés dans le sud-est du Nigéria soient exotiques, les produits indigènes deviennent de plus en plus populaires. De plus, les scientifiques de diverses disciplines s'intéressent de plus en plus aux recherches sur les utilisations alimentaires, médicinales, industrielles et autres de plantes moins connues et, pour une grande part, indigènes. À la différence des fruits et des graines d'origine exotique, la littérature portant sur les espèces purement indigènes est pauvre. Cet article apporte des informations sur certaines espèces aisément identifiables, donnant des fruits et des graines consommés par les populations locales et considérées comme mises en danger. **Matériel et méthodes**. Des plantes à fruits et graines comestibles, considérées comme menacées au Nigéria, ont été listées. Des fruits et des graines mûrs ont été photographiés, puis classés par catégorie selon leurs familles, leur type de croissance, l'état de leur domestication, leurs noms vernaculaires et leur utilisation. **Résultats et discussion**. Trente espèces végétales réparties en 19 familles botaniques ont été répertoriées. La liste inclut 19 arbres, 3 arbustes, 4 plantes grimpantes et 2 plantes à rhizomes. Environ 27 % des espèces recensées bénéficient de certaines techniques de culture, alors qu'environ 70 % d'entre elles peuvent encore être trouvées protégées ou sauvages. Jusqu'à 16 % sont encore récoltées sur des plants sauvages. Les facteurs prédisposant la plupart des espèces à l'extinction seraient : la perte d'habitat due au déboisement et à d'autres formes de pression des populations sur l'écosystème ; le manque d'intérêt pour la plantation d'arbres, du fait de la lenteur de mise en route des actions génétiques existantes ; la pression et la demande croissantes de ces espèces issues d'un nombre restreint de sites où elles se maintiennent ; des méthodes de récolte non préconisées. **Conclusion**. Des stratégies de conservation *ex situ*, des études de génétiques, l'encouragement de pratiques pour l'établissement de jardins de case et de règlements d'exploitation de la forêt, ainsi que le lancement d'incitations pour la plantation d'arbres, sont des stratégies recommandées pour la conservation et la production durable de ces espèces fortement prisées dans la région d'étude.

Nigéria / espèce en danger / inventaire / plante sauvage / domestication

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1. Introduction

The feeding habits of the peoples of Southeastern Nigeria are dominated by the starchy foods of root and tuber origin usually taken with soups of various vegetables [1]. In addition to the bulky foods such as yam, cassava, cocoyam and plantains, peoples of Southeastern Nigeria consume a wide range of fruits and masticatories outside formal meal times such as during reception of visitors, opening of ceremonies, making of vows and pledges at marriages and while out in the fields or at other leisure times. Many of the fruits and seeds in this category, some of which serve as soup condiments, are often harvested from wild or protected plants. Many are often packaged as special gifts to friends and relations resident in cities within Nigeria and overseas. It may be necessary to stress that the demand for and consumption of the fruits and seeds cut across age brackets, standards of living and literacy levels. Thus, an account of the feeding habits of the peoples of Southeastern Nigeria will be incomplete without mention of these non-formal but vital food items.

Although some of the non-formal food items consumed in the area are exotic, the indigenous products are becoming increasingly popular. Because many of the indigenous items are obtained from the widely distributed plants, their gathering, distribution and marketing have created opportunities for employment of a number of rural and urban inhabitants, especially women. There is also a growing interest among scientists in various disciplines to conduct research on nutritional, medicinal, industrial and other uses of the less studied and largely indigenous plants. In 2000, Schippers [2] acknowledged the vague definition for vegetables and thus included green or fresh fruits as vegetables. The use of some green fruits as part of dessert with main dishes is largely allied to the traditional food habits. Fruits and seeds are freely consumed, independent of the main carbohydrate meals. They are also taken when ripe or mature.

In 1980, Okigbo [1] provided a distinction and prepared separate lists of food plants of Southeast Asian and South and Central American origin from indigenous food plants cultivated, protected or wild. Unlike the exotic fruits and seeds, which have received a great deal of horticultural attention, literature on the purely indigenous species is scanty.

