



## **Assessment of On-farm Cultivation and Conservation of Indigenous Fruit Species in Ekiti State, Nigeria**

**Joshua Kayode<sup>1,2\*</sup> and Tolulope O. Bamigboye<sup>2</sup>**

<sup>1</sup>Department of Plant Science, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria.

<sup>2</sup>Department of Crop Production Technology, Federal College of Forestry, Ibadan, Oyo State, Nigeria.

### **Authors' contributions**

*This work was carried out in collaboration between both authors. Authors JK and TOB designed the study, wrote the protocol and wrote the first draft of the manuscript. Author TOB managed the literature searches, analyses of the study, performed the structural equation modeling and discuss the conclusion. Both authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/JAERI/2016/24811

#### Editor(s):

- (1) Mirza Hasanuzzaman, Department of Agronomy, Faculty of Agriculture, Sher-e-Bangla Agricultural University, Bangladesh.
- (2) Malgorzata Pietrowska-Borek, Department of Biochemistry and Biotechnology, University of Life Sciences, Poznan, Poland.
- (3) Daniele De Wrachien, Department of Agricultural and Environmental Sciences of the State University of Milan, Italy.

#### Reviewers:

- (1) T. Pullaiah, Sri Krishnadevaraya University, India.
- (2) Dipak Kumar Sahoo, Iowa State University, USA.

Complete Peer review History: <http://sciencedomain.org/review-history/13968>

**Original Research Article**

**Received 1<sup>st</sup> February 2016**

**Accepted 14<sup>th</sup> March 2016**

**Published 1<sup>st</sup> April 2016**

### **ABSTRACT**

**Aims:** The study aimed at the identification of the disincentives hindering their on-farm cultivation in Ekiti State.

**Place of Study:** The study was carried out in Ekiti State, Nigeria.

**Methods:** A combination of social survey and direct field observation was used to assess the on-farm cultivation of indigenous fruit species (IFS) in Ekiti State, Nigeria.

**Results:** Twelve IFS were identified. Field observation revealed that despite the fact that these IFS were reservoirs of numerous returns in the study area, considerable number of factors threatens their cultivation hence present dependency is based on those growing in the wild.

\*Corresponding author: E-mail: [joshua.kayode@eksu.edu.ng](mailto:joshua.kayode@eksu.edu.ng);

**Conclusions:** Respondents' indigenous knowledge on the identified species were documented and used for proposing conservation strategies that would enhance the sustainability of the IFS.

*Keywords:* Assessment; on-farm cultivation; conservation; indigenous fruit species; Ekiti State.

## 1. INTRODUCTION

The importance of indigenous fruit species (IFS) in rural households cannot be over-emphasised. They are fruits that grow in forested areas which have been ignored for a long period. Some of them have excellent flavour, attractive fragrance and delicious tastes [1]. Quite often in rural countryside of many developing nations, they are often the only fruits consumed as people cannot afford cultivated commercial fruits such as apple, grapes, pomegranate or orange [2]. Indeed some of them have been identified to have better nutritional value than the cultivated fruits [3].

Fruits are now known to form a vital part of human nutrition as they are valuable because of the minerals and vitamins they contribute to the diet [4]. In addition to food value, indigenous fruits are marketable and provide the opportunity to supplement household income [5] and thus contribute to cash economy of small-scale farmers [6]. Some of them can be processed to make juice, wine, jam, chutneys and animal-feed concentrates. Hence, they have the potentials to meet household food and income securities [7].

In recent years, a growing interest has emerged to evaluate various indigenous fruit trees for their nutritional features [8]. Research on indigenous fruit species has accumulated considerably in Sub-Saharan Africa and their roles have been recognized in the domain of poverty reduction [9]. With increased climatic instability causing frequent agricultural crop failure, the role of indigenous fruits in providing nutritional supplement to mankind is gaining recognition [10]. During drought periods indigenous fruit species provide food and income to rural households. Hence, they are often labelled as famine or hunger food. Unfortunately in Nigeria, there has been little research undertaken on them. Most of the studies reported so far had concentrated on the nutritional and economic benefits derived from them. The study being reported here aimed at the identification of the disincentives hindering their on-farm cultivation in Ekiti State. It is expected that this would eliminate the paucity of information on their suitability for incorporation into the farming practices of the study area.

