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Biter-Kola Marketing and Conservation of Threatened Plant Species in Sub Saharan Rainforest Region

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ABSTRACT: The extinction of plants and animal species from existence could be primarily tied to the activities of man on the planet, globally, 'threatened species' is an international connotation for species of plants and animals that are at the verge of 'disappearing from their natural habitat', in-spite of their value addition to humanity and the ecosystem. Bitter Kola or Garcinia Kola is a flouring plant found in the west and central region of Sub-Saharan Africa. The aim of this study is to examine how strategic marketing could be adapted as conservation pivot for continuous existence of this plant within its natural habitation. Outstanding issues to be considered include; the damaging effect of urbanization, reduction or non-existing plant conservation research and increased interest of distribution intermediaries on profiteering. The theoretical framework for the study is the ecological sustainability dimension, A combined descriptive and exploratory research methodology was adopted, in which primary (comprehensive and in-depth interview) and secondary (journals, books and periodicals) sources of data were collected from Northern and Southern Iman, Enitan Local Government Area, Akwa Ibom State, Nigeria before the analysis. The findings of the study revealed that there is a significant relationship between sustainable marketing of biter kola and increased productivity and conservation. The conclusion and recommendations of the study was based on the need for stakeholders to augment capacity on how to increase biter kola productivity; as well as protection of the tropical forest reserves through ecosystem through closer-to nature conservation management.

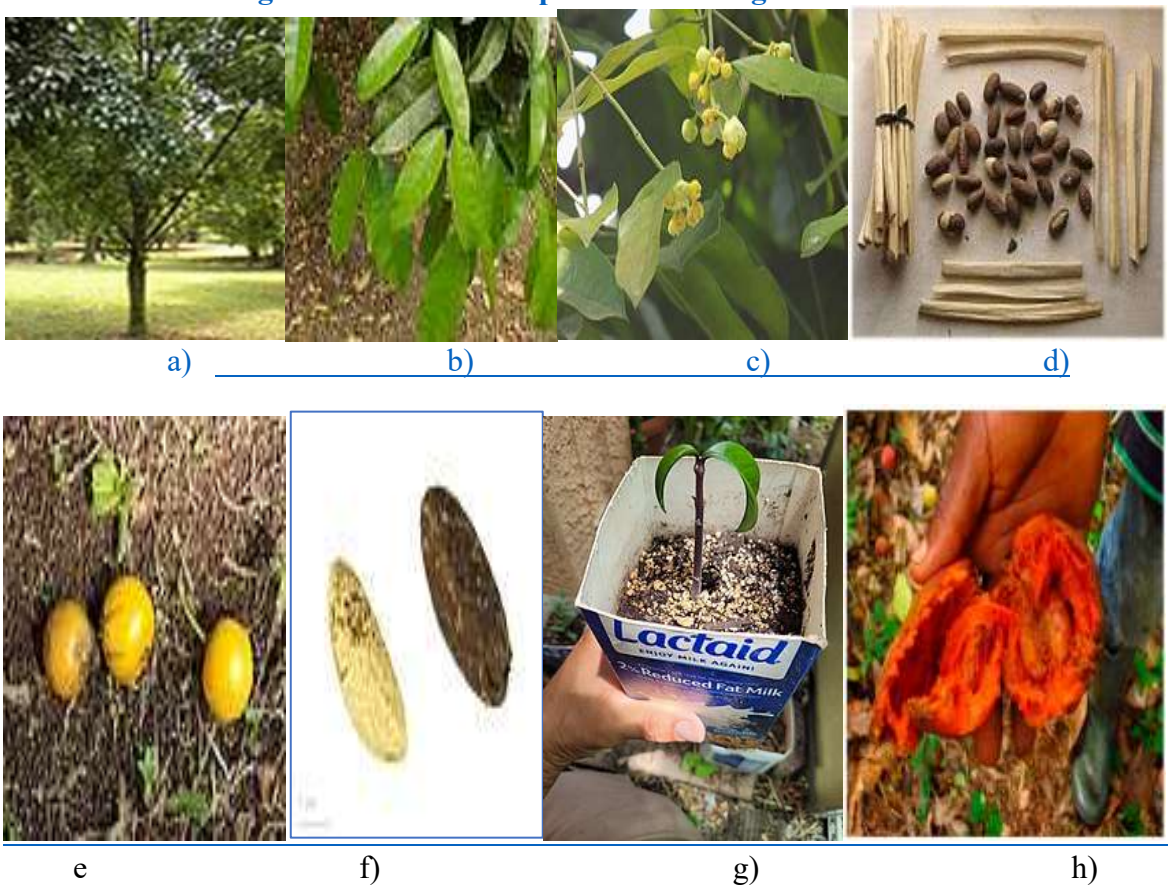
KEYWORDS: Conservation, Restoration, Closer-to-nature-management, Forest Health, Sustainable Marketing, Succession control and Productivity.

