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Assessment of Plant Species Diversity and Benefits of Agroforestry Homegardens in Umuahia North Local Government Area, Abia State, Nigeria

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ABSTRACT

A field survey was conducted to assess plant species diversity of homegarden agroforestry system and its benefits to household in Umuahia North Local Government Area, Abia State, Nigeria. A multi stage sampling technique was used to select eighty households for data collection. Descriptive statistics such as mean, percentage, frequency distribution and table were used to analyze the data. A total of 72 plant species (40 woody and 32 herbaceous), belonging to 38 families were recorded. Fabaceae and Rutaceae were the most diverse among the woody species while in the herbaceous species, Solanaceae and Poaceae were the dominant families. Food production (89%) was the main benefit derived from the homegardens. Other benefits were shade (69%), medicinal and financial (68%), erosion control (24%) and beautification (43%). The result further revealed that homegarden practices pose some challenges. It was documented that 85% of the homegarden farmers have never been visited by extension agents. Agroforestry homegardens are hotspots for local plant species conservation. Some species recorded in the studied homegardens are in IUCN Red list as either vulnerable or near threatened. Adequate government initiative is vital to promote the development of the homegarden agroforestry system.

INTRODUCTION

Forests and the associated resources are vital to human existence because of their numerous important ecological and economic functions (Bhatt, 2022). Despite these functions, the forest estates have been exposed to serious encroachments, vegetation removal for agriculture, industrial development, urbanisation etc. These have led to the loss of forest biodiversity and also its vital ecological functions (Fasona *et al.*, 2020). The disappearance of the forests has more impact on the rural population whose livelihoods are economically and ecologically intertwined with forest. Fortunately, agroforestry homegardens have the potentials of producing some of the goods and services of the forest as well as conservation of forest plant species in deforested landscape (Tomar *et al.*, 2021). Agroforestry homegardens are regarded as in-situ germplasm conservation of indigenous plant species which are deliberately preserved (Kumar and Tiwari 2017). Protecting biodiversity

alongside food security is a vital key for achieving Sustainable Development Goals (SDGs) (Ortiz *et al.*, 2021).

Homegarden trees can improve livelihood of rural households by ensuring availability of food, fodder, medicine, fuelwood and timber (Mehari and Abera, 2019). Therefore, agroforestry homegardens are unique land-use systems involving the deliberate management of multipurpose trees and shrubs in intimate association with annual, perennial, and seasonal agricultural crops, and perhaps livestock within the area of land around the family home (Nair *et al.*, 2021). The agroforestry homegarden is one of the agroforestry practices with the most complex and diverse agroecosystem. It is ecologically sustainable and diversifies livelihood of local community (Asfaw *et al.*, 2015). A well-developed homegarden is a complete farming system. It is a low cost production system with a constant and relatively high productivity (Sharma *et al.*, 2022). The homegardens are small homestead holding with individual farm size between 0.1 - 0.5ha (Ijah *et al.*, 2020). In spite of the very small average size of the home gardens, they are characterized by a high species diversity that play the main agro-ecological roles of the homegardens (Galhena *et al.*, 2013).

Homegarden has a long tradition in many tropical countries. It is the most widespread and culturally practiced agroforestry system among the rural communities (Habtewold and Fekadu 2020). Homegardens are an integral part of local food systems in developing countries and enhance household food security and nutrition (Galhena *et al.*, 2013). It can serve as additional source of food and income (Habtewold and Fekadu, 2020). They show a promising option for biodiversity conservation and mitigation of ecosystem degradation. In some cases, they were found to be equally effective as natural forests in the conservation of tree species diversity (Terfassa, 2021). Hence, this study was purposely designed to take inventory of the various plant species in the homegardens of Umuahia North Local Government and their benefits to the owners.

