Nigerian Plant Resources, an Incredible Generosity with an Incredible Responsibility

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ABSTRACT
Nigeria is a physically and climatically diverse country that has been endowed with substantial plant resources. The natural vegetation varies from rain forest to savanna with nine distinct ecological zones which permit the growth of a wide variety of crops. The country is generously blessed with a lot of plant resources to the extent that, there will be no reason whatsoever to live in hunger or suffering. This magnanimity is an incredible generosity of Mother Nature which carries with it an equally incredible responsibility. This review paper attempts to highlight the value and incalculable magnanimity of Mother Nature in Nigerian Plant genetic resources. It also discusses the need to utilize the God-given plant genetic resources with responsibility and wise exploitation. Apparently, there is need for the scientific research community in every country to wake up to this reality and be engaged in not just knowing their heritage in plant genetic resources but also to do what is necessary to ensure food security in their country.

Keywords: Plant genetic resources, Natural vegetation, Incredible generosity, Incredible responsibility, Wise exploitation, Food security

INTRODUCTION
All life on earth depends on plants. Without their capacities to fix the sun's energy by means of chlorophyll, man and all other species of animals would die. Besides, plants are sources of our basic needs: food, cloth, house and medicine. They account for over 80 percent of the human diet (FAO, 2013). The plant resources form an integral part of a huge inter-dependent system that encompasses the physical components and the biological community of life(Malik and Singh, 2006). Plant genetic resources can be described as any material of plant origin that contains functional units of heredity of actual or potential use. It refers to the reproductive or vegetative propagating materials of the following categories of plants i) cultivated varieties(cultivars) in current use and newly developed varieties ii) obsolete cultivars iii) primitive cultivars or land races iv) wild and weed species, near relative of cultivated varieties and v) special genetic stocks including elite and current breeders lines and mutants(FAO,1993). They are genetic materials of plant origin of actual or potential value for food and agriculture, e.g. seeds, tubers, mature plants etc. These include all our agricultural crops and some of their wild relatives which are often of valuable traits. They are the raw materials that farmers and plant breeders use to improve the quality and productivity of crops. These resources according to FAO (2013) are generally referred to as germplasm and the lifeblood of plant breeding. They are a heritage of mankind to be preserved and to be freely available for use for the benefit of present and future generations. Generally speaking, plant resources are the backbones of agriculture which play a positive and unique role in the development of new cultivars including the restructuring of existing ones (Ishaq *et al*., 2004).This paper attempts to highlight the value and incalculable magnanimity of Mother Nature in Nigerian Plant genetic resources. It also discusses the need to utilize the God-given plant genetic

resources with responsibility.

Nigerian Plant Genetic Resources: – Nature's Incredible Generosity

Nigeria is a physically and climatically diverse country that has been endowed with substantial plant resources. According to National center for Genetic resources and Biotechnology NCGRB (2008), the natural vegetation in Nigeria varies from rain forest to savanna with nine distinct ecological zones (Figure 1) which, due to similarity of characteristics, has been streamlined into five namely, (i) sahel/sudan savanna, (ii) guinea savanna, (iii) derived savanna, (iv) lowland rainforest/montane forest and (v) freshwater swamp forest/mangrove forest and coastal vegetation. Nigerian physical and climatic diversity permits the growth of a wide variety of crops. The Federal Ministry of Environment (2006) reported that 7,895 plant species from 338 families and 2,215 genera have been identified in Nigeria (Table 1). These include a wide range of crops in which we enjoy comparative advantage. The fertility of the Nigerian soil and the wide range of variations in climate has also allowed the production of a variety of crops(Durugbo *etal.,* 2012). The major staple food crops in the country include Yam, Cassava, maize, Plantain Rice, Sorghum, Millet and a variety of fruits and vegetables. Currently, Nigeria is one of the world's leading producers of cowpea, cassava and yam. According to NCGRB (2008), the leading cash crops are Cocoa, Oranges, Cotton, Groundnuts, Palm oil, Palm kernel, Beans seeds and Rubber. Certainly God has blessed our country with a variety of plants that can make our existence much better and perhaps longer. The huge genetic resources that we have in the country are meant for our enjoyment, progress, daily survival and livelihood(Kutama *et al*., 2015; Titus *et al*., 2018). Unfortunately, we have utilized only very little out of the array of these plant genetic resources. Some of those we have explored for food are listed in Table 2 and Plates 1-32