INTRODUCTION

Biter Kola is an indigenous fruit with its' natural habitat in the tropics; the increasing medicinal value of the plant crisscrosses every cultural divide in the country; with different name attached to this fruit based on language variations (North -South - East and Western Nigeria). Report from the Center for International Forestry Research, (CIFR) acknowledges that commercial transactions in biter *kola* amongst communities in Nigeria dates back to centuries. (Cheek, 2004), the fruit has become a lucrative source of income to small holder farmers and mostly distribution intermediaries; which have the exclusive privy of determining the price of bitter kola across the

region under study. The medicinal value of bitter kola is widely applicable in the tropics for the treatment of cough, blood sugar, hypertension, cholesterol reduction and weight control (Unaeze, et. al. 2013; & Adebisi, 2004)

Figure 1. Bitter Kola Spices and Ecological Features



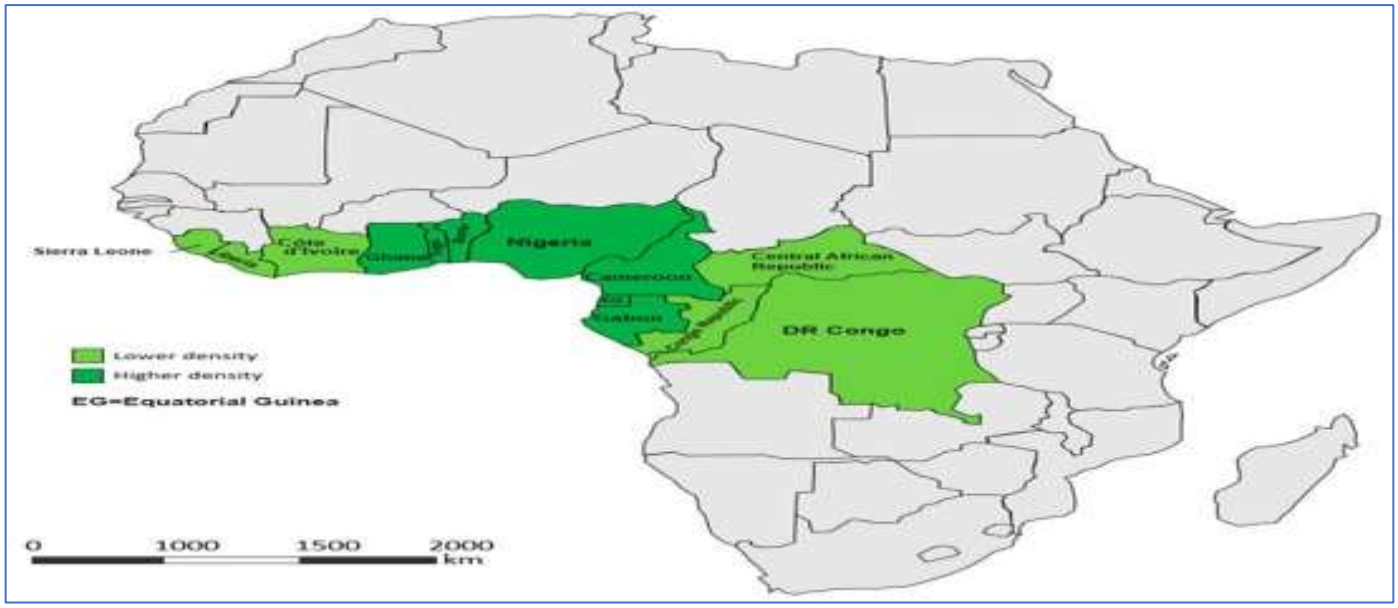
a) b) c) d)

e f) g) h)

Garcinia kola. Ecological Features (**a**) Biter Kola Tree (**b**) Collection of Leaves (**c**) Floured section of the leaf (**d**) Display of cultural setting of biter kola seed and chewing sticks (**e**) Ripe fruits; (**f**) Seed covered and Removed g) Biter kola Seedling and, h) with typical irregular branching pattern Adapted:.(a-g - https://en.wikipedia.org/wiki/File:Garcinia_Kola_Germination.jpg, Adapted: h) https://en.wikipedia.org/wiki/File:Garcinia_Kola_Germination.jpg