MATERIALS AND METHODS

Study Area:

The study was carried out in Ibeku in Umuahia North Local Government Area (LGA) of Abia State, Nigeria. Ibeku is one of the two clans of Umuahia North LGA and lies between latitude 5° 54' N and longitude 7° 50' E. It has two major seasons, dry season and rainy season. It has an annual mean rainfall of 2, 278mm, with eight months of precipitation, which starts from early March to late October the rainfall is bimodal. The dry season is characterized with a period of short spell of dry/cool season referred to as harmattan (Ochege and Okpala-Okaka, 2017). The mean annual maximum temperature is 31°C with little daily variations. Mean daily insolation is 4.8 h (Ochege and Okpala-Okaka, 2017), while the mean relative humidity varies from 60 to 90% (Kalu *et al.*, 2012). Geologically, Umuahia is within the Benin formation which comprises of shale and sediments with intercalation of thin clay beds. It is a part of the coastal plain sands of the Cenozoic Niger Delta region of Nigeria (Nnaji *et al.*, 2019).

Sampling Procedure and Data Collection:

A multi stage sampling procedure was employed, which involved five stages. In the first stage, Umuahia North LGA was purposively selected out of the seventeen local government area in Abia State. The second stage also involved the purposively selection of Ibeku Clan out of the two clans of Umuahia North LGA. The third stage was the random selection of four sub-clans out of the seven sub-clans of Ibeku (Afara Ukwu, Ndume, Isieke and Emede). The fourth stage was the random selection of two villages from each of the four sub-clans, making eight villages in total (Umuana, Umuezeala, Okwuta, Ajata, Agbo, Odide, Isiama, Okwulaga). The data were collected using a well-structured questionnaire and individual discussion with the respondents. A total of eighty copies of the questionnaires were administered that is ten copies of the questionnaires per village.

Data Analysis:

The data collected from this study were subjected to descriptive statistical analysis. Descriptive statistics such as frequency distribution table, averages, and percentages were used to analysed the data collected.

RESULTS AND DISCUSSION

1 Socio-demographic Characteristics of Respondents:

i. Gender of Respondent:

In the study, a total of 74 individuals' (households) were interviewed, 53% were female while male was 47% (Table 1). Women have been reported to participate significantly in homegarden agroforestry systems and this is confirmed from the number of women interviewed. This report is in accordance with that of Aworinde *et al.*, (2013) in Nigeria and Bargali and Shahi (2015) in India. In homegardens, women play active roles in the planting and the maintenance of crops. Decisions on the choice of species to plant are mostly taken by women. They organize farm inputs such as seed, seedling and fertilizers. They are also involved in the rearing of livestock especially poultry (Islam, 2015).

Sex	Frequency	Percentage			
Male	35	47			
Female	39	53			
Total	74	100			
Common Eigld common 2002					

Table1: Frequency distribution of gender of respondents.

Source: Field survey, 2023

ii. Age:

Majority of the respondents (42%) were above 51 years, while 27% of the respondents were between the age range of 20-40 years, 26% were within the age range of 41-50 years and 5% were within the age group of 0- 20 years of age (Table 2). Majority of the farmers in the homegardens were within the working age range that possess the strength and energy needed to carry out all agronomical activities of home garden. This finding is in agreement with Ijah *et al.*, (2020) who reported that 95% of home gardeners in Rigachikun District of Kaduna State, Nigeria were within the working age group.

Age	Frequency	Percentage
0-20	4	5
20 - 40	20	27
41 - 50	19	26
Above 51	31	42
Total	74	100
0 511	2022	

Table 2: Frequency distribution of the age of respondents.

Source: Field survey, 2023

iii. Marital Status:

The marital status of the respondents in the study area, revealed that 72% of the respondents were married, 23% were Singles while 5% were widowed (Table 3). There were no divorcees.

Marital Status	Frequency	Percentage
Single	17	23
Married	53	72
Widowed	4	5
Divorcee	0	0
Total	74	100

Table 3: Frequency distribution showing the marital status of respondents.

Source: Field survey, 2023

iv. Level of Education:

All of respondents were literate but with different levels of education (Table 4). 49% of the respondents had only primary education, 40% had a secondary education while 11% had a tertiary education. This shows that 51% of the respondents had a post primary education. All of the homegarden owners were literate while majority had a post primary education. This is in accordance to the findings of Umar *et al.*, (2018) where majority of the farmers in homegardens of FCT Abuja were literate. When farmers are literate, the ability to comprehend and adopt new farming technologies and innovations that will result in high productivity is enhanced.

