



## **Valuable Tropical Flora of Anambra State, Nigeria- Amawbia Watershed in Focus!**

**G. Ukpaka Chukwujekwu<sup>1\*</sup>, C. Nnabude, Peter<sup>2</sup> and J. Anyaegbunam Ngozi<sup>3</sup>**

<sup>1</sup>Department Biological Science, Chukwuemeka Odumegwu Ojukwu University, Uli, Nigeria.

<sup>2</sup>Department of Soil Science, Nnamdi Azikiwe University, Awka, Nigeria.

<sup>3</sup>Department of Science Education, University of Nigeria, Nsukka, Nigeria.

### **Authors' contributions**

*This work was carried out in collaboration between all authors. Authors GUC and CNP designed the study. Author GUC performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript and managed the analyses of the study. Author JAN managed the literature searches. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/IJPSS/2018/36870

#### Editor(s):

(1) Sateesh Suthari, Department of Plant Sciences, University of Hyderabad, India.

#### Reviewers:

(1) F. C. Akharaiyi, Afe Babalola University, Nigeria.

(2) Aneta Popova, University of food technology, Bulgaria.

(3) Tuğba Kiper, Namik Kemal University, Turkey.

Complete Peer review History: <http://www.sciencedomain.org/review-history/22916>

**Original Research Article**

**Received 15<sup>th</sup> August 2017**  
**Accepted 29<sup>th</sup> October 2017**  
**Published 29<sup>th</sup> January 2018**

### **ABSTRACT**

Well structured questionnaires and rating schedule were utilized to establish the economic relevance of each member of each species for each growth form. Available growth forms have very low economic relevance except probably the ones man knowingly planted for their high Economic values. Species with a rating higher than 6.5 had high relevance; those having less than 6.5 rating had low Economic relevance while those having a 6.5 rating had average relevance. Generally, the tree, shrub and climber species recorded higher relevance than the grasses and forbs. Some of the more important Economic relevance include: edible food, export commodity, cash crop, industrial raw material, medicinal plants and erosion control/soil protection. Replacements of unwanted species with the more economically relevant ones are of priority!

*Keywords: Valuable; tropical flora; common.*

## 1. INTRODUCTION

Many plant species of Anambra State are very useful commodities even in the international market particularly as sources of industrial raw materials and medicinal products. These important species have been over harvested, abused and degraded over the years, thereby resulting to extinction. The absence of a sincere programme of replanting and conservation has made this state of affairs more desperate. Handing down to our children what our fathers handed down to us is the essence of survival. The time has come for the Government and people of Anambra State and the rest of tropical Africa to take the issue of routine tree planting campaigns and massive replanting (reforestation) of our rapidly depleting resources more seriously.

### 1.1 Objective of Study

The objective of the study is to determine the economic relevance of some common flora of Anambra state.

## 2. LITERATURE REVIEW

### 2.1 Importance of Watersheds

Watersheds supply our drinking water, water for agriculture and manufacturing, offer opportunities for recreation and provide habitat to numerous plants and animals. Unfortunately various forms of pollution, including runoff and erosion, can interfere with the health of the watershed [1]. Therefore, it is important to protect the quality of our watershed. The Amawbia watershed is the source of the water for irrigation of the market garden domiciled within the watershed. Pollutants from neighboring commercial enterprises – faecal contamination, char from bushfires, effluents from car washing concerns/block industries, sewage from hotels and residential buildings, and of course artificial fertilizers used in the market garden, and the runoffs from the ever-increasing floods-all impact negatively on the watershed in line with what obtains in the Amawbia watershed, according to the [2], "People live in particular watersheds, and each of these watersheds are unique, based on the specific size, terrain, soil, land use, flora and fauna, climate and others. Human activities impact watershed, which may arise from agricultural, residential, and commercial activities. For example, pesticides from

agricultural activities in the highlands may flow down to smaller rivers and then to major rivers or lakes. Today, there is a tendency to manage watershed areas in order to provide for human needs and a healthy environment. For the fact that watersheds are interconnected, negative influence in one rapidly spread to others therefore all efforts must be made to safeguard the overall health (wellbeing) of our watersheds.

Watersheds, as drainage basins have been important historically in determining (delineating) boundaries, particularly in regions where trade by water has been important. [2].