This paper is aimed at the documentation, through pictures, of some of the readily identified fruits and seeds, which are considered to be endangered. A discussion is also provided on the factors which predispose the species to extinction.

2. Materials and methods

2.1. The study area

Southeastern Nigeria lies between lat. 4° 20' N and 7° 00' N and long. 5° 25' E and 9° 35' E. It is bounded on the East by the Republic of Cameroon, on the South by the Atlantic Ocean, on the West by the River Niger and on the North by Kogi, Benue and Taraba States of Nigeria. The zone includes Enugu, Anambra, Imo, Abia, Ebonyi, Akwa Ibom, Bayelsa, Cross River and Rivers States. However, two tribes and two major languages, Ibo and Ibibio/Efik, predominate. The zone comprises the most densely populated states in the country with an average of about 0.19 ha per capita [3].

The mean maximum daily temperature is 27 °C, but the maximum temperature does not exceed 35 °C. The minimum daily temperature decreases from the coast towards the interior but it does not fall below 18 °C [4]. Rainfall ranges from about 4 338 mm per annum in Bonny in Niger Delta to about 1 675 mm per annum in Nsukka up north.

Soils are very varied including shallow stony soils, young soils derived from deposited materials and hydromorphic soils. Soils in most areas are described as acidic and of low fertility status [5].

The primeval tropical rainforest vegetation has been replaced in most areas with what Hopkins described as farm-fallow and oil palm bush following centuries of deforestation and slash and burn agriculture [6]. Home gardens and village fruit tree forests containing several protected indigenous edible plants are common, particularly in the most densely populated states [7–9].