Tab	le 4: Frequency distri	ibution of the ed	ucational level	l of respondents.
	Educational level	Frequency	Percentage	
	5		10	

Educational level	Frequency	Percentage
Primary	36	49
Secondary	30	40
Tertiary	8	11
No-formal	0	0
Total	74	100

Source: Field survey, 2023

v. Occupation:

The various occupations of the respondents are shown in Table 5. The respondents were mostly traders (43%) followed by civil servant (34%). Farmers were the least respondents (23%). It can be deduced from the Table that 77% of homegarden farmers were not core farmers. The high percentage of other occupation who engage in homegarden when compared to farmers shows that the practice of agroforestry homegarden cut across other occupation not necessarily for farmers alone and this is in line with the report of (Ijah *et al.*, 2020) in Rigachikun District of Kaduna state, Nigeria. The engagement of other occupation in homegarden farming could be due to the fact that homegarden has significant impact on human livelihood. It supplies fresh fruits and vegetables as well as boosting household income from the sales of homegarden produce (Suwardi *et al.*, 2023).

Table 5: Frequency distribution of the occupation of respondents.

Occupation	Frequency	Percentage
Civil servant	25	34
Trader	32	43
Farmer	17	23
Total	74	100

Source: Field survey, 2023

2. Homegarden Establishment, Benefits And Challenges Encountered: i. Homegarden Establishment:

The studied homegardens were observed to have been established with seeds/seedling from different sources (Table 6). Most farmers purchased their seeds/seedlings from either the local markets (68%) or from Research Institutes (35%), some collected the seeds / seedlings free from

the forest (22%). Those who inherited the plants in their homegardens were 20%, while a small percentage of the farmers (15%) found the plants growing on the land and protected them.

The plant species found and protected in the homegardens may have been remnants of the natural forest that once covered the area (Eyasu *et al.*, 2020). They could also have been introduced by agents of disposal such as man, animals and explosive mechanism (Aworinde *et al.*, 2013).

Table	6:	Frequency	distribution	of	the	source	of	seeds/seedlings	of	plants	in	the
	ho	omegardens.										

Source of	Frequency	Percentage	
seeds/seedlings			
Found and protected	11	15	
Forest	16	22	
Inherited	15	20	
Market	50	68	
Research	26	35	

Multiple response Source: Field survey, 2023

ii. Benefits of Homegarden:

As presented in Table 7, 89% of the respondents practice home garden for food production. 68% of the respondents derived shade, medicinal and financial benefits. Erosion control and beautification benefits were derived by 24% and 43% of the respondents respectively. This study confirmed that homegardens play significant role in local food production, majority of the homegarden owners gave food production as one of their major benefits of the homegardens. This agrees with the work of Amenu (2017) in homegarden of Dawro, Ethiopia. An aspect of food production in homegardens is the almost continuous production that occurs throughout the year (Korpelainen, 2023). The combination of crops with different production cycles and rhymes result in relatively uninterrupted supply of food product (Mubashankwaya *et al.*, 2023).

Trees and shrubs in the homegarden provide not only food, but also medicine and some environmental services such as erosion control which are beneficial not only to the farm family but the community at large (Korpelainen 2023).

Table 7: Frequency distribution of respondents based on benefits derived from homegardens

Benefits	Frequency	Percentage
Shade	50	68
Medicinal and Financial	50	68
For food	66	89
Beautification	32	43
Erosion control	18	24

Multiple response Source: Field survey, 2023

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iii. Challenges Encountered:

Homegarden ownership poses no problem to majority of the respondents (60%) in terms of management (Table 8). The top 3 frequently encountered problems were attraction of snakes (12%), environmental factors such as wind thrown trees (10%), breeding of mosquito (8%). Pest and disease attack on the plants in the studied homegarden were found to be minimal (5%). Though a majority of the respondents ignore these challenges (66%).

Challenges Encountered	Frequency	Percentage
No problem	44	60
Snakes	9	12
Breeding mosquitoes	6	8
Pest & diseases attack on plants	4	5
Environmental factors	7	10
Threat of trees to houses & electric poles	2	3
Lack of farm inputs	1	1
Lack of improved varieties	1	1

Table 8: Challenges encountered in homegarden management.