In hydrology, the drainage basin is a logical unit of focus for studying the movement of water within the hydrological cycle, because the majority of water that discharges from the basin outlet originated as precipitation falling on the basin. Measurement of the discharge of water from a basin may be made by a stream gauge located at the basin outlet. [2].

In ecology, watersheds (as drainage basins) are important units. As water flows over the ground and along it can pick up nutrients, sediments and pollutants. Like the water, they get transported towards the outlet of the basin, and can affect the ecological processes along the way as well as in the receiving water body. Modern usage of artificial fertilizers, containing nitrogen, phosphorus and potassium, the sources has affected watersheds. The minerals will be carried by the watershed to the source and accumulate there, disturbing the natural mineral balance [2]. For the fact that drainage basins are coherent entities in a hydrological sense, it has become common to manage water resources on the basis of individual basins [2].

Watersheds sustain life, in more ways than one. According to the Environmental protection Agency, more than \$450 billion in foods, fiber, manufactured goods and tourism depend on clean, healthy watersheds [1]. To a very large extent, this is also true of the Amawbia watershed. Annual vegetables are harvested for sale in the markets yearly; medicinal plants are harvested together with livestock fodder species. The major problem here is deforestation and lack of regular afforestation, proper disposal of industrial, commercial and domestic sources of pollution will also go a long way.

### 3. MATERIALS AND METHODS

#### 3.1 Economic Relevance of Encountered Flora / instrument of Data Collection

A well structured Questionnaire containing a hundred and eighty-eight items of flora (trees, climber, shrubs, grasses and forbs), on which responses were sought, was replicated a hundred and fifty times. The sample population comprised of foresters and the elderly. Thirty respondents each represented Awka, Onitsha, Nnewi, Uli and Aguata areas of Anambra State. The instrument was face-validated by some experts in Botany who looked out for clarity of instructions and structural organization. Instrument reliability was ascertained using Test-Retest method (repeating the same questions to the same respondents after three months).

**Table 1. Economic relevance of encountered flora arranged according to their order of importance**

S/N	Economic relevance	Order of importance	
1	Edible Food	12	A
2	Export Commodity	11	B
3	Cash crop	10	C
4	Erosion control/soil protection	9	D
5	Fuel wood	8	E
6	Medicinal plant	7	F
7	Industrial raw material	6	G
8	Non wood forest product	5	H
9	Fodder crop	4	I
10	Ornamental plant	3	J
11	Weed crop	2	K
12	Any other identified value	1	L

#### 3.2 Techniques of Data Analysis

There are 12 Economic Relevance (Table 1) under consideration, and there are five plant growth forms –trees, climbers, shrubs, grasses and forbs. The trees were 31, climbers were 9, shrubs were 18, grasses were 37 and forbs were 97. Some species have more than one Economic Relevance. The total number of Economic Relevance per species is represented by N= 12 (Table 1). The Economic relevance with the highest value/species size is referred to as the maximum, that with the lowest value/species size is referred to as the minimum. The means is the

sum of Economic relevance/specie size, divided by the number of economic relevance, N. Data collected from the respondents through the set of questionnaires were analyzed using descriptive statistics- Bar chart, percentage, graphs, pictures. The data were summarized and presented in tables.

The encountered flora was ranked according to their economic importance as follows (1-12) under S/N above.

The mean of the above ranks is

$$X = \frac{12+11+10+9+8+7+6+5+4+3+2+1}{12} = 6.5$$

Any flora (plant species) with a means value of 6.5 and above are of high economic relevance while any with a mean value less than 6.5 is of low economic relevance.