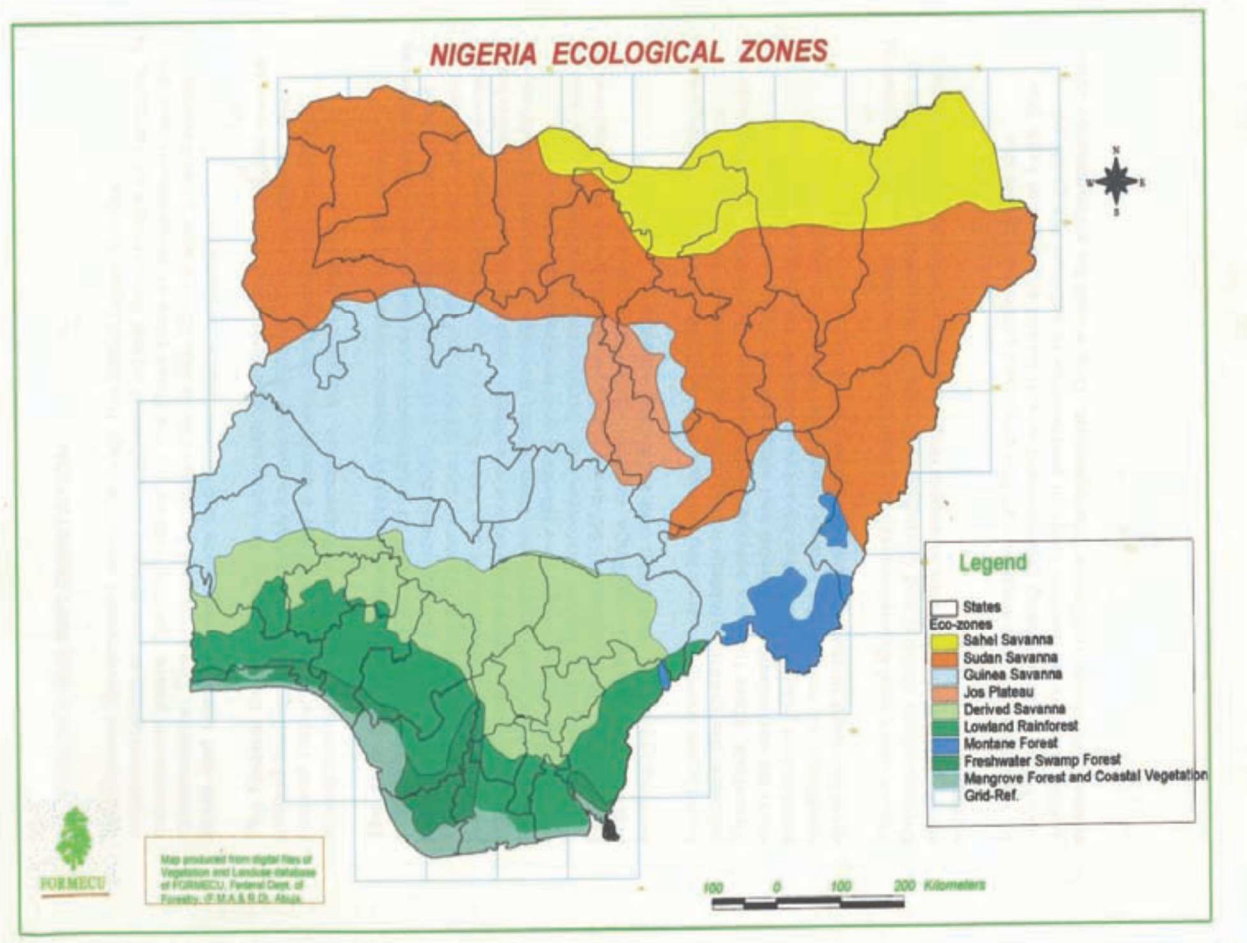


Figure 1: A map of Nigeria showing the nine ecological zones in the country.
Source: NCGRB (2008)