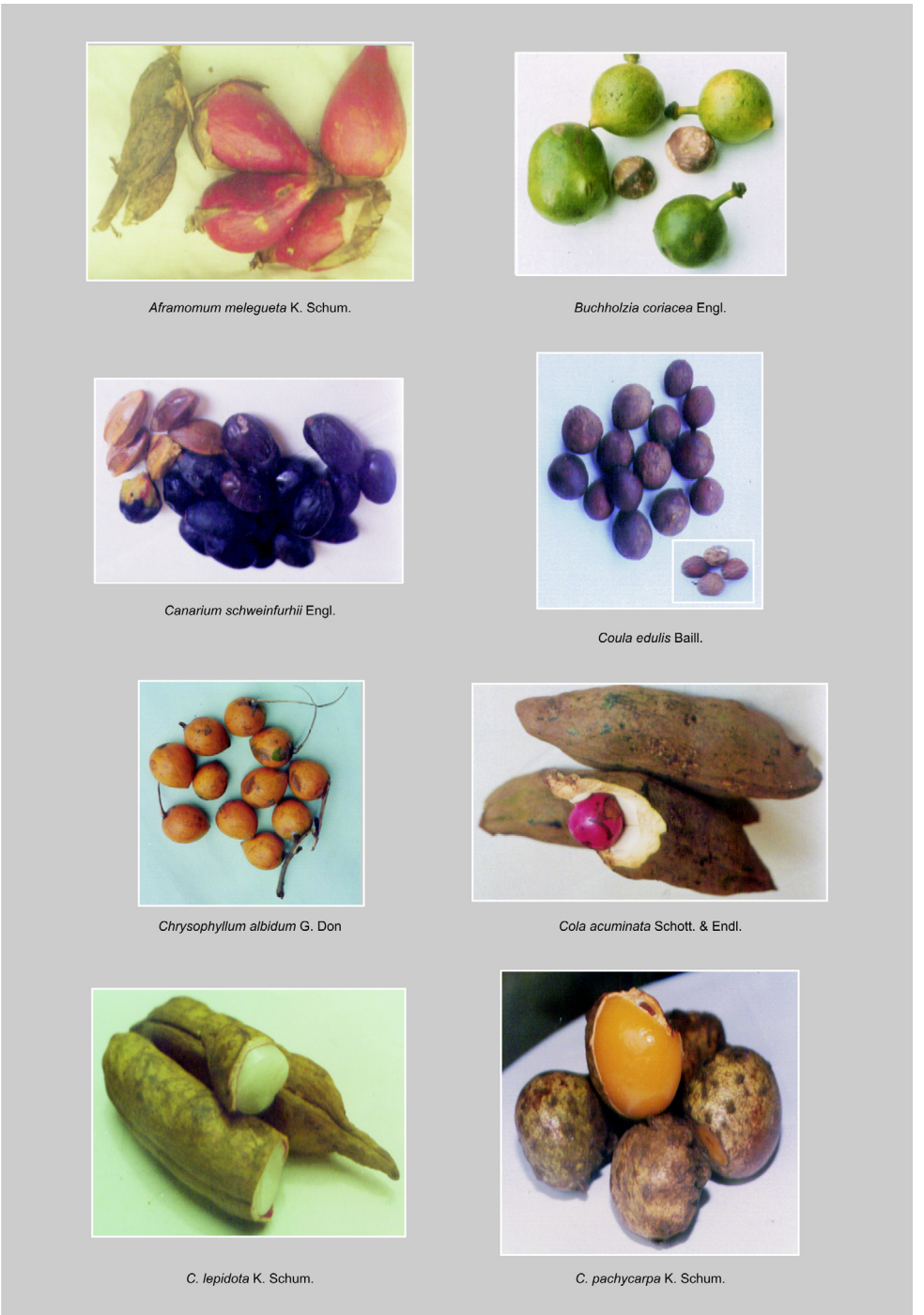

Figure 1.
Some of the plant species producing edible fruits or seeds, found to be presently endangered in Nigeria (see colour pictures on *Fruits*' website).

2.2. Listing of endangered species

Mature or ripe fruits/seeds of plant species judged to be endangered in the area were collected and photographed (*figures 1–4*). A list of the plants was prepared, providing information on the scientific name, the family (sub-family in the case of leguminous