Multiple response

Source: Field survey, 2023

Some solutions were proffered to these problems during the study (Table 9). The few problems encountered by the respondents are in accordance with the report of Islam (2015), in Bangladesh where homegardens owners experienced few problems such as limited access to finance, inadequate improved variety and environmental sustainability. The low pest/disease attack could be as a result of the stability of the homegarden agroecosystem, that promotes activities of natural enemies which in return control and maintain low pest population (Sudiono *et al.*, 2017). In addition, the diversity of plants in homegarden may encourage host-hiding. This is a situation where specific herbivores find it difficult to locate their host plant resulting in low infestation of pest (Parker *et al.*, 2013).

Table 9: Frequency distribution of the solutions of challenges in homegarden management by respondents

Solutions	Frequency	Percentage
Ignored	49	66
Chemical spray	6	8
Use of insecticides	3	4
Watering	1	1.4
Cutting down of tree	10	14
Pruning	5	7
Total	74	100

Source: Field survey, 2023

iv. Visitation by Extension Agents:

The frequency of visitation by extension agents is presented Table 10. Visitation of extension agents to homegardens was poor. Most of the respondents (85%) said they had never been visited by extension agents. The poor visitation of extension agents to homegardens is an indication of a dearth in research on the agroforestry homegardens. Despite of their significance, the agroforestry homegardens do not get the required attention in terms of research and extension support. Grants, utilization and marketing facilities are

also lacking (Galhena *et al.*, 2013). There are no measures specially aimed at improving the productivity of agroforestry homegardens.

Visitation	Frequency	Percentage
Monthly	3	4
Quarterly	3	4
Twice a year	3	4
Yearly	2	3
None	63	85
Total	74	100

Table 10: Frequency distribution of visitation of extension agents.

Source field survey, 2023

3. Crops and Animals Found in the Homegardens:

i. Plant Families in the Homegardens:

A total of 72 plant species (40 woody and 32 herbaceous), belonging to 38 families were recorded. Among the woody families in the homegarden, Fabaceae and Rutaceae were the most diverse having 5 species each (Table 11), these were closely followed by Euphorbiaceae and Annonaceae with 4 and 3 species respectively. Combretaceae, <u>Arecaceae</u>, Malvaceae, Burseraceae, Rubiaceae, Moraceae, Meliaceae, Anacardiaceae and Sterculiaceae were represented by 2 species each while the remaining families were represented by a species each.

In the herbaceous families, Solanaceae and Poaceae as shown in Table 11 were the most diverse having 4 species each. Cucurbitaceae and Zingiberaceae were represented with 3 species each, while Musaceae and Lamiaceae had 2 species each. The remaining herbaceous families were only represented with just a species each.

The 72 Plant species recorded in the homegardens of Umuahia North LGA, Nigeria, was comparable to 69 reported in Jabithenan District, Ethopia (Ewuketu *et al.*, 2014) but contrary to 120 plant species reported in homegardens of Southwestern Nigeria (Aworinde *et al.*, 2013). The high species diversity of the agroforestry homegardens produce food and a wide range of other products such as firewood, fodders, spices, medicinal plants and ornamentals and this high species diversity play the main agro-ecological roles of the agroforestry homegardens (De Zoysa, 2022)

The dominance of Fabaceae, Poaceae, Rutaceae, Solanaceae and Euphorbiaceae is in accordance with the report of Beyene *et al.*, (2018) where Fabaceae, Rutaceae, Poaceae and Curcubitaceae were the dominant species in homegardens of Bulen District Northwest Ethiopia. Similarly, Aworinde and Erinoso (2013) reported Euphobiaceae, Solanaceae, Rutaceae, Malvaceae, Fabaceae and Poaceaas the most represented species in homegardens of Odeda Iga in Nigeria. The dominance of these species could be due to the fact that their families contain species that are important sources of food, medicine and spices (Regassa, 2016; Shavanov, 2021). They provide highly nutritious food that are important for human existence. The Fabaceae (Leguminosae) family for example is well known for providing traditional or ethnic food and medicine (Maroyi, 2023; Raj *et al.*, 2023). The leaves of *Pterocarpus mildbraedii* are used as vegetables for local food preparation among the indigenous people of Umuahia likewise the seeds of *Pentaclethra macrophyla*, *Afzelia africana*. In the studies carried out by Odeyemi *et al.*, (2018) *Brachystegia eurycoma* was reported as condiments for food.