Table 1 : Inventory of Plant Taxa in Nigeria

Group of plants	No of families	No of genera	No of Species
Algae	67	281	1335
Lichens	-	14	17
Fungi (Mushrooms)	26	60	134
Mosses	-	13	16
Liverworts	-	16	6
Pteridophyte	27	64	165
Gymnosperms	2	3	5
Chlamydosperms	2	2	6
Monocotyledons	42	376	1575
Dicotyledon	172	1396	4636

Total	338	2215	7895

Source: Nigeria's First National Biodiversity Report, Fm Env. (2006

Table 2: Plants being used for Food in Nigeria

S/N	Plant	Common name	Uses
A	TUBERS		
1	*Manihot esculentus*	Cassava	Root tuber, processed into flour, (elubo), pure starch fufu or eaten boiled, used as industrial major starchy foods, e.g. garri raw materials bakery
2	*Dioscorea spp*	Yam	Stem tuber, processed into major starchy foods e.g. yam flour or boiled and eaten directly or pounded (pounded yam).
3	*Ipomeae batatas*	Sweet potato	Root tuber, boiled and eaten directly or pounded with yam or fried in oil.
4	*Solanum tuberosum*	Irish potato	Stem tuber, used as a carbohydrate food fried or flaked. and eaten throughout Nigeria in different forms, boiled, mashed
5	*Colocacia esculentus*	Cocoyam	Root tuber/Rhizome, processed into different carbohydrate foods.
B	CEREALS		
1	*Zea mays*	maize (corn)	Grains are eaten boiled or roasted, can be processed into different food items, as feed for livestock, also as industrial raw material.
2	*Sorghum bicolor*	Guinea corn	Grains are eaten boiled, roasted or processed into different food items; also as industrial raw materials in breweries.
3	*Pennisetum americanum P. glaucum*	Millet	Grains are used in various forms of staple food
4	*Tritium aestivum*	Bread wheat	Main source of flour bread, cake, and other confectionary.
5	*Oryza spp.*	Rice	Rice is a staple food, a major source of carbohydrate food in Nigeria
C	FOOD LEGUMES		
1	*Vigna unguiculata*	Cowpea	The most important legume in Nigeria, cultivated- for food and forage

2	*Glycine max*	Soya bean	Soya bean is an important source of plant protein and is processed to serve as food supplements as soya milk, soyabean or to fortify other food products such as soyaogi, soya feeds formulation. infants food and livestock.
3	*Arachis hypogea*	Groundnut/ Peanut	Groundnut is very rich in plant protein and source of rich vegetable oil. The nuts are processed into various food items and soup, and is an important component of livestock feeds
4	*Parkia biglobosa*	Locus bean tree	Friut pulp is eaten and used in a local brew. The seeds are processed into condiment called iru (Yoruba) or Dadawa in Hausa
D	OIL CROPS		
1	*Elaeis guinensis*	Oil palm	Source of red oil and kernel
2	*Sesamum indicum*	Sesame (Beniseed)	source of highly priced rich vegetable oil,
3	*Citrullus lanatus*	Egusi, melon	Very rich in vegetable oil Seeds also used in soup preparations
4	*Cocos nucifera*	Coconut	Source of coconut oil
5	*Ricinus communis*	Castor oil	Source of castor oil
6	*Gossypium* spp.	Cotton	Source of cotton seed oil
E	PLANT- BASED SWEETNERS		
1	*Saccharium officinarium*	Sugarcane	Main source of the Raw material for the sugar industry.
F	HORTICULTURAL CROPS		
1	*Capsicum* spp.	Pepper	Pepper is a major component of Nigerian food with different degree of purgency
2	*Lycopersicon esculentus*	Tomato	Tomato is an important component of Nigerian food.
3	*Alium cepa*	Onion	Onion is an important food.
4	*Amaranthus* spp.	Amaranthus, Tete (Yoruba)	Amaranthus is an important leaf vegetable
5	*Albelmoschus esculentus*	Okra Ila (Yoruba)	Okra is an important fruit
6	*Corchorus* spp.	Jute Ewedu (Yoruba)	*Corchorus olitorius* is an important leaf vegetable.
7	*Solanum raddi*	Egg plant (indigo)	The fruit of garden egg is eaten raw or cooked