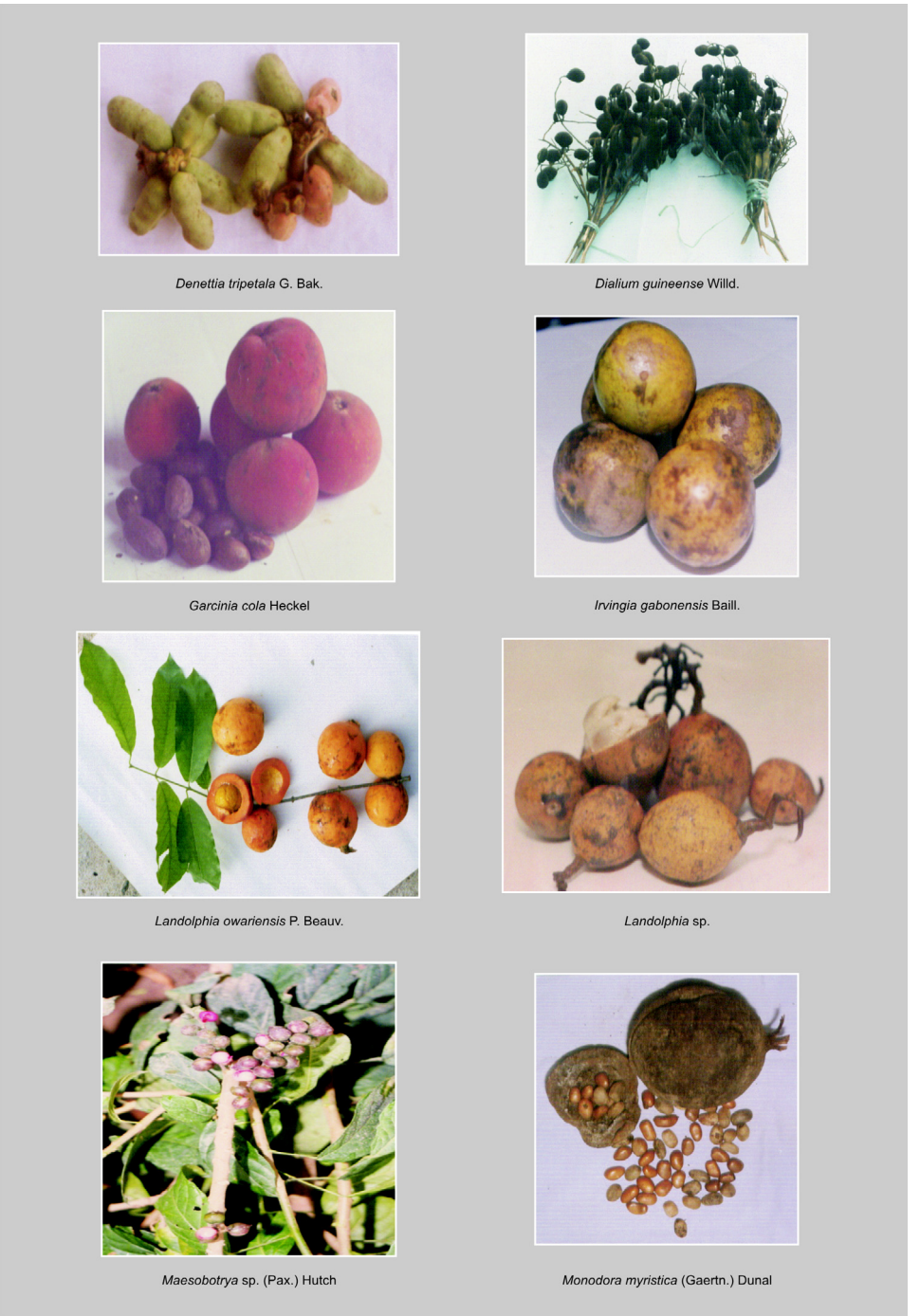

Figure 2.
Some of the plant species producing edible fruits or seeds, found to be presently endangered in Nigeria (see colour pictures on *Fruits*' website).

species), growth habits, local names and a brief description of the parts commonly eaten. For each species, the degree of domestication was identified as protected, cultivated or wild. The common name was provided only in cases where the name is judged to be used fairly freely beyond the zone. Local flora [10–12] were freely referred to for proper classification and naming of the plant species.