### 4. RESULTS AND DISCUSSION

#### 4.1 Economic Relevance of Encountered Floral Species Based on Standard Rating Schedule

From Fig. 1, trees like *Hevea braziliensis*, *Azalia africana*, *Tetrapleura tetraptera*, *Citrus sinensis*, *Mangifera indica*, *Elaeis guineensis* etc. were shown to have an Economic Relevance higher than 6.5, which according to the rating schedule, depicts very useful plants. Climbers namely: *Cucurbita pepo*, *Telfeiria occidentalis* and *Gongronema latifolium* etc. also had an Economic Relevance higher than 6.5 (Fig. 3). In the shrub category, we have: *Vernonia amygdalina*, *Uvaria chamae*, *Manihot esculentum*, *Solanum melanguena*, *Ananas comosus* and *Bambusa vulgaris* (Fig. 2). For the grass species, only *Saccharum officinarum*, *Zea mays* and *Oryza Sativa* (Fig. 4), had a reasonable Economic relevance; while for the forbs, only 10 species out of a total of 97 had economic relevances higher than 6.5; *Talinum triangulare*, *Corchorus olitorius*, *Sida garckeana*, *Ocimum basilicum*, *Musa sapientum*, *M. paradisiaca*, *Murraya koenigii*, *Amaranthus viridis* and *A. hybridus* (Fig. 5). [3] stated that, information on use and level of use of tree species is recorded in the Tree conservation Database. The information collated on globally threatened tree species illustrates that 25% have at least one recorded use: Timber was represented by 1351 species; fuel was represented by 254 species; medicinal plants were represented by 193 species; food was