Plant Family	Woody	Herbaceous
Anacardiaceae	2	-
Amaranthaceace	-	1
Annonaceae	3	-
Arecaceae	2	1
Asclepiadaceae	-	1
Asphodelaceae	-	1
Asteraceae	1	-
Bignoniaceac	1	-
Bromeliaceae	-	1
Burseraceae	2	-
Combretaceae	2	-
Convolvulaceae	-	1
Cucurbitaceae	-	3
Caricaceac	-	1
Dioscoreaceae	-	1
Euphorbiaceae	4	-
Fabaceae	5	1
Gnetaceae	-	1
Irvingiaceae	1	-
Lamiaceae	-	2
Lauraceae	1	-
Malvaceae	2	1
Meliaceae	2	-
Moraceae	2	-
Myrtaceae	1	-
Passifloraceae	-	1
Poaceae	-	4
Polygalaceae	-	1
Portulacaceac	-	1
Rubiaceae	2	-
Rutaceae	5	-
Sapotaceae	1	-
Solanaceae	-	4
Steculiaceae	2	-
Tiliaceac	-	1
Zingiberaceae	-	3

Table 11: Frequency distribution of Herbaceous plant families and their species

Source: field survey, 2023

ii Plants Found in Homegarden:

The various plants found in the studied homegardens were categorized into arable crops, vegetables horticultural fruit trees, forest plants, and spices. The frequency of occurrence of arable crops across the homegardens is presented in Table 12. *Capsicum chinense* (73%), *Abelmoschus esculentus* (68%), *Manihot esculenta* (55%) and *Colocasia esculenta* (54%) were the topmost frequently occurred plants while *Arachis hypogaea* (11%) and *Colocynthis citrullus* (12%) were the least frequently occurred plants. In the vegetable category, the species frequency distribution in decreasing order (Table 13) were *Telfairia occidentalis* (89%), *Vernonia amygdalina* (77%), *Talinum triangulare* (66%), *Pennisetum*

purpureum (17.9%), *Amaranthus hybridus* (53%). *Cymbopogon citratus* (73%) was the highest frequently appeared plant among the spices (Table 14), this was followed by *Aloe barbadensis* (67%) while *Ocimum gratissimum* (26%) was the least appeared plant across all homegardens.

Name of species	Common name	Local name	Frequency	Percentage
Capsicum chinense	Pepper	Ose	54	73
Abelmoschus esculentus	Okra	Okwuru	51	69
Solanum lycopersicum	Tomato	Oburu	22	30
Ipomoea batatas	Sweet.potato	Ji nwannu	19	26
Solanum aethiopicum	Garden.egg	Anyara	22	30
Manihot esculenta	Cassava	Akpu	41	55
Colocasia esculenta	Cocoyam	Ede	40	54
Colocynthis citrullus	Egusi	Egusi	11	15
Arachis hypogaea,	Groundnut	Ahuekere	12	16
Dioscorea esculenta	Yam	Ji	33	45

Table 12 : Frequency distribution of arable crops found in the homegardens.

Multiple response

Source: field survey, 2023

Table 13 : Frequency distribution of vegetables found in the homegardens.

Name of species	Common name	Local name	Frequency	Percentage
Telfairia occidentalis	Pumpkin	Ugu	66	89
Vernonia amygdalina	Bitter.leaf	Onugbu	57	77
Pennisetum purpureum	Elephant grass	Achara	47	64
Talinum triangulare	Water.leaf	Mgbolodi	49	66
Amaranthus hybridus	Green	Akwukwogirin	39	53

Multiple response

Source: field survey, 2023

Table 14 : Frequency distribution of spices found in the homegardens.