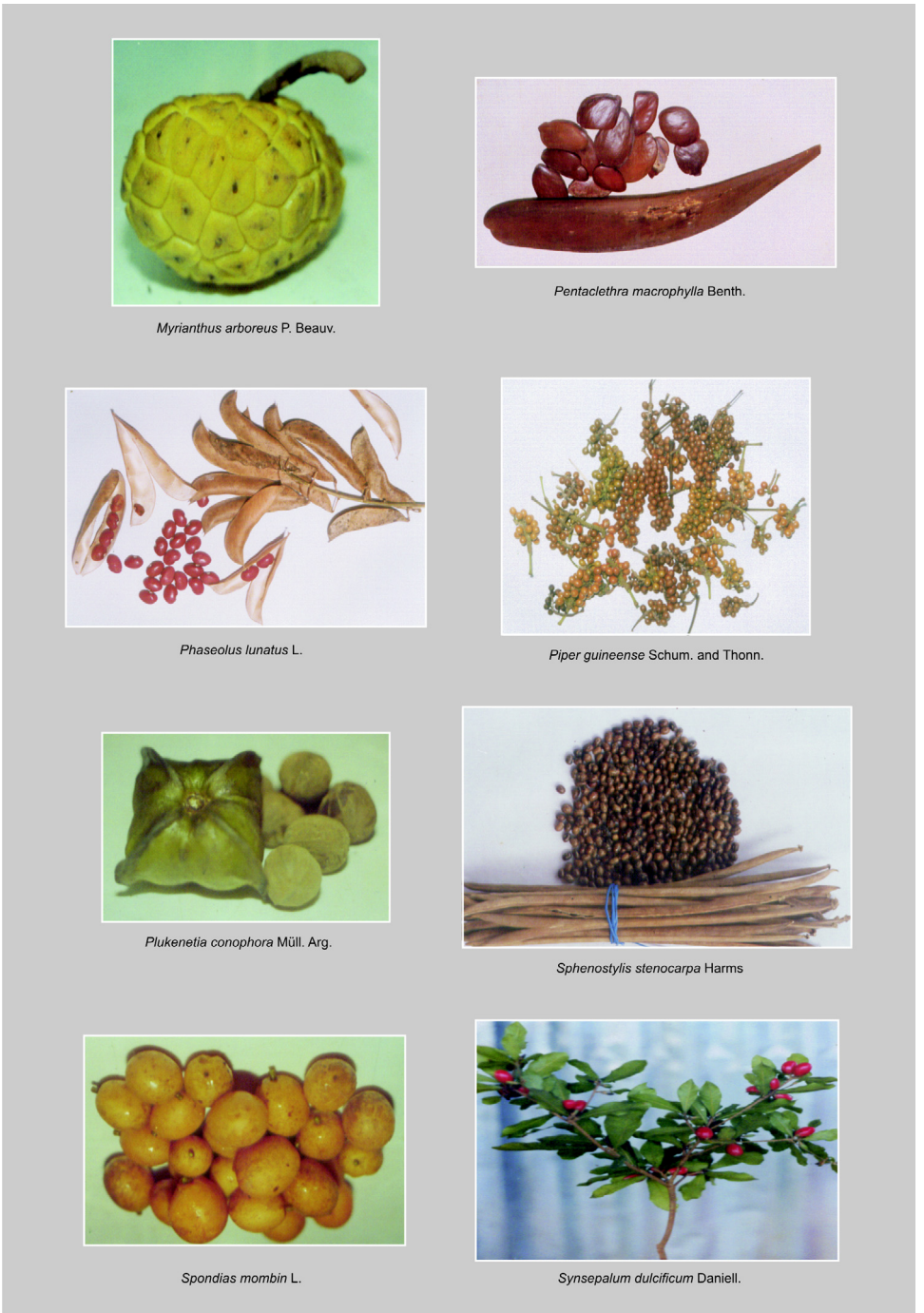

Figure 3.
Some of the plant species producing edible fruits or seeds, found to be presently endangered in Nigeria (see colour pictures on *Fruits*' website).

3. Results and discussion

3.1. Species listed

Thirty plant species belonging to 19 different families were identified as endangered species (*table I*). Nineteen are trees while three are markedly shrubs. Four are climbing dicotyledons while two are rhizomatous monocots. About 27% of all the species listed have enjoyed some degree of domestication

Figure 4.
Some of the plant species producing edible fruits or seeds, found to be presently endangered in Nigeria.

and cultivation and 70% may still be found protected or wild; about 16% of all the species are largely harvested from the wild.

3.2. Concept of endangered species in the area

Some edible plants of the climax vegetation of Southeastern Nigeria may have gone extinct through several years of forest degradation and vegetation change. Thus, only a fraction of these plants would be listed (*table I*).

In 1980, Okigbo compiled a list of 106 edible plants including leaf and fruit vegetables, oils, pulses, spice roots and tubers. According to his results, thirty-one (29%) are exotic and of Asian and South and Central American origin.

Nearly all the fruit trees that are commonly planted in homes or in industrial plantations are the exotic species; they include *Mangifera indica, Psidium guajava, Persea gratissima, Theobroma cacao* and the *Musa* species.

The inclusion of any plant in the list of endangered species in southeastern Nigeria is based largely on the fact that little or no effort is made to propagate the indigenous

Table I.
Some endangered trees producing edible fruits or seeds in Southeastern Nigeria (for domestication stage: C, cultivated; P, protected; W, wild).