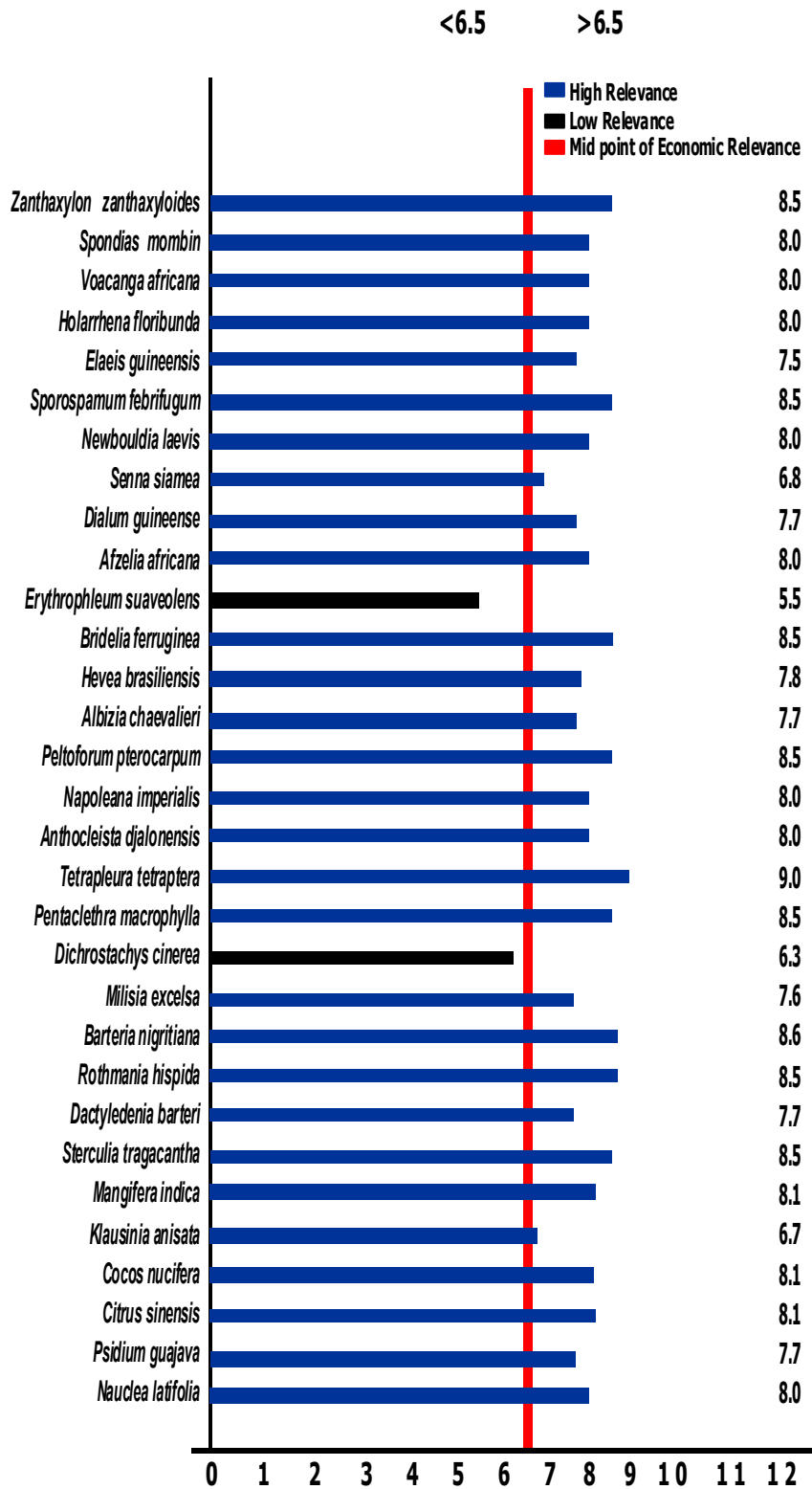
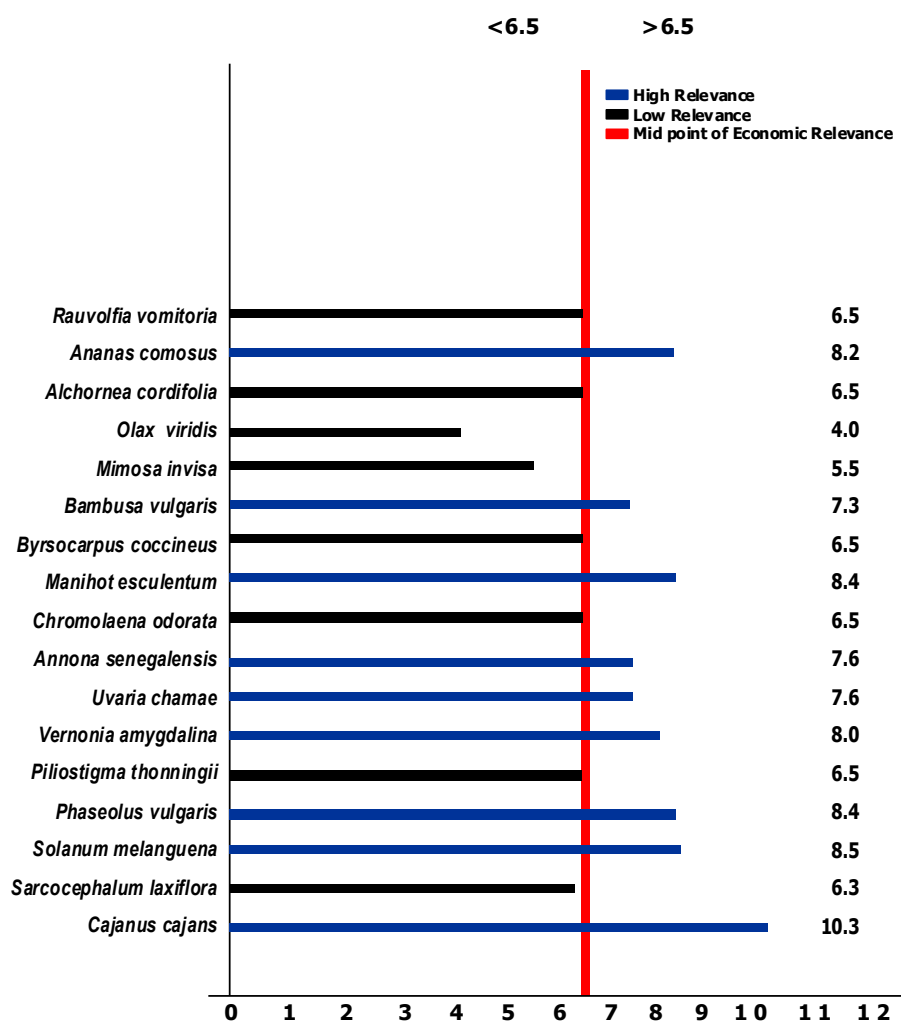


Fig. 1. Economic relevance of encountered trees of the watershed based on standard rating scale