## 2. MATERIALS AND METHODS

The detailed description of the study area was provided by Kayode [11]. The state was divided into three zones based on the existing political senatorial delineation. In each zone, five rural communities were randomly selected and used for the study. In each community, ten farmers who had maintained continuous residency in the community in the last ten years were selected and interviewed with the aid of semi-structured questionnaire matrix. The questions were structured to obtain data on the socio-economic profile of the farmers, their attitudes and willingness towards indigenous fruit species cultivation, indigenous knowledge on propagation and management of IFS, opportunities and constraints to promoting cultivation of IFS.

Also in each community, group interviews were conducted. Each group was made up of at least three farmers. The group interviews were aimed at obtaining group consensus on the parameters described above. Key informants, consisting of forest and agriculture development officials were also interviewed.

## 3. RESULTS AND DISCUSSION

Table 1 shows the demographic and socio-economic characteristics of respondents in the study area. Most of the respondents were male (83%), over 30 years old (88%), literates (85%) and were all involved in agricultural activities. Field observation revealed that all the respondents were well familiar with IFS thus indicating that the socio-economic features were not regarded as prerequisites to fruits mindedness of the respondents in the study area. Previous study by Kayode [11] had earlier revealed that respondents in the study area were conscious on issues related to trees.

A total of 12 species belonging to 11 families were identified as been indigenous fruit species in the study area (Table 2). Apart from *Borassus aethiopum*, other identified IFS were primarily valued for their fruits. *Borassus aethiopum* was valued for its stem that is used as plank for construction activities. Also, Kayode [11]

**Table 1. Demographic and socio-economic characteristics of respondents in Ekiti State, Nigeria**

Feature	Description	Proportion (%) of respondents			
		EC	EN	ES	Average
Sex	Male	78	82	90	83
	Female	22	18	10	17
Age (Yrs)	<20	18	6	12	12
	30 -60	73	81	72	75
	>60	9	13	16	13
Education	Literate	78	86	90	85
	Illiterate	22	14	10	15

**Table 2. Identified IFS in Ekiti State, Nigeria**

S/n	Species	Vernacular name	Family
1	<i>Adansonia digitata</i> L.	Ose	Bombacaceae
2	<i>Annona senegalensis</i> Pers.	Abo	Annonaceae
3	<i>Artocarpus heterophyllus</i> Lam.	Berefutu	Moraceae
4	<i>Blighia sapida</i> K. D. Koenig	Ishin	Sapindaceae
5	<i>Borassus aethiopum</i> Mart.	Agbon-Eye	Arecaceae
6	<i>Chrysophyllum albidum</i> G. Don	Agbalumo	Sapotaceae
7	<i>Dioscoreophyllum cumminsii</i> (Stapf) Diels	Omu-Aja	Sapotaceae
8	<i>Garcinia kola</i> Heckel	Orogbo	Clusiaceae
9	<i>Irvingia gabonensis</i> (Aubry. Lecomte ex O'Rorke) Baill.	Oro	Irvingiaceae
10	<i>Plukenetia conophora</i> Mull. Arg	Asala	Euphorbiaceae
11	<i>Vitellaria paradoxa</i> C. F. Gaertn.	Emi	Sapotaceae
12	<i>Vitex doniana</i> Sweet	Oori	Verbenaceae

asserted that fruits bearing trees has always been of interest to respondents in the study area. Such interest could be utilised as incentive to the adoption of IFS in the study area.

Table 3 revealed that only 31% of the respondents owned land. Most of these land owners (over 90%) were of small and medium holdings. Also most of the land tenants were of small holdings. Only 4% of the total respondents possessed IFS on their lands. The IFS on these lands were mostly *Plukenetia conophora*, *Bligha sapida*, *Garcinia kola*, *Chrysophyllum albidum* and *Artocarpus heterophyllus*. Relatively few proportions (2%, Table 3) of the respondents had been involved in planting IFS in the study area. Species reportedly planted were *Bligha sapida* and *Artocarpus heterophyllus*. Similarly, only 6% of the respondents had been involved in IFS' wildling preservation. Species preserved included *Plukenetia conophora*, *Garcinia kola*, *Irvingiagabonensis* and *Chrysophyllum albidum*. All the species planted and retained in this study were those whose fruits served as viable source of income in the study area.

Kayode [12] asserted that small and medium land holders in the study area were often

inhibited from investing in tree planting as planting trees was regarded as a means of establishing ownership on the land or as a means of prolonging tenants' stay on rented land.