Biter Kola exclusive origin is the coastal forest lands of West Africa; (Liberia, Cote d'l Voir, Ghana, Togo, Benin Republic and Nigeria) and central Africa (Cameroun, Central African Republic, Gabon, Equatorial Guinea and Congo) based on Figure 1 as shown in the map (Manourova, 2017, & Agyil, et. al. 2007). The plant could also be cultivated in climates such as: Tropical rainforest, Monsoon and Savanah with ideal temperature ranging from (21 °C to 31 °C) with a relative humidity level of 75%, and average rainfall ranging between 1000 to 3000 mm per year thus making it favorable for the planting, growth, development and harvesting of the fruit (Climate Data for Cities Worldwide, 2018, Babalola, & Agbeja, 2010). The tree has natural capacity to grow in all types of soils within its area of origin (Bechem, et. al. 2014).

Figure 2: Regional Distribution of Biter Kola across West and Central Africa



Adapted: Maňourová, et. al. (2019), Medicinal Potential, Utilization and Domestication Status of Bitter Kola (*Garcinia kola*) in West and Central Africa, *Forests*, MDPI, *10*(2), 124; https://doi.org/10.3390/f10020124

In recent year within the area of this study, Bitter Kola has reduced in its number of forest trees, this has also affected product availability and price. A thorough examination has shown that this tree could soon be classified as 'endangered' if practical steps are not taken to stem the tide of reduced availability of this tropical plant. One of the key issues is the difficulty encountered by farmers to produce its seedlings for planting, the Garcinia kola species is quite limited due to challenges faced by farmers in the process of the crop germination, thereby reducing the widespread availability of its seedlings as other tropical trees. (Adebisi, 2004). Based on the issues of increased productivity and conservation, various research has been conducted has shown that; a greater proportion of bitter Kola distributed in Nigeria are taken from the natural forest and not cultivated exclusively as other tropical tree crops like palm trees and cocoa, the authors also suggested the that; seedlings could be made available through the process of seed pretreatment in bags through the application of cold water, while reducing the seed moisture content (Anegbeh, et. al. 2006). This assertion by the researchers is an indication that the constant haulage of trees in the forest (deforestation) could result in total elimination of this tree plant from our ecosystem. Additional empirical contribution on how to increase productivity of bitter kola include the; a

pretreatment process of dismantling the plants embryo inactivity using auxins, cytokinins, and gibberelins, but it was observed that it had little or no effect on germination or plant inactivity, hence the authors suggested the application of vitro fertilization process using (NAA, BAP, and 2,4-D), could increase root, shoot and callus formation, resulting in a more productive and resistant specie, slightly different in trait from its parents (Kanmegne et. al. 2010).

The 1999 United Nations Convention on Biological Diversity established the Global Strategy for Plant Conservation (GSPC) with the main aim is saving plant seed and reducing the pace of extinction in plants by 2010. (*Guerrant, et. al. 2004*). Biter Kola is one of such plants species that has already been listed by the World Agroforestry Centre (ICRAF) in west and central Africa precisely, under the project conservation in Sub-Saharan Forest Genetic Resources Program (SSAFORGENR) Sacandé; & Pritchard, (2004), World Agroforestry Centre (ICRAF) (Franzel; & Kindt, 2012; Sacandé; & Pritchard, 2004), The program seeks to mitigate plant extinction, genetically augment the status of slow-growing seedlings, reduce illegal logging of timber and overutilization of endangered forest plants species in Sub Saharan Africa (Cheek, 2004). This study intends to fill the dearth in literature by critically examining the rate at which deforestation has drastically reduced the density of this threatened

plant species in Etinan LGA and Nigeria, without any reciprocation by regulatory authority to replace this endangered species of plant through forest conservation and increased farmers productivity. This study concentrated specifically in Etinan LGA in South-South Nigeria, further empirical investigation is required to access the effect of threatened extinction of this plant through improved conservation program, and productivity. Envisaging previous studies conducted in this area of study, Table 1: shows a list of study conducted by; (Cheek, 2004), on listing Biter Kola as one of the threatened species of forest plant in Sub Saharan Africa; (Altemimi, et. al. 2017), optimization and extraction of bioactive compounds, (Franzel.; & Kindt, 2012; & Leakey, 1999, Leakey; & Simons, 1998), Analgesic and anti-inflammatory potentials of Garcinia kola., (Kanmegne, et. al. 2010), on biochemical and morphological composition of plant trait, (Okonkwo, et. al. 2014), on the enhancement of intrinsic antioxidant properties in the plant biodiversity and conservation.