8	*Musa* spp.	Plantain	Fruit rich in iron
9	*Telfairia occidentalis*	Ugu (Ibo)	Leafy vegetable, rich in iron.
10	*Carica papaya*	Pawpaw	This is a fruit vegetable
11	*Ananas cosmotus*	Pineapple	An important fruit and raw materials for juice Industry
12	*Daucus carota*	Carrot	An important root vegetable.
13	*Pisidium guajava*	Guava	Fruit is eaten fresh and as component of jam
14	*Cirtus sinensis*	Orange	Juice taken fresh or extracted and used in beverages
15	*Mangifera indica*	Mango	Fruit is eaten fresh or processed into beverages.
16	*Anacardium occidentale*	Cashew	Juice is taken directly or processed into beverage. The nuts are also eaten
17	*Pyrus communis*	Pear	The fruit is delicious
18	*Ocimum gratissimum*	(Yoruba) Efinrin	The spicy leaves are eaten as vegetable or used to ganish soups.
19	*Cucumis sativus*	Cucumber	Fruit vegetable.
20	*Latuca sativa*	Lettuce	Leaf vegetable
21	*Celosia* spp*;*	Ajefowo (Yor)Sokoyokoto	Leaf vegetable
22	*Vernonia amygydalina*	Ewuro (Yoruba) Bitter leaf	Leaf vegetable
23	*Hibiscus* spp	Isapa,Zobo plant	Leaf vegetable.
24	*Tetracarpidium conophorum*	Awusa (Yor)	The cotyledons are proteinous and eaten cooked.

Source: NCGRB (2008)

Plate 1: Seeds and fruits of Guinea Corn (*Sorghum bicolor)*

Plate 2: Fruit and seeds of Millet *(Pennisetum americanum)*

Plate 3; Seeds and fruit of Maize *(Zea mays* L.) plant

Plate 4: Fruiting Rice (Oryza spp) plants

Plate5: Fruits and seeds of Cowpea (*Vigna unguiculata* (L) Walp)

Plate 6: Leaves and tubers of **Cassava** (*Manihot esculanta*, crantz)

Plate 7: Yam (*Dioscorea rotundata*) tubers and seed yam

Plate 8: Tubers and shoots of Cocoyam (*Colocacia esculentus*)

Plate 9: Seeds and Shoot of Groundnut (*Arachis hypogea*)

Plate10: Fruit of *Parkia biglobosa*

Plate 11: Fruit of Mango (*Mangifera indica*)

Plate 12: Fruit of Cashew (*Anacardium occidentale*)

Plate 13: Fruit of Orange (*Citrus sinensis*)

Plate 14.: Fruit of Tomato (*Lycopersicon esculentus*)

Plate 15: Fruit of Melon (*Citrullus lanatus*)

Plate 16: Fruit of Pepper

Plate 17: Plants and seeds of Bambara nut (*Vigna subterranean*)

Plate 18: Shoot, Fruit Pods and Seeds of *Moringa oleifera*

Plate 19: Fruits and Seeds of *Garcinia kola* (Bitter kola)