In addition, a myriad of problems (Table 4) were identified as disincentives to the planting of IFS in the study area. In the recent times, a gross dearth of labour hands abounds in the study area hence farm preparations are now accompanied with burning hence wildlings of IFS are burnt off. The apathy demonstrated in the study area towards tree incorporation with agricultural crops has been documented by Kayode [12]. The shading effects from the trees cannot be tolerated. The time taken to fruit by most IFS was considered a serious disincentive. The period involved is considered as a loss of economic return from such investment.

Field observation tends to corroborate information from respondents as occurrence of IFS such as *Adansonia digitata*, *Bligha sapida* and *Chrysophyllum albidum* were considered as common property. Subsistence harvest of fruits from these species irrespective of their location was not considered as a serious crime in the

study area. This attitude constitutes a disincentive to investment in these species. Similarly, the consumption of foreign fruits, especially apple, is now a fad in the study area. Fruits preference are now skewed towards the foreign fruits to the detriment of the indigenous fruits whose loss is now imminent. Field observation revealed that the aboriginal community is ignorant of this loss. However the IFS were observed to be sparse in the sapling stage. Although such scarcity might not be

limited to IFS alone as Kayode [13,14] have asserted that most indigenous fruit species were not well represented in the sapling stage.

Most of the respondents were quite familiar with the reproductive biology of the IFS. Their indigenous knowledge ranged from their familiarity with IFS periods of flowering, fruiting to soil requirements (Table 5). This knowledge could be exploited for their cultivation.

**Table 3. Classification of respondents in Ekiti State, Nigeria**

Description	Proportion (%) of respondents
1. Land ownership	
(a) Land owners (n=48)	34
i. Small land owners	65
ii. Medium land owners	31
iii. High land owners	4
(b) Tenants (n=102)	66
i. Tenancy on small land holdings	71
ii. Tenancy on medium land holdings	23
iii. Tenancy on high land holding	6
2. Occurrence of any IFS on the land holdings	4
<i>Frequency of occurrence by ranking</i>	1. <i>P. conophora</i> , 2. <i>B. sapida</i> , 3. <i>G. kola</i> , 4. <i>C. albidum</i> , 5. <i>A. heterophyllus</i>
Respondents who had been involved in planting any IFS	2
<i>Frequency of planting by ranking</i>	1. <i>B. sapida</i> , 2. <i>A. heterophyllus</i>
Respondents who had been involved in IFTs' wildling preservation	6
<i>Frequency of preservation by ranking</i>	1. <i>P. conophora</i> , 2. <i>G. kola</i> , 3. <i>I. gabonensis</i> , 4. <i>C. albidum</i>

**Table 4. Disincentives to planting of IFS in Ekiti State, Nigeria**

Rank	Disincentive	Proportion (%) of respondents
1	Land tenure system	98
2	Bush burning	95
3	Covering effects on crops	94
4	Time taken to fruit	94
5	Perception as free for all	93
6	Ignorant of IFS loss	92
7	Invasion of exotic fruits	91
8	Dearth of planting materials	90
9	Dearth of financial support	90

**Table 5. Local knowledge of respondents on IFS in Ekiti State, Nigeria**

Indigenous knowledge	Conservation inference	IFTs applicability
1. Flower at the end of dry season	Seeds ready for dispersal and planting at the on-set of rains	<i>A. digitata</i> , <i>A. senegalensis</i> , <i>A. nitida</i> , <i>V. doniana</i> , <i>V. paradoxa</i>
2. Could be propagated vegetatively.	Ensure availability of planting materials	<i>A. digitata</i> , <i>A. senegalensis</i> , <i>B. nitida</i>
3. Grow in various soils	Suitable for planting in all parts of the state	<i>A. nitida</i> , <i>A. senegalensis</i> , <i>B. nitida</i> , <i>B. aethiopum</i> , <i>V. paradoxa</i> , <i>V. doniana</i>