1 2	1		0	
Name of species	Common name	Local name	Frequency	Percentage
Aloe barbadensis	Aloe vera	Akwarata	42	57
Cymbopogon citratus	Lemon grass	Atabekee	54	73
Murraya koenigii	Curry	Akwukwo curry	39	53
Ocimum gratissimum	Scent leaf	Nchanwu	19	26

Multiple response

Source: field survey, 2023

Table 15, shows the frequency of occurrence of the forest plants species. The five topmost frequently occurred species in decreasing order were *Dacryodes edulis* (55%), *Pterocarpus mildbraedii* (54%), *Gongronema latifolium* (41%), *Chrysophyllum albidum* (32%) and *Carpolobia lutea* (32%). *Aframomum melegueta* and *Rothmannia hispida* were the least frequently appeared species (1%). Among the timber species across the homegardens, *Milicia excels* (12%) and *Triplochiton scleroxylon* (12%) were the most dominant species.

Name of species Common name		Local name	Frequency	Percentage
Aframomum melegueta	Aligator pepper	Oseoji	1	1
Azadirachta indica	Neem	Dogoyaro	3	4
Brachystegia eurycom	African Teak	Achi	10	14
Canarium schweinfurthii	African Elemi	Ube.npkulaku	3	4
Carpolobia lutea	African Birch	Oziza	24	32
Ceiba pentandra	Kapok tree	Ubulu	4	5
Cola nitida	Kola	Oji	12	16
Dacryodes edulis	Native pear	Ube	41	55
Dennettia tripetala	Pepper fruit	Mmimmi	13	18
Dialium guineense	Velvet tamarind	Icheku	10	13
Discoclaoxylon hexandrum	Bush apple	Odu	1	1
Gacinia kola	Bitter cola	Akilu	6	8
Gambeya albida	Star apple	Udara	24	32
Gongronema latifolium	Sodom apple	Utazi	30	41
Irvingia gabonensis	Bush mango	Ugiri	14	19
Khaya ivorensis	Mahogany	Onu	3	4
Markhamia tomentosa	Markhamia	Ogirisi	5	7
Milicia excels	Iroko	Oko	9	12
Newbouldia laevis	Newbouldia	Abosi	4	5
Pentaclethra macrophylla	Oil bean	Ugba	13	18
Plukenetia conophora	African walnut	Ukpa	5	7
Pterocarpus mildbraedii	Ogege	Oha	40	54
Ricinodendro heudelotii	African Plum	Ukwu	2	3
Rothmannia hispida	African beautyberry	Uli	1	1
Terminalia ivorensis	Afara	Idigbe	4	5
Treculia africana	Bread fruit	Ukwa	3	4
Triplochyton scleroxylon	Obeche	Ofor	9	12
Xylopia aethiopica	Guinea pepper	Uda	4	5

Table 15: Frequency distribution of forest plant species found in the homegardens.

Multiple response

Source: field survey, 2023

The five most dominated species in the horticultural fruits category (Table 16) were *Musa paradisiaca* (78%), *Carica papaya* (77%), *Psidium guajava* (64%), *Citrus sinensis* (55%) and *Theobroma cacao* (53%). *Ananas comosus* (5%) was the least appeared plants across all study sites.

The studied homegardens were rich with various food plants such as fruits, vegetables roots, tubers and spices. This is in agreement with Oladele *et al.*, (2020) in Igbabi, Nigeria where the homegardens were composed mainly of staple food crops, vegetables, fruits and spices.

The primary function and role of most, if not all of the agroforestry homegardens is food production. A well-developed agroforestry homegarden can provide families with virtually all the staple and non-staple foods they need, such as fruits, vegetables, legumes, tubers and roots crops as well as spices (Amenu, 2017).

The high representative of Iroko and Obeche among the timber species found in the homegardens could be as a result of farmers' desire to plant and retain important woody species of the forest in the homegarden. This indicates that agroforestry homegardens could serve as an alternative habitat for growing and conserving indigenous woody species. This

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is supported from the findings of Eyasu *et al.*, (2020) in Northern Ethiopia where the woody species composition of the homegarden agroforestry systems were similar to the adjacent natural forest.