**Fig. 2. Economic relevance of encountered shrub of the watershed based on standard rating scale**

represented by 241 species, oil, gum and resin were represented by 170 species. Meanwhile the Economic relevance used in this study were collectively represented by edible food, export commodity, cash crops, erosion controls/soil protection, fuel wood, medicinal plants, industrial raw materials, Non wood forest products, fodder crop, ornamental plants, weed crop, and any other identified value. Out of fifteen major African timber species recorded by [4], in the book jungles, only one species, *Azalia* was encountered in this work. For fibres and canes, out of eight species recorded in their work, only one specie was encountered in this work and that is *Bambusa* species. Of 11 essential oil species recorded in their work, only one appeared in this work, and that is citrus species. For gums and resins, of those recorded by [4]

none was represented in this work. Of pharmaceuticals, tanning agents and dyes, [4] recorded 14 species and 2 (*Dioscorea* and *Rauvolfia*) species were also represented in this work. [5] recorded the following species which were also encountered in this work: *Mangifera indica*, *Voacanga africana*, *Holarrhena floribunda*, *Acioa barteri* and *Newbouldia laevis* (trees) *Annona senegalensis*, *Uvarea chamae*, *Rauvolfia vomitoria*, *Gongronema latifolium*, *Ananas comosus*, *Telfeiria occidentalis*, *Dioscorea dumentorum* (shrubs) and *Cleome ruidosperma*, *Cleome viscosa*, *Commelina diffusa*, *C. erecta*, *Palisota hirsuta*, *Ageratum conyzoides*, *Aspilia africana*, *Bidens pilosa*, *Chromolaena odorata*, *Eclipta alba*, *Emilia coccinea*, *Melanthera scandens*, *Synedrella nodiflora*, *Tridax procumbens*, *Evolvulus*

*alsinoides*, *Ipomoea aquatica*, *I.eriocarpa*, *I. involucrata*, *I. triloba*, *I. vagans*, *Citrullus lanatus*, *Cyperus difformis*, *C. alternifolia*, *C. haspan*, *C. iria*, *C. rotundus*, *Fimbristylis littoralis*, *Kyllinga erecta*, *K. pumilla*, *K. squamulata*, *Mariscus alternifolia*, *M. flabelliformis*, and *Scleria verrucosa* (forbs) as having multiple economic relevance particularly- medicinal properties. On *Vernonia amygdalina* particularly, [6] reported that 'The parts of this plant are used in folk medicine as antihelminths, laxatives and fertility

inducers in barren women. Also in Tanzania, some wild Chimpanzees were observed to use it for the treatment of parasite related diseases [6]. Leaves of this plant were found to be of nutritional importance. In Nigeria, the plant is used as vegetable and as spices. Phytochemical screening of the plant revealed the presence of steroid, in the entire plant, sesquiterpenes in the leaves, fruits and flowers and also tannins, as well as flavonoids in the leaves. In this present work, the Economic rating, for *V. amygdalina*