Table 1. Previous Conceptualization on Biter Kola - *Garcinia kola*

Study	Conceptualization	Item Considered	Parameter of Measurement
Cheek, 2004	Threatened species	Availability	Empirical study: The Sub Region
Altemimi, et. al. 2017	Optimizationand extraction	Processing	Empirical study: Bioactivity
Franzel.; & Kindt, 2012, Leakey, 1999, Leakey; & Simons, 1998	Anti-inflammatory potentials	Medicinal value	Empirical Study; Setting procedure
Nwaehujor, et. al 2015	Morphological composition	Medicinal	Empirical Study; Plant Biochemistry
Kanmegne, et. al. 2010	Enhancement of intrinsic plant value	Medicinal	Empirical Study; Antioxidant properties
Okonkwo, et. al. 2014	Integrating biodiversity	Developmental Policy	Empirical Study; Conservation
Babalola, F.D.; Agbeja, 2010	Product Development	Distribution	Empirical Study; Supply chain processes
Sacandé, et. al. 2004	Mitigating threats and actualizing opportunities	Communication with indigenous farmers	Empirical Study; Conservation
(Dadjo, et. al.2018, Tchoundjeu, et. al. 2010; & Leakey; & van Damme, 2014)	Domestication and commercialization of individual nuts	Processes	Empirical Study; Farmers livelihood
Tshibangu, et. al. 2016, Usunomena, 2012, & Zhang, 2004)	Promotion and utilization and augmentation of plant traditional value	Medicinal system	Empirical Study; Analysis and validation
Daramola; & Adegoke, 2011; & Adebisi, 2004)	), seeds and health management potential	Medicinal system	Empirical Study; Analysis and validation

Other considered studies include, (Babalola, F.D.; Agbeja, 2010), om marketing and distribution of the product, (Sacandé, et. al. 2004), conservation and mitigating all threats and opportunities and

communicating same to indigenous farmers, (Dadjo, et. al.2018, Tchoundjeu, et. al. 2010, & Leakey; & van Damme, 2014), domestication and commercialization of individual nuts to improve farmers livelihood, (Tshibangu, et. al. 2016, Usunomena, 2012, & Zhang, 2004), Promotion and utilization of medicinal of plant to augment the value chain of traditional medicinal system (& Adebisi, 2004; Daramola & Adegoke, 2011; & Uwhibetine, *et. al*, 2022), seeds and health management potential of 'African Wonder Nut'. An evaluation of previous studies from the foregoing shows a departure from the core basis of this study which seek to fill existing gap in literature, it is quite obvious that none of the studies examined the need for adapting sustainable marketing of Biter Kola as pivot increased productivity in Nigeria.

Statement of the Problem

The rising prices and gradual disappearance of Biter Kola in local communities in Nigeria, has become a source of worry, based on its medicinal and associated value addition to various communities in Nigeria. It is disturbing to realize that most communities that has depended in transacting with merchants on the product across the country are nearly out of business, the current development could be traceable to some underlying reasons which is clearly elucidate as follows;

The increasing need of developing certain rural communities to urban centers is to pave way for the industrialization of cities, such development sometime results in deforestation and clearing of huge tree crops to pave way for resources such as; roads, rail, industries and estates for the teeming city dwellers to reside. Most of the trees cleared to make way for development are often fruit trees such as Biter Kola, without alternative arrangements to replace lost forest resources due to urbanization.

Also, the increasing number of small holder farmers without a registered cooperative society to channel issues affecting them has continually robed these farmers of empowerment opportunities. A greater percentage of biter kola farmers are small holders, without bargaining capabilities on their products; hence, benefit accruable to these farmers have been hijacked by channel intermediaries who are responsible for buying biter kola in large quantities and have the facilities to transport them to city centers where this product is in high demand. This development has discouraged 'would be biter kola farmers' from investing in productivity capacity increase. The aim of this study is to examine sustainable marketing of biter kola as a pivot for increased productivity and conservation. Additionally, difficulties encountered in bitter kola seedling germination/cultivation, and the threat of ecosystem balance due to the effect of urbanization on biter kola conservation/preservation.

Literature Review

Concept of Threatened Species

Threatened species are vulnerable plant/animal/fungi that are susceptible to extinction now or in the nearest future. Previous studies have shown that one in eight of documented plant species are under extinction threat (Reid, 1995), with an estimated 140,000 species undergoing extinction threat every year/ threatened (Pimm, 1995), argument that biodiversity threat could also be the resultant effect of human activity on the environment. (Vimal, 2021). Threatened species are in three categorized, based on the degree of threat encountered by the specie listed as; i) Vulnerable species, ii) Endangered species and iii) Critically endangered species (Sharock & Jones, 2009). Biter Kola is also listed the tropical forest region in Sub Saharan Africa; (Altemimi, et. al. 2017), optimization and extraction of bioactive compounds, (Franzel.; & Kindt, 2012), Analgesic and anti-inflammatory potentials of Garcinia kola., (Kanmegne, *et. al*. 2010), on biochemical and morphological composition of plant trait, (Okonkwo, et. al. 2014), on the enhancement of intrinsic antioxidant properties in the plant by integrating conservation in regional policy making.