Indigenous knowledge	Conservation inference	IFTs applicability
4. Possess the ability to survive dry condition	Suitable for planting in all parts of the state	<i>A. digitata</i> , <i>V. paradoxa</i> , <i>V. doniana</i>
5. Produce fruits throughout the year	Production of returns throughout the year	<i>B. nitida</i>
6. Production of enough seeds	Production of planting material	<i>B. aethiopum</i> , <i>C. albidum</i> , <i>V. paradoxa</i> , <i>V. doniana</i>
7. Resistance to fire and herbivory	Survive bush burning now rampant in the state	<i>B. aethiopum</i>
8. Flower at the onset of the rain	Seeds are made available for planting during rainy season	<i>I. gabonensis</i>
9. Possess two fruiting seasons	Production of adequate returns	<i>I. gabonensis</i>
10. Fruits for many years	Produce returns for several years	<i>V. paradoxa</i>
11. Flower during the raining season	Produce seeds suitable for planting in the raining season.	<i>B. aethiopum</i>
12. Have medicinal values	Capable of enhancing planting	All the IFS identified in this study.

#### 4. CONCLUSION

The IFS identified were all found capable of being planted in the study area. Many of them (Table 5) fruit during the dry season, thus their seeds are available for cultivation during the rainy season. They all produced considerable number of seeds that are widely consumed in the study area thus they are viable sources of income. All the species were also valued for their medicinal importance thus constituting another incentive for their conservation.

The large scale cultivation of IFS could also be promoted. Institutions, such as Forest Research Institute of Nigeria, should be encouraged to mass produce seedlings of IFS. The taungya approach could be exploited for the development of ITS plantations where government could make land and seedlings of IFS available to landless farmers for cultivation. Cottage industries that could utilise seeds produced by these IFS should be established as availability of regular market would encourage investment in IFS plantings.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

#### REFERENCES

- Pantastico ERB. Postharvest physiology, handling and utilization of tropical and subtropical fruits and vegetables. The AVI Publishing Company Inc., New York; 1975.
- Ajay Kumar Mahapatra, Satarupa Mishra, Uday C. Basak, Pratap C. Panda. Nutrient analysis of some selected wild edible fruits of deciduous forests of India: An explorative study towards non conventional bio-nutrition. *Advance Journal of Food Science and Technology*. 2012;4(1):15-21.
- Maikhuri RK, Semwal RL, Singh A, Nautiyal MC. Wild fruit as a contribution to sustainable rural development: A case study from the Garhwal Himalaya. *Inter. J. Sustain. Dev. World Ecol*. 1994;1:56-68.
- Bassey ME. Common wild fruits from Akwa Ibom State, Nigeria and nutritional analyses of *Landolphia membranacea* (Stapf) Pichon. *Scientific Journal of Biological Sciences*. 2012;1(4):86-90.
- Wilson KB. Ecological dynamics and human welfare: A case study of population, health and nutrition in Southern Zimbabwe. University College, London; 1990.
- Okafor JC. Edible indigenous woody plants in the rural economy of the Nigerian forest zone. *Forest Ecology and Management*. 1980;3:45-55.
- Kebu B, Fassil K. Ethnobotanical study of wild edible plants in Derashe and Kucha Districts. South Ethiopia. *J. Ethnobiol. Ethnomed*. 2006;2:53.
- Nazarudeen A. Nutritional composition of some lesser-known fruits used by ethnic communities and local folks of Kerela. *Ind. J. Traditional Knowl*. 2010;9(2):398-402.
- Mithofer D, Waibel H. Income and labour productivity of collection and use of indigenous fruit tree products in Zimbabwe. *Agroforestry Systems*. 2003;59:295-305.
- Maghembe JA, Simons AJ, Kweisga F, and Rarieya M. Selecting indigenous fruit

- trees in southern Africa. ICRAF, Nairobi; 1998.
11. Kayode J. Demographic survey of tree species in urban centres of Ekiti State, Nigeria. *Journal of Sustainable Forestry*. 2010;29(5):477-485.
  12. Kayode J. Farm- and village-forest use practice in Ekiti State: Analysis of government policy and tenure issues. *Journal of Sustainable Forestry*. 2011; 30(4):321-328.
  13. Kayode J. Conservation perception of endangered tree species by rural dwellers of Ekiti State, Nigeria. *Journal of Sustainable Forestry*. 2004;19(4):1-9.
  14. Kayode J. Reconciliation of the supposedly irreconcilable: Conservation and development. 26<sup>th</sup> Inaugural Lecture of The University of Ado-Ekiti, Ado-Ekiti, Nigeria. University of Ado-Ekiti Press, Ado-Ekiti, Nigeria. 2010;57.

---

© 2016 Kayode and Bamigboye; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:*

*<http://sciencedomain.org/review-history/13968>*