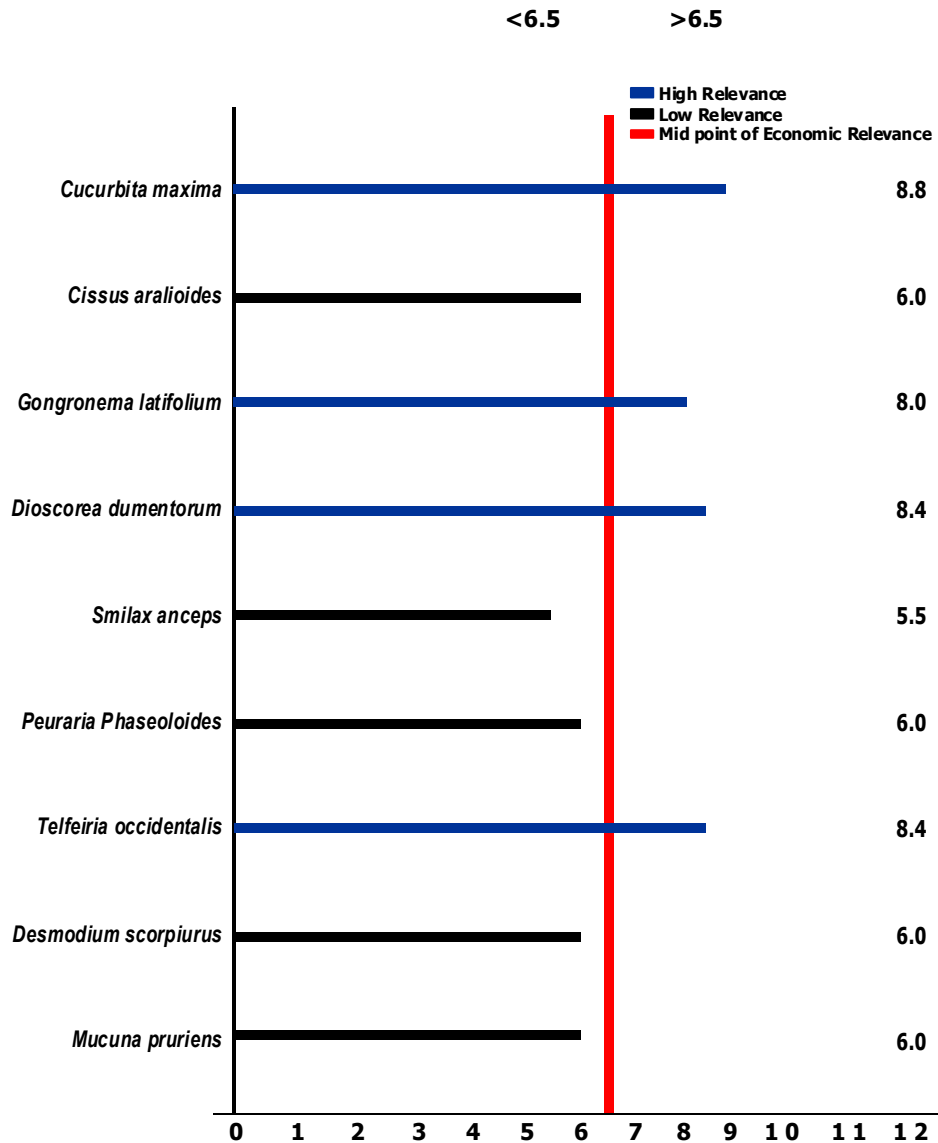


Fig. 3. Economic relevance of encountered climbers of the watershed based on standard rating scale