Concept of Conservation

Concept of Sustainable Marketing Ecosystem

The concept of marketing ecosystem We define the marketing ecosystem as an interconnected system of coevolving actors and forces that affect firms' abilities to sense-make the market and seize

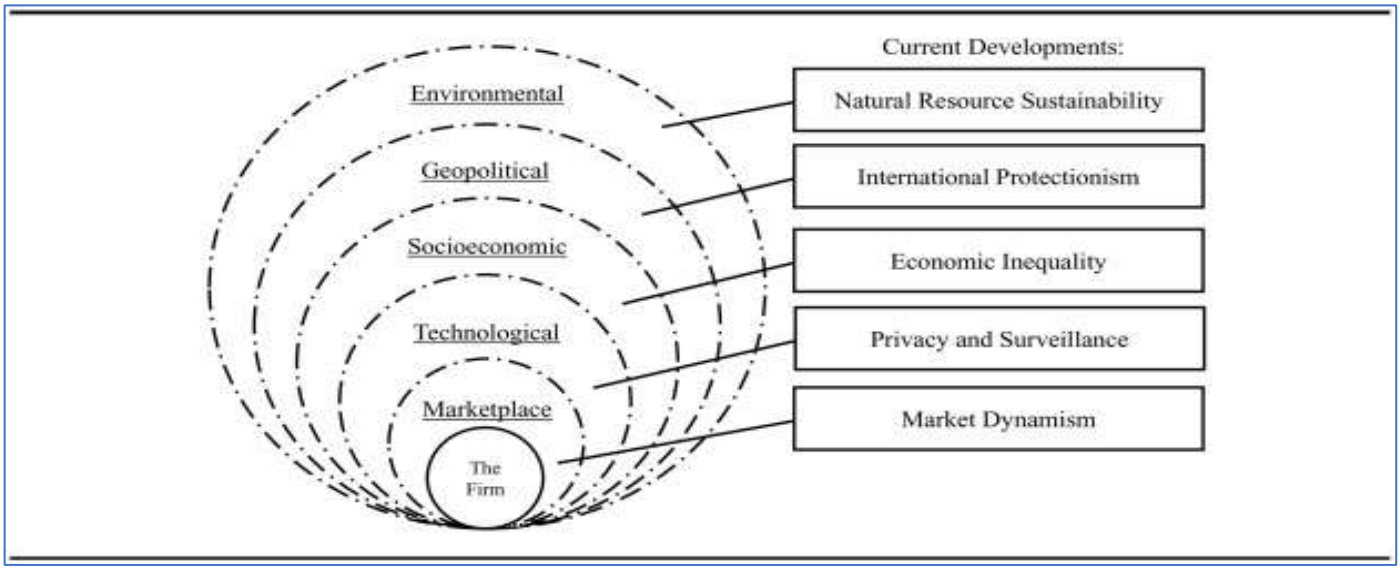
opportunities. In addition to competitors' and collaborators' actions that directly affect the firm's business, the marketing ecosystem contains five macro factors: 1) marketplace factors, 2) technological factors, 3) socioeconomic factors, 4) geopolitical factors, and 5) natural environmental factors. The marketing ecosystem perspective expands the existing lens of outside-in view in marketing to include a set of structured macro factors and associated megatrends that influence consumers and have profound implications for firm strategies. The marketing ecosystem perspective explicitly recognizes that marketing is an "open system," and that the firm can be thought of as an organism that is embedded in the broad ecosystem with which it needs to develop a symbiotic relationship to survive and prosper. Therefore, this perspective calls for a proactive and broad mindset of adaptability, exploration, and collaboration to improve firms' abilities for market-sensing and market-seizing.

The marketing ecosystem has many elements. In this paper, we primarily focus on the megatrends occurring within the five macro factors, which are often ignored in previous outside-in perspectives. Fig. 1 highlights the five macro factors as well as the megatrends occurring in each that we identify later in Section 4. The five factors are portrayed as concentric circles reflecting their specificity and the immediacy of their influences on consumer behaviors and, consequently, firms' decision-making. This broadened outside-in perspective provides a stable structure in that the five macro factors encompass the vast majority of the influence that consumers face, but also allows for flexibility and dynamics through the identification and updating of trends within each factor.