Species (domestication stage)	Family	Common name	Local names	Growth habits	Part eaten
Aframomum melegueta K. Schum. (C P W)	Zingiberaceae	Alligator pepper Melegueta pepper	Ose oji (Ibo) Ntuenibokk (Ibibio)	Rhizomatus monocots	Peppery seed chewed often with cola
Buchholzia coriacea Engl. (P W)	Capparidaceae	Wonder cola	Uke (Ibo)	Tree up to 20 m	Seed eaten after prolonged boiling
Canarium schweinfurhii Engl. (P W)	Burseraecae	Aiele	Ubemgba or Agbaka (Ibo) Ebenetidok (Ibibio)	Tree up to 35 m	Fruit pericarp eaten when softened with hot water
Coula edulis Baill. (P W)	Olacaceae	Walnuts	Udi (Ibo) Ekom (Ibibio)	Tree up to 20 m	Oily seed eaten fresh as for walnut
Chrysophyllum albidum G. Don (C P W) Syn. *Gambeya africana* (A. DC) Pierre	Sapotaceae	Star apple	Udara (Ibo) Udara (Ibibio)	Tree up to 30 m	Thick fleshy pulp eaten fresh
Cola acuminata Schott. & Endl. (P)	Sterculiaceae	Cola nut	Oji (Ibo) Ibong (Ibibio)	Tree up to 20 m	Seed eaten fresh
C. lepidota K. Schum. (P W)	Sterculiaceae	Monkey cola	Ochicha (Ibo) Ndiya (Ibibio)	Tree up to 18 m	White thick seed aril eaten fresh
C. pachycarpa K. Schum. (P W)	Sterculiaceae	Cola	Ochicha (Ibo) Ndiya (Ibibio)	Tree up to 18 m	Yellow thick seed aril eaten fresh
Denettia tripetala G. Bak. (F C P)	Annonaceae	Pepper fruit	Mmimi (Ibo) Nkarika (Ibibio)	Small tree up to 10 m	Whole fruit green or ripe pink eaten fresh
Dialium guineense Willd. (W)	Caesalpiniaceae	–	Nchichi Nkwaa (Ibo) Ukak (Ibibio)	Small tree often shrubby	Soft pink seed aril eaten fresh
Garcinia cola Heckel (P)	Guttiferae	Bitter cola	Akilu/Akara (Ibo) Efiat (Ibibio)	Tree up to 18 m	Seed eaten fresh
Irvingia gabonensis Baill. (P W)	Irvingiaceae	Bush mango	Ugiri, Upupa (Ibo) Uyo (Ibibio)	Tree up to 20 m	Thick fleshy mesocarp eaten fresh Seed is soup condiment
Landolphia owariensis P. Beauv. (P W)	Apocynaceae	Landolphia Madagascar rubber–	Utu (Ibo) Enwang (Ibibio)	Woody climber	Sour pulp in fruit eaten
Landolphia sp. (P W)	Apocynaceae	Landolphia–	Utuohia (Ibo) Ewang Ikot (Ibibio)	Woody climber	Sweet pulp in fruit eaten
Maesobotrya sp. (Pax.) Hutch (W)	Euphorbiaceae	–	Uvune, Ubene (Ibo) Nyata (Ibibio)	Shrub	Juicy pulp around seeds eaten fresh as in grapes
Monodora myristica (Gaertn.) Dunal (P)	Annonaceae	African nutmeg	Ehiri, Ehuru	Tree up to 25 m	Seed used as spice or condiment as in nutmeg
Myrianthus arboreus P. Beauv. (W)	Moraceae	–	Ujuju (Ibo) Ndigo (Ibibio)	Tree up to 15 m	Portions of compound fruit eaten fresh as in pineapple
Pentaclethra macrophylla Benth. (C P W)	Mimosaceae	Oil bean	Ugba (Ibo) Ukana (Ibibio)	Tree up to 20 m	Seed boiled and shredded eaten after some fermentation
Phaseolus lunatus L. (C)	Fabaceae	Lima bean	Akidi (Ibo)	Twined	Boiled seed eaten
Piper guineense Schum. and Thonn. (W)	Piperaceae	African black pepper	Uziza Adua (Ibibio)	Clasping climber	Ripe seeds cooked in soups for flavoring and as spice

Table I.
Continued.