Plate 20: Fruits and Seeds of *Chrysophyllum albidum* (African Star apple)

Plate 21: Fruits and Seeds of *Treculia africana* (African Bread fruit)

Plate 22:Fruits and Seeds of *Irvingia gabonensis* (African Bush Mang)

Plate 23:Fruits and Seeds of *Dacryodes edulis* (African bush butter)

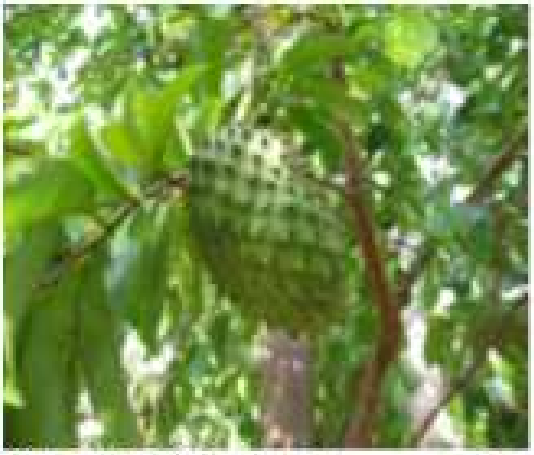
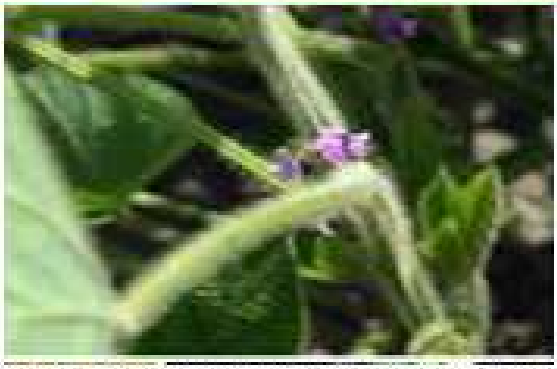


Plate 24: Fruit head of *Annona muricata* (Soursop Fruit)



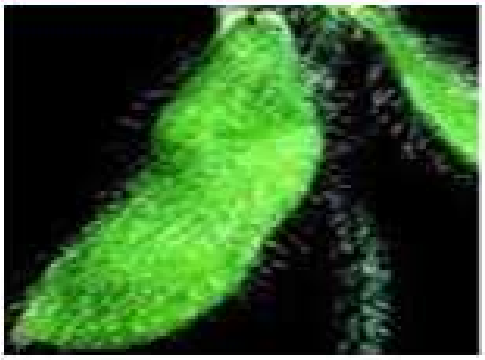


Plate 25 : Fruit and shoot of Soyabean (*Glycine max*)