Theoretical framework - Sustainable Marketing Ecosystem

The combination of sustainable marketing ecosystem could be explained in detail, within the framework of the following combination of factors such as; Environmental - Natural Resource Sustainability; Geopolitical - International Protectionism; Socio-economic - Economic Inequality; Technological - Privacy and surveillance; and Marketplace – Market Dynamics

Figure 3; Framework for Sustainable Marketing Ecosystem



Adapted: Jonathan**, et. al. (2020),** Marketing ecosystem: An outside-in view for sustainable advantage, *Industrial Marketing Management*, 88, 287-304, https://doi.org/10.1016/j.indmarman.2020.04.023

Figure 3 shows the marketing ecosystem which highlights emerging trends in the macro environment, and the competing variables that is beyond profit maximization, by including elements such as;

a) **Environment- natural resource sustainability**\

Environmental sustainability issues became prominent between the 1960s and 1970s, and since then, human activities on the planet/preservation of the ecosystem have gained momentum, previous studies has shown greater focuses on;

human activities and the three pillars of sustainability (Purvis, *et. al,* 2019), research reviews on ecological sustainability (Vaden*, et. al*, 2020), sustainability laws to check losses of forest trees (Klaus. 2010), policy implementation failures (Howes, *et. al,* 2017), accomplishing Sustainable Development Goals -SDGs with Biodiversity (Obrecht, *et. al,* 2021), cost and benefit of environmental sustainability (Ekins & Zenghelis, 2021; & Eshiett & Eshiett, 2024), sustainability and inclusivity (Virtanin, *et. al,* 2020), the riskiness the earth faces as a result of human activities (Fletcher, *et. al,* 2024). In essence, human activities on forest lands should be monitored to ensure that it connotes a combination of economic, social and environmental elements, while making provision for future generations to accomplish their goals.

Documented evidence has shown that, biter kola is one of the non-timber trees that has a difficult germination process (Aegbeh, *et. al,* 2006), hence, farmers are not encouraged to easily cultivate it due to non-availability of seedlings. To worsen this scenario, crop scientist and extension workers have not deemed it a necessity to salvage the situation; hence the continuous depletion of biter kola without replacement. It must be stated herein that, Biter Kola has been officially listed as one of such plants categorized as 'threatened species' that must be conserved in Sub-Saharan Africa in a project tagged 'Forest Genetic Resources Program (SSAFORGENR). The essence of this research is to coopt marketing efforts adapted in procurement and distribution of bitter Kola, towards addressing the need for committed effort by experts to ensure its continuous existence within its natural habitat, .and sustainability

b) **Geopolitical – international protectionism**

Protectionism is an economic policy by government, using restrictive economic tools such as; tariff, import duty, food safety, environmental standards, use of own labor, direct subsidies, and outright embargo, in order to sprotect those products from external/internal competitive forces (Carlos, 2008; & Edward, 2012). Hence, 'threatened species' such as biter Kola, which has been listed as one of such plants that could disappear from existence in the future, need to be protected by implementable government policies. Previous studies have shown the negative economic implications of protectionism as weakening the free trade/welfarist economic ideals (Malcolm, 2014; & William, 2004), protectionist policy argued as the cause of economic depression (Douglas, 2017), while others have argued that trade liberalism could be the result in short-run unequal resource allocation (Ping, 2012b; & William, 2004), others have argued, that the developed nations clamoring for trade liberalization today (Mehdi, 1998), implemented protectionism as a means of achieving the current level of industrialization developments (Eric, 2007; & Robert & Alan, 2013), and the core cause of was and global armed conflicts (Keeley, 1996).

The anti-Protectionist have argued that; liberalism trade enhancing intellectual property and global health (Timmermann & Henk, 2013), enhancing effective learning during devastating experiences like the COVID-19 pandemic disaster (Eshiett *et al.,* 2022a; Eshiett & Eshiett, 2021a), improvement in global living standards, due to its effect on prices of goods and services (Fajgelbau & Khandelwal, 2016), enhances economic growth and development (Panagariya, 2019), sustainable marketing of threatened products species (Unaeze, *et. al,* 2013), and sustainable environmental management through effective waste disposal management of products (Eshiett & Eshiett, 2024a). Hence, developing countries in Sub Saharan Africa should harness the protection and preservation of threatened species of plant 'biter-kola' through the implementation of protectionist policies, that could preserve the plants from going extinct through 'un-professionalized marketing activities', by harnessing the value of such plants for the benefit of humanity.