Species (domestication stage)	Family	Common name	Local names	Growth habits	Part eaten
Plukenetia conophora Müll. Arg. (C P W) Syn. *Tetracarpidium conophorum*	Euphorbiaceae	African walnut	Ukpa (Ibo) Ekporo (Ibibio)	Woody climber	Boiled seed eaten
Sphenostylis stenocarpa Harms (C)	Fabaceae	African yam bean	Odudu (Ibo) Nsama (Ibibio)	Twined	Boiled seeds eaten
Spondias mombin L. (P W)	Anacardiaceae	Jobo Hog plum	Uvuru (Ibo) Nsuka kara (Ibibio)	Tree up to 25 m	Fruit pulp eaten as in plum
Synsepalum dulcificum Daniell. (P W)	Sapotaceae	Miracle fruit	Sotonso (Ibo) Nkpantung (Ibibio)	Shrub	Fruit with persistent sweet taste Sweetens sour drinks
Tetrapleura tetraptera Taub. (P W)	Mimosaceae	Exotic spice	Uhokiriho/Shokirisho (Ibo) Edeminan (Ibibio)	Tree up to 25 m	Portions of fruit boiled in soups as condiment Charred fruit flavors drinking water
Treculia africana Decne (P C W)	Moraceae	African breadfruit	Ukwa (Ibo) Ediang (Ibibio)	Tree up to 35 m	Shelled seeds boiled and eaten as in rice
Thaumatococcus danielli (Benth.) (P C W)	Marantaceae	Sweet prayer	Etere (Ibo)	Rhizomatous monocots	Seed aril is sweet as in miracle berry
Uvaria chamae P . Beauv. (W)	Annonaceae	Finger root	Mmimi-ohia (Ibo) Nkari Ikot (Ibibio)	Straggling shrub	Juicy seed aril eaten
Vitex doniana Sweet (P W)	Verbenaceae	Black plum	Uchakoro (Ibo)	Tree up to 15 m	Ripe (black) fruit eaten fresh
Xylopia aethiopica (Dunal) A. Rich. (P W)	Annonaceae	Negro pepper	Uda (Ibo) Atta (Ibibio)	Tree up to 20 m	Fruit pod cooked in soup for flavoring and as spice

species in spite of the increasing demand for their products. Some factors would contribute to the predisposition of the species to extinction:

– The natural habitats of the plants, including the forests, and other stages of vegetation change are threatened by intensive agriculture, urban development and other infrastructure expansions.

– Traditional home gardens and village fruit tree forests, which serve as sanctuaries for *in situ* and some degree of *ex situ* conservation of the choice plants, are also threatened by back-to-back settlements and infrastructural development.

– Unlike the exotic species, which could fruit within 3 to 4 years after planting, most of the highly cherished fruit trees such as *Chrysophyllum albidum, Denettia tripetala* and *Cola acuminata* have very long gestation periods of 10 years or more. Thus, whereas people readily plant the former, there is a great deal of reluctance in planting the latter. Only two (*Irvingia gabonenis* and *Treculia africana*) out of the fruit trees listed have been subjected to some degree of improvement [13]. Through the process of grafting, the two species have been made to fruit within 4 years and at heights of less than 50% of their natural habit. Nevertheless, the apathy over planting of indigenous fruits, including the improved species, appears to persist.

– As mentioned earlier, many of the fruit trees are highly cherished and there is a

great deal of demand for the products by old and young people, including residents overseas. There is therefore tremendous pressure on existing protected or wild plants, some of which are wholly or partially cut to harvest the fruits.