Plate 26: Sugarcane (*Saccharium officinarium*) stems and leaves

Plate 27: Cucumber (*Cucumis sativus*) fruits and leaves

Plate 28: The Jute (*Corchorus* spp) plant

Plate 29: Onion (*Allium cepa*) leaves and bulb

Plate 30: Bansana (*Musa* spp) fruits and shoots

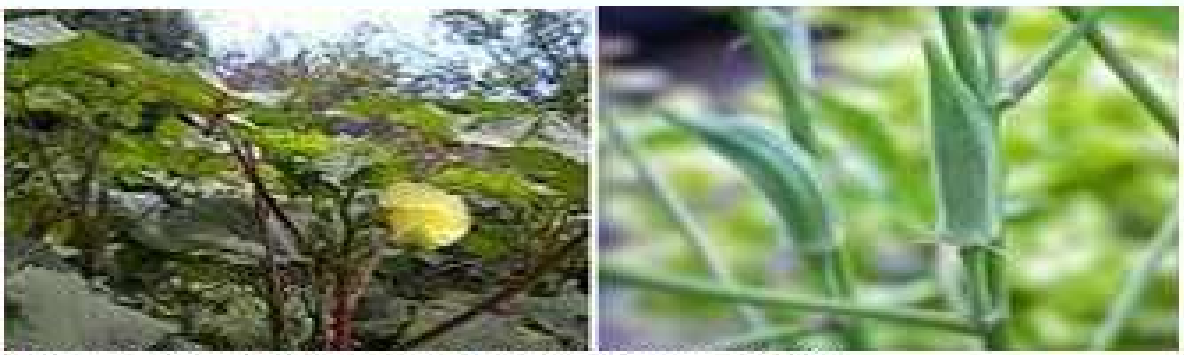


Plate 31: Okra (*Albelmoschus esculentus*) leaves and fruits

Plate 32: Flowers fruits and seeds of Sesame (*Sesamum indicum*)

Sources of Plates: Falusi *et al*.(2001) Falusi and Salako,(2002); Falusi *et al*. (2002); Ndukwu(2012)

Apart from these plants, Nigeria also has a wide diversity of other plant species. The country is very rich in plant resources which exist in wild forms in plants' natural habitats and in diverse crop landraces/ecotypes/cultivars. They include grasses and many browse species. Nigeria has a list of 2, 200 verified nutritious species which include 600 grasses, 540 herbaceous legumes and 380 browse species and over 600 others of lower values (NCGRB, 2008; Amusa *et al*., 2010; Monpara, 2016). Most of these species are components of the high forest, guinea savanna, sudan savanna and some very hardy plants in the sahelian zone. The number of non-domesticated plants that has been collected from the wild to bridge hunger gaps is far more diverse.

From the incalculable magnanimity of Mother Nature to Nigeria, we can unanimously attest that the country's plant genetic resources is indeed an INCREDIBLE GENEROSITY. This generosity is thrilling, exhilarating and bewildering. It is simply a wonder and a marvel. I believe it is God's incredible gifts that need to be explored for food security .

Our Incredible Responsibility

The nature's intention and generosity is for us to use plant genetic resources to ensure our future survival. It is, therefore our responsibility to be wise on the exploitation of the resources. According to Ndukwu (2012),the

magnanimity and incredible generosity of Mother Nature carries with it an equally incredible responsibility. *"And the Lord God took the man, and put him into the Garden of Eden ….. to DRESS IT and to KEEP IT ……"* Genesis 2:15 .Permit me to inform us that we may not have an Eden in that original sense anymore. However, each of us has been handed over an Eden of a sort. Our own Eden could be our University or our village, compound, estate or homestead garden, depending on our sphere of influence. I wish to inform all of us that those words 'DRESS IT' and 'KEEP IT' are heavy, if we understand them. It requires our greatest RESONSIBILITY. We may sound religious about this. We may trivialize and gloss over it. But I assure us that if we ignore them, the implications will not be good enough. This is because our very lives, livelihood and continued existence in the beautiful EDEN – planet earth is inextricably hinged on how we utilize our God-given plant genetic resources. It is this dynamic approach that has guided the title of this paper.

It is our collective responsibility to conserve and make proper good use of the generous gift of God in plant genetic resources. There are several of the benefits of these plants that are hidden in deep secrets. *'It is the glory of God to conceal a thing; but the honour of kings (men) is to search out a matter'…… Proverbs 25; 2,* Part of our responsibilities and indeed honour is to discover, and wisely exploit them for our advantages. If we humble ourselves and quietly approach Nature, we will be shown some of these deep secrets. This is the basis of all human ingenuity and inventions.

CONCLUSION

God has generously blessed our country with a lot of plant resources and we certainly have no reason whatsoever to live in hunger or suffering. Our country is endowed with a wide diversity of plant resources that we can harness to ensure food security. This magnanimity, to me is an incredible generosity of Mother Nature. It also carries with it an equally incredible responsibility. Therefore the scientific research community needs to wake up to this reality and be engaged in not just knowing these heritage but also engaged in preserving it to ensure food security for this generation and the unborn generations.

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