c) **Socio-economic – Economic Inequality**

Economic inequality is an ambiguous terminology that coopts three economic concepts such as; income distribution disparity, wealth distribution disparity, and disparity in consumption of goods/services in a given society (Bourguignon, 2015; & Trapeznikova, 2019). But an ideal sustainable ecosystem should ensure that societal income, wealth and consumption are equally distributed, this is contradicted with previous studies showing; distorted trends in global inequality assessment (Acemoglu, *et. al,* 2017; &

Hung, 2021), men elevating themselves as 'gods among men' in a review of rich class in the west (Alfani, 2023), a threat to rising economic inequality as threat to liberal international order (Flaherty & Rogowski, 2021; & Wei, 2017), others have argued that, the root cause of wars and conflicts could be traceable to global economic imbalance (Gleditsch, *et. al,* 2013; Stewart, *et. al*, 2020), as the cause of global income disparity, and uneven wealth earnings/distribution (Benjamin, et al, 2022; Hammar, & Waldenström, 2020; Kausik, 2022; & Kenworthy, 2017), the changing trends in consumption, markets, and perspectives of economic inequality (Attanasio & Pistaferri, 2016; Stewart, 2016), and cognitive biases in globa financial decisions (Ruggeri, *et. al,* 2023)

Technological – Privacy and Surveillance

Privacy is the ability of individual, groups or nation to seclude themselves from others, in order to selectively make known their programs and activities. Privacy in the 21st century context involves the rights to security/protection of individual, groups or national information from the accessibility of unauthorized persons or group (DeCew. 2015; in Zalita & Nodelam (eds.); & Ali, et. al, 2019). Previous research on privacy has shown wide rag of discourses such as; the philosophical basis of privacy and the law (Konvitz, 1966), the philosophical views and values of privacy (Negley, 1966), the role of household, private, and public issues in the 17th century (Longfellow. 2006), taxonomy of privacy (Solove, 2008), the 21st century privacy, data, and corporate power (Waldman, 2021). Others hav argued on the infringements on privacy information through social media network ads hype (Eshiett & Eshiett, 2023), the cross-cultural aspects of privacy breaches (Trepte, *et. al,* 2020), a measure of the implicit value of privacy under risk (Frik & Gaudeul, 2020), the battle for digital privacy and the internet (Chen, 2021), the harm done by privacy fallacy to the information economy (Cofone, 2023), and the non-human rights to privacy protection (Pepper, 2020). Based on Pepper, (2020) assertion, the protection of privacy rights of individual, community and nations ownership to non-human elements such as plants and peepholes for animals to enhance their privacies, and effective legislation to enhance their privacies, and continuous existence.

Surveillance involves the use of communication gadgets to gather necessary information, and monitor/manage the wellbeing of human and non-humans within a specified area, at a given time (Lyon, 2001). The essence of surveillance is to use electronic devices as monitoring gadgets for the security of surrounding environments, in order to keep societies free undesirable activities, that are harmful to human societies. The concepts of surveillance contradict the maxim of human rights/freedom (Radsan, 2007), but the proponents of the concept of surveillance have question the extent to which democracy could guarantee human right/freedom without due surveillance (Stallman, 2013), others have argued about upholding the sociology of privacy (Anthony, 2017), social media as a participatory surveillance (Fuchs, *et. al*, 2012), the risk/ethical implication of implantable Radio Frequency Identification devices (RFID). In essence, surveillance equipment could be deployed into the SSA tropical rainforest region where threatened species of plants and animals are resident, to track the wellbeing/performance, as well as reduce unwholesome human activities against plant/animal existence within their natural habitation, to avert the extinction of natural habitats within the ecosystem.

d) **Marketplace – Market Dynamism**

Dynamic change in future market structure due to possible extinction of threatened plant requires that, stakeholders such as; traditional medicine practitioners, pharmaceutical industries, farmers and channel intermediaries that depend on this plant, should analyze the strength and weaknesses of current processes, and craft effective strategies that could aid the plant conservation (Aaker & McLoughlin, 2010). The entire product market should be segmented and profile using retail outlets (Eshiett & Eshiett, 2021), to create differentiation opportunities for a wide range of customers based on perception, established technological trends that could affect demand and supply (Eshiett & Eshiett, 2024), market size, and opportunities (Aaker & McLoughlin, 2010; (Eshiett & Eshiett, 2022).