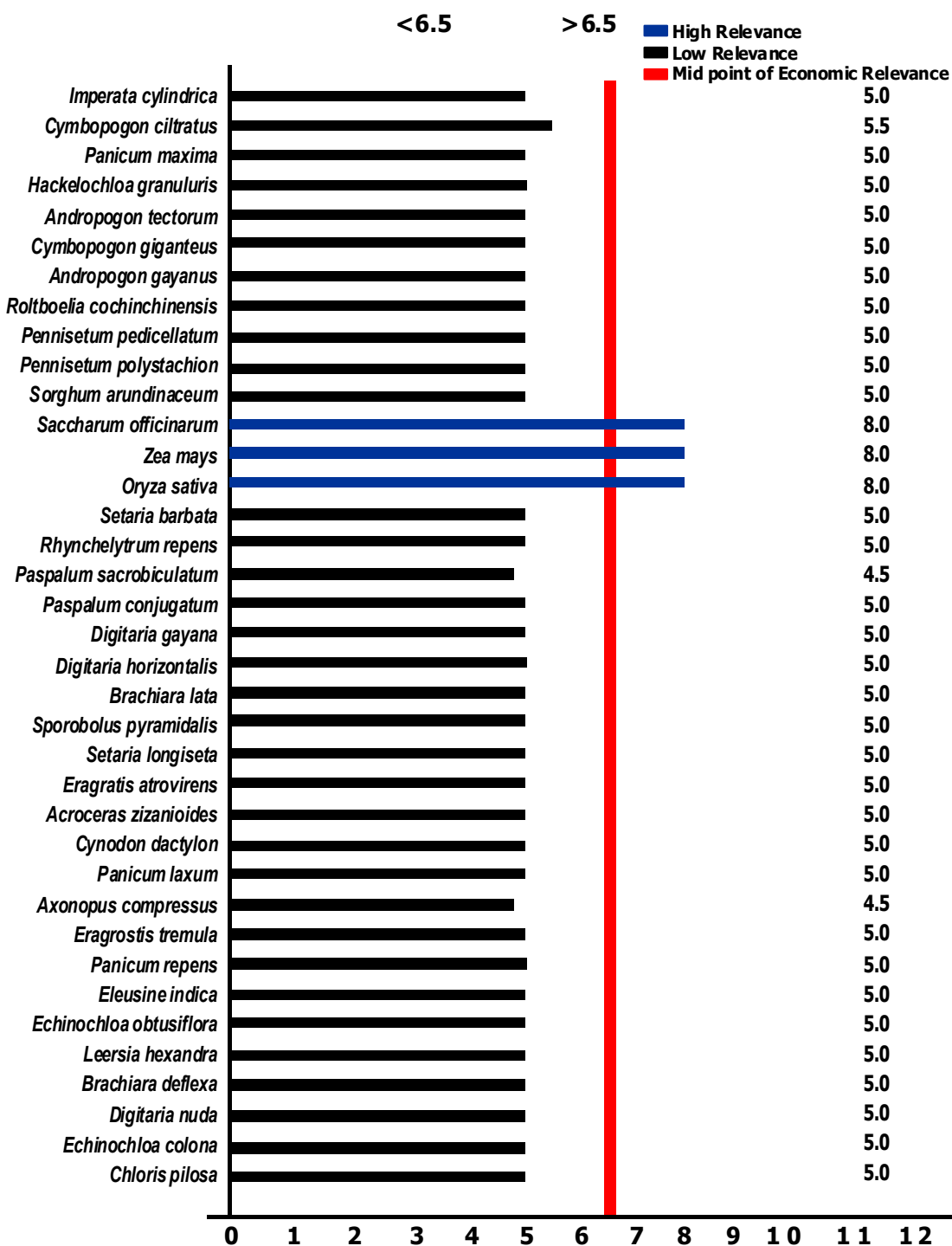


Fig. 4. Economic Relevance of Grasses of the Watershed using standard rating scale

was 8.0 (Fig. 3) which is 1.5 points ahead of the midpoint score of 6.5. This shows that it has very high Economic relevance. *Amaranthus spinosus*,

*Piliostigma thonningii* and *Portulaca oleraceae* encountered in this work, were also reported by [7] as having anti-inflammatory activities.

**4.2 Others Listed under Selected Plants Commonly Used in Nigeria include**

1. *Annona senegalensis* Leaves- Leaves are good strength food for human and horses. Flowers are used for flavouring food. Ripe fruits are edible and have a pleasant taste.
2. *Boerhavia diffusa* Leaves - The leaf is used occasionally as a course kind of pot-herb in soup.
3. *Dialum guineense* Seed kernel - Seed kernel powder is used as condiment.
4. *Napoleana vogelli* Fruit Pulp -Ripe fruit pulp and seed mucilage are sucked.
5. *Pentaclethra macrophylla* Seed Kernel – Kernel of cooked seed is sliced, washed and allowed to ferment a few days after which it is eaten as salad or used as condiment in other food preparations. The leaves and fruits are edible and are used as spice in soup and other foods all over Nigeria.
6. *Portulaca oleracea* leaves are used as vegetable.
7. *Trianthema portulacastrum* leaves are used as vegetable
8. *Uvaria chamae* Fruit pulp Ripe fruit is sweet and is widely eaten.