Some species of conservation concern on the International Union for Conservation of Nature Red List were found in the studied homegardens, these include vulnerable species such as *Garcinia kola* and *Khaya ivorensis as well as near threatened species like Milicia excelsa, Chrysophyllum albidum and Irvingia gabonensis* (IUCN, 2023). Hence, the abundance of *Milicia excelsa* in homegardens of Umuahia North is a plus to the homegarden agroforestry system. this further buttress the fact that agroforestry homegarden could be used as a tool for the conservation of threatened and endangered plant species of the natural forest.

Name of species	Common name Local name		Frequency	Percentage
Musa paradisiaca	Plantain	Unere	58	78
Carica papaya	Pawpaw	Okwurubekee	57	77
Persea Americana	Avacado pear	Ube bekee	32	43
Psidium guajava	Guava	Gorova	47	64
Terminalia catappa	Indian Almond	Ebelebo	10	14
Citrus sinensis	Orange	UjiriOroma	41	55
Citrus reticulate	Tangeline	Oroma	16	22
Annona muricata	Sour-sop	Ogbaka nti	31	42
Citrus latifolia	Lime	Uyirinta	9	12
Passiflora edulis	Passion fruit	Mkpuru osisi	15	20
Ananas comosus	Pineapple	Akwuchukwu	4	5
Elaeis guineensis	Oil palm	Nkwu	29	39
Cocos nucifera	Coconut	Aki bekee	30	41
Theobroma cacao	Cocoa	Kokwo	39	53
Saccharum officinarum	Sugarcane	Achara mmako	17	23
Mangifera indica	Mango	Mangoro	24	32
Anacardium occidentale	Cashew	Canshu	34	46
Citrus paradise	Grape	Osan nla	16	22

Table 16: Frequency distribution of horticultural fruits found in the homegardens.

Multiple response

Source: field survey, 2023

ii. Animals in the Homegadens:

The respondent in the studied homegardens also rear animals. Poultry was found to be the most practiced by majority of the respondents (43%) (Table 17), while livestock (goat/sheep) was 16%. Beekeeping (8%) was more practiced than snailery and fishery (4%). The high integration of poultry compared to other animals could be due to the fact that free range poultry requires less space and is less capital intensive. The incorporation of animal production into home gardening further boosts the food and nutrition security for the households as milk, eggs, and meat from animals raised in the homegarden are good sources of protein (Kenneth-Obosi *et al.*, 2019).

Animal husbandry	Frequency	Percentage
Snailery	3	4
Beekeeping	6	8
Fishery	3	4
Livestock	12	16
Poultry (free range)	43	58

 Table 17: Frequency distribution of respondents based on animal husbandry practiced in homegardens.

Multiple response

Source: field survey, 2023

Conclusion

This study supported the fact that homegarden agroforestry systems are hotspots for local plant species diversity. They could be crucial in conserving forest species diversity. The major significant benefit of the homegarden which is food production was also evident in this study. In addition to food production the agroforestry homegardens also provide some socioeconomic and environmental benefits.

In spite of these benefits, this age long agroforestry system, do not get the required attention in terms of research and extension support. Grants, utilization and marketing facilities are also lacking. Adequate government initiative is vital to encourage research, promote tree planting and provide credit facilities, improve varieties of planting stocks to families of homegarden agroforestry system. Secondly, the government should encourage the establishment and development of homegarden agroforestry system through distribution of free tree seedlings as part of the biodiversity conservation strategy.

Extension agents should be mobilized by the Forestry and Agricultural Ministries to the honegardens in the communities. Regular visits of extension agents will help in addressing some of their challenges and also educate them on fundamental scientific principles of homegaden agroforestry systems.

Declarations:

Ethical Approval: Ethical considerations are not necessary as no plant, animal or human subjects were recruited for the current study.

Conflict of interest: The authors declare no conflict of interest.

Authors Contributions: I hereby verify that all authors mentioned on the title page have made substantial contributions to the conception and design of the study, have thoroughly reviewed the manuscript, confirm the accuracy and authenticity of the data and its interpretation, and consent to its submission.

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