In essence, the dynamism of market forces to react to dwindling product supply, resulting from the reduction in plant species availability within its natural habitat could be achieved through;

effective research development on crop germination, thereby reducing the widespread availability of its seedlings as other tropical trees. (Adebisi, 2004), aggressive agricultural extension services to provide local farmers with seedling that could germinate and produce more fruits (Aegbeh, *et. al,* 2006), abrogation of land tenure system which fragments tropical rainforest forest lands, thereby encouraging commercial plantation ((Tshibangu, et. al. 2016; & Usunomena, 2012), and the promotion of effective demand through differentiated product profiling of end users (Aaker, *et. al,* 2010' & Eshiett & Eshiett, 2021)

Research Methodology

Research Design This could be seen as the procedure and processes adopted for collecting and analyzing data for this study. The researcher adopted exploratory research design in which in-depth interview was conducted amongst farmers, distribution intermediaries and end-users of the product. Secondary sources of data were critically examined through the use of; journals, periodicals, textbooks and workshops on threatened species within their natural habitats, with specific attention to species of biter Kola in the rainforest tropical region of Sub-Saharan Africa.

Sources of Data Collection Data for this study were obtained through primary main sources of data collections which is the most important and reliable sources of data collection. It entails detail conduct of in-depth interview amongst farmers and channel intermediaries.

Reliability and Validity of Instrument: Reliability refers to the consistency of the method of measurement. Hence, the reliability of the questionnaire was ensured by using test and re-test approach, which involves application to the same respondent.

Validity of instrument; the essence of validation is to ensure that the instrument measures what it is desired to measure, hence, the content of information obtained from respondents were relevant to the objectives of the study.

Discussions of findings

Findings from the study revealed that the increasing number of small holder farmers without a registered cooperative society to channel issues affecting them has continually robed these farmers of empowerment opportunities. A greater percentage of biter kola farmers are small holders, without bargaining capabilities on their products; hence, benefit accruable to these farmers have been hijacked by channel intermediaries who are responsible for buying biter kola in large quantities and have the facilities to transport them to city centers where this product is in high demand, this development has discouraged 'would be biter kola farmers' from investing in productivity capacity increase, as such increasing the negative impact on the forest plant conservation. Also, robust engagements by researchers on improved methods of cultivating biter kola could enhance its seedlings availability to farmers, and by extension its increased productivity, and a way of protecting their income from bitter kola. Documented evidence has shown that implemented protectionism as a means of achieving the current level of industrialization developments (Eric, 2007; & Robert & Alan, 2013), other scholars have argued that improvement of derivatives in value chain as obtained in other farm product, could be a better means of protecting conservation for biter kola, and farmers in the region (Eshiett & Eshiett, 2022).

Increasing industrial activities and urbanization has resulted in the reduction of rainforest contents across Sub Saharan Africa, bitter kola is one rainforest plant that has been significantly affected by human activities; resulting in Biter Kola has been officially listed as one of such plants categorized as 'threatened species' that must be conserved in Sub-Saharan Africa in a project tagged 'Forest Genetic Resources Program (SSAFORGENR). Conservation of this plant could be guaranteed through intensive research on how to enhance the process of the plant germination since documented evidence has shown that, biter kola is one of the non-timber trees that has a difficult germination process (Aegbeh, *et. al,* 2006), other authors have argued that sustainable marketing of threatened products species could enhance their survival (Unaeze, *et. al,* 2013), this could encourage to easily cultivate it due to availability of seedlings. Also, crop scientist and extension workers could salvage the situation through effective field monitoring of plant productivity. To enhance biter kola sustainability as rainforest plant, other researchers have argued about the need for research reviews on ecological sustainability (Vaden, *et. al*, 2020),

enhanced legislation of conservation laws that could check losses of forest trees (Klaus. 2010), effective control on policy implementation failures (Howes, *et. al,* 2017); this will facilitate the accomplishment Sustainable Development Goals - SDGs with Biodiversity (Obrecht, *et. al,* 2021),

Conclusion and Recommendations

The study conclusion and recommendations is based on the objectives of the study and the outcome of the results of the analysis as well as the discussion of findings which affirmed that; sustainable marketing of biter kola could enhance productivity and conservation in Nigeria. The development of human communities should be well planned to factor in the need for sustainable conservation of eco-habitats, specifically for threatened plant species such as biter kola; also, the engagement of farmers' cooperative is a key factor that could enhance capacity building amongst key stakeholders of bitter kola, since a 'perceived possible extinction' of the plant, could affect lives and livelihoods of all operators. Additionally, the biodiversity effect of conservation of threatened plant species should be tackled nationally and internationally; to avert perceived vacuum that could be created due to existing threat on rainforest plants. Finally, the effective marketing of biter kola nationally and internationally by stakeholders; could create awareness about threat on the plant's existence.

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