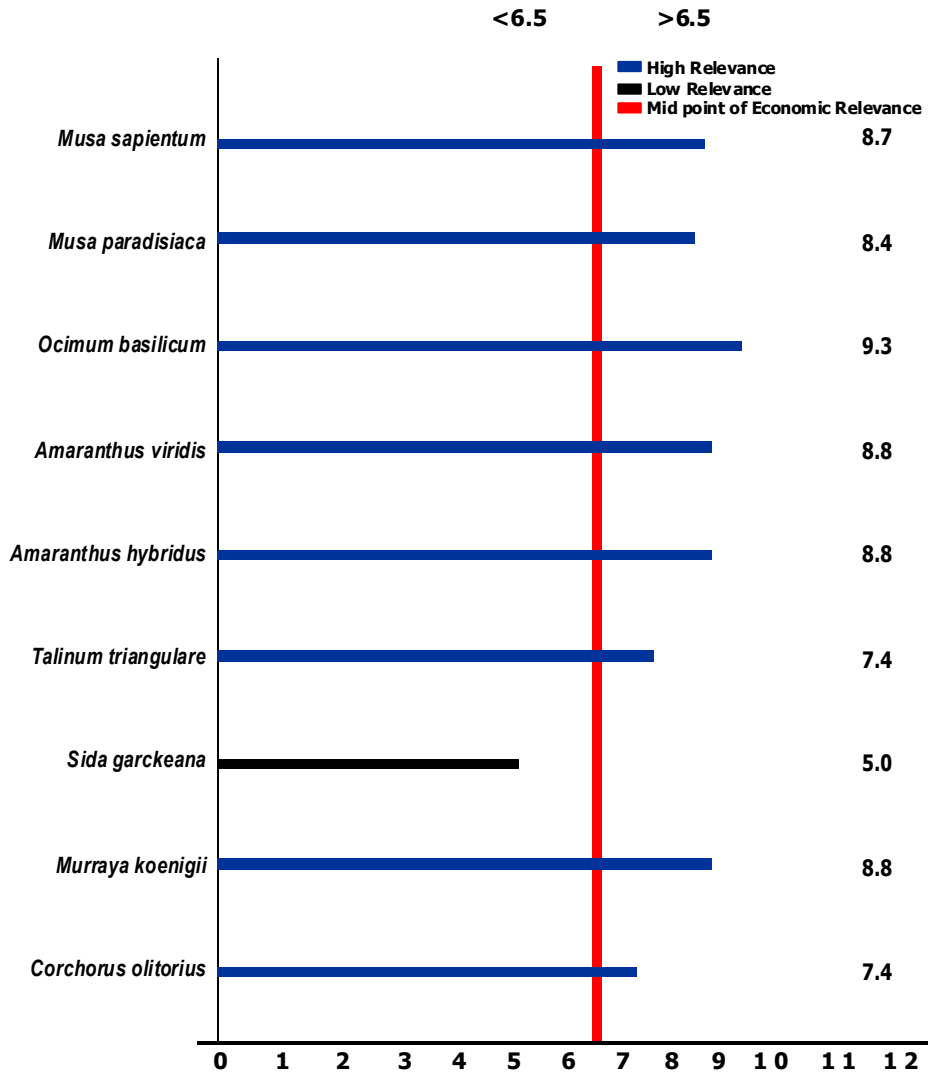


Fig. 5. Economic relevance of the more useful forbs



## 5. CONCLUSION

In terms of Economic relevance, useful plants of the world are often those having high indices of usefulness particularly with regards to industrial raw materials (Timber, pulp and paper, food, oils, textile, cosmetics, fabrics etc); medicinal products (drugs, vaccines, phytochemicals, herbal medicine etc); foods (Fruits, vegetables, energy and protein rich foods, oils, alcoholic and non-alcoholic beverages etc), to mention just a few. Most plant resources are also useful for income generation, soil protection, research purposes, ornamentals, plant fodder and fuel wood. Every plant has one use or the other. The plants of the Amawbia watershed were not an exception, the only constraint is poor biodiversity in terms of both quantity and quality, which was occasioned by uncontrolled degradation influences from man.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. The Nature Conservancy, Watersheds. USA. 2016;101.
2. New World Encyclopedia. Watershed/ Drainage basins. U.S.A 2009;2. Available:<http://www.newworldencyclopedia.org/entry/watershed> (Accessed, March.2011)
3. Oldfield S, Lusty C, Mackinven E. The world list of Threatened Trees. World conservation Press, Cambridge, UK. 1998;650.
4. Ayensu ES. Jungles. Marshall Editions Limited. London, U.K. 1980;176-195.
5. Burkill HM. The Useful Plants of West Tropical Africa. 2<sup>nd</sup> edition. families A-D. Royal Botanic Gardens, Kew, Great Britain. 1985;1:960.
6. Ibrahim G, Abdurahman EM, Katayal UA. Pharmacognostic studies. Nigerian Journal of National Products and Medicine. 2004; 08.8-10.
7. Ibewuiké JC, Abiodun OO, Bohlin L, Ogungbamila FO. Anti-inflammatory activity of selected Nigerian medicinal plants. Nigerian Journal of Natural Products and Medicine. 1997;01:10 -14.

© 2018 Chukwujekwu et al.; 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://www.sciencedomain.org/review-history/22916>