Cola sp. seeds, particularly the local cola (*C. acuminata*), is a very important seed not only for hospitality in the reception of visitors but also for pledges and vows at marriages and other ceremonies in the area. The seed is highly symbolic among traditional chiefs. The chief will not normally accept or present any cola other than the seeds of *C. acuminata*. Thus, a single seed of this plant will cost (25 to 30) Nairas (1 N = 0.59 €), about five times the cost of very good seed of the exotic *C. nitida*. Our investigations have shown that a number of old *C. acuminata* trees in some locations stopped fruiting, probably due to changes in the prevailing environment.

4. Conclusion and recommendations

Peoples of Southeastern Nigeria depend on a wide range of edible indigenous fruits and seeds for staple foods, hospitality, chewing at leisure times, traditional pledges and vows and as a status symbol. Many of the species are not readily planted and are therefore in danger of extinction. Changes in the environment caused largely by human population pressure further predispose the protected and wild remnant species to total extinction, leading to loss of genetic resources, which they represent. In addition to the need for survey, categorization and documentation of the most socio-economically important species, there is an urgent need for the establishment of *ex situ* conservation centres for these species, particularly in relevant educational and research institutions.

The *ex situ* conservation efforts should be supported with genetic improvement and biotechnological studies to improve the growth habits of the trees concerned and select more desirable attributes of their products.

Government should support the education and enlightenment efforts on the importance of indigenous plant products with some policy of incentives such as tax rebate, free supply of propagation materials and land reforms to encourage the planting of the trees.

Government should discourage the proliferation of back-to-back housing estates, replacing these with settlements, which will provide a place for multistrata home gardens. Such settlements are associated with a range of sustainability indicators, including poverty alleviation, ecological stability, biodiversity maintenance and environmental soundness.

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Especies que producen frutas y semillas comestibles, amenazadas en el sureste de Nigeria.

Resumen — Introducción. Aunque algunas plantas que producen alimentos no comunes consumidos en el sudeste de Nigeria sean exóticas, los productos indígenas se vuelven cada vez más populares. Además, los científicos de distintas disciplinas se interesan cada vez más en las investigaciones que se refieren a las utilizaciones alimenticias, medicinales e industriales entre otras, con plantas menos conocidas y, en gran parte, con plantas indígenas. A diferencia de los frutos y de las semillas de origen exótico, la literatura sobre especies puramente indígenas es escasa. Este artículo aporta información sobre algunas especies fácilmente identificables, que producen frutas y semillas consumidas por las poblaciones locales y que se consideran en peligro de extinción. **Material y métodos**. Se clasificaron algunas plantas de frutas y semillas comestibles, y que se consideran en situación de amenaza en Nigeria. Se fotografiaron algunas frutas y semillas maduras, luego se clasificaron por categoría según sus familias, su tipo de crecimiento, el estado de su domesticación, sus nombres vernáculos y su utilización. **Resultados y discusión**. Se enumeraron treinta especies vegetales distribuidas en 19 familias botánicas. La lista incluye 19 árboles, 3 arbustos, 4 plantas trepadoras y 2 plantas de rizomas. Alrededor del 27% de las especies contadas se benefician de algunas técnicas de cultivo, mientras que alrededor del 70% de ellas pueden aún encontrarse protegidas o salvajes. Hasta un 16% aún se recogen sobre plantas silvestres. Los factores que predisponen a la mayoría de las especies para la extinción podrían ser: la pérdida del hábitat debido a la tala de árboles y a otras formas de presión de las poblaciones sobre el ecosistema; la falta de interés por la plantación de árboles, a causa de la lentitud de la puesta en marcha de las acciones genéticas existentes; la presión y la demanda creciente de estas especies resultantes de un limitado número de lugares donde se mantienen; métodos de cosecha no preconizados. **Conclusión**. Las estrategias de conservación *ex situ*, los estudios de genética, el estímulo de prácticas para el establecimiento de jardines familiares y de reglamentos de explotación del bosque, así como el lanzamiento de incentivos para la plantación de árboles, son estrategias recomendadas para la conservación y la producción sostenible de estas especies muy rebuscadas en la región de estudio.

Nigeria / especies en peligro de extinción / inventarios / plantas silvestres / domesticación