Contribution of plant species in homestead farms, to food security and sustainability in Ebonyi state – Southeastern Nigeria.

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A three Agricultural Zone (Abakaliki, Afikpo and Ohoazzara) exploratory survey of useful plant species in three compound farms in 12 communities in Ebonyi State of Nigeria was conducted to develop a plant species inventory study so as to assess the contribution of plant species in homestead farm to food security and stability in the State. A total of 156 different plant species including 63 woody plant species (exploited, unexploited and endangered) which yield edible fruits, seeds or vegetables, 36 boundary and live fence plant species and 57 different arable and other field crops (legume, cereal, vegetable, spice, herb) were identified in the 12 communities. These communities were classified into three identifiable settlement patterns: nucleated, isolated and dispersed settlements; and the survey revealed that the three settlement patterns had average number of plant species of 79.8, 88.3 and 80.1 respectively. Fifteen (15) plant species of most considerable value have been seen in all the communities visited. Twelve (12) plant species were considered endangered, having been found only in three communities visited while many plant species not exploited were also observed in all the communities. Study therefore revealed that isolated and dispersed settlement patterns produced the highest plant species that are environmental friendly and conservative and as such should be improved for increase food security and stability.

Key words: Homestead farms, plant species, food security, sustainability.

INTRODUCTION

The demand for food is on the increase globally and scientists have come up with many systems of farming to boost food supply. Food crops are grown either on a large scale under farming conditions or as a small scale in a garden near a home. Compound or homestead farms in several countries of tropical Africa have become an increasingly important sub-system of traditional agricultural farming systems (IITA, 1985; Meregini, 2005).

Homestead or compound farms have been described as multi-layered stands of annual and perennial plants adjoining living houses and managed sometimes with some small livestock, by household labour for food, cash incomes, social and cultural needs of the family, all of which play strategic nutritional roles (Okigbo, 1990; IITA, 1985). Compound farm used interchangeably with homestead farm or home garden refers to similar farm production (Fernandez and Nair, 1990), which are fairly stable agro-ecology systems of varying complexity, help to minimize seasonal periods of food shortages. At the same time, they ensure reasonable levels of productivity for variety of foodstuff with very little or no risk of crop failure (IITA, 1985). Apart from food production as the
primary function of most compound farms, it constitute also the function of providing fuel wood, timber (Meregini, 1999; Fernando and Nair, 1990), wind breakers, feed (in the form of fodder for livestock) and erosion control measures. Home garden in urban settings provide nutrition and income, often to those most in need and at low cost to the gardener. The gardens are valuable, even indispensable, to many urban households (Vasey, 1990). The plant species (herbaceous, woody and creeping) propagated is always mixed, but the vegetation forms a multi-storeyed canopy, favorably placed to exploit the above and below ground environmental resources at different layers. The multi-storeyed structure and the wide range of species allow almost complete coverage of the soil by the plant residues while refuse obtained from waste of plants and animals are also used in maintaining the soil fertility (Altieri, 2005; Beetz, 2002). The homestead farm is a common practice in Ebonyi State and has been seen to be a vital tool of increasing food supply with less effort and at a reduced cost. Against this background, this survey was carried out to identify and categorize existing woody plants in association with food crops in selected compound farms within the densely and sparsely populated areas in Ebonyi State. It was also aimed at understanding their composition, structure, interactions among components, nutrition, economic and overall socio-cultural importance of compound farms in the communities.

MATERIALS AND METHODS

Location of the study

A three exploratory survey of three Agricultural Zones that make up Ebonyi State of Nigeria was undertaken. Three compounds were visited in each of the 12 randomly selected communities in the three zones (Abakaliki, Afikpo and Ohaozzara) surveyed. Plant species in compound farms in the South-Eastern Nigeria appraisal as outlined by Meregini (1999) were adopted for the survey. In the areas visited, most homestead farms had mixtures of trees and shrubs (fruits, seeds, leaves, nuts or fire woods), annual crops, many varieties of vegetables and ground covering plants, and these plants are grown together to make the best use of the small space available with small livestock inclusive (mostly free range).

Features of homestead in the study area

In the study areas, some compounds had ranges of 3 - 5 households occupied by the man, his wife/wives, children and others living as subordinates to them, separated by live fence mainly at the backyard. The compound farm comprised both undeveloped and planted-up land by members of the family. The population density in the communities studied ranged from 500 to 2,000 persons per km² (Nigerian National Population Commission, 1991) and the land area was dominated by plains 200 m above sea level (Meregini, 1999). The soil is hydromorphic, poorly drained with percentage slope between 1-2% (Lekwa et al., 1995). The soils were characterized by deep porous sandy soils derived from sandy deposits in some zones. The soil in the study area is generally characterized with clayed loam soil that is easily prone to water logging, hard-pan that dries up and capped easily. These zones (Abakaliki and Afikpo) possess red and brown soils derived from sand stones and shale (Unamma et al., 1985). The vegetation of the area is within the derived savanna of the South-Eastern Nigeria, with a tropical wet and dry climate having annual temperature and rainfall of about 29°C and 13510 mm, respectively (FCAI, 2003; Mbagwu, 2001).

The compound farm size ranged from one quarter to slightly less than two hectares. The size of the compound tended to cluster around 20% of the total cultivated farm area (IITA, 1999).

The compound farms in some communities in the area visited were densely located along roads and paths in relation to associated field in the traditional farming system (Figure 1).

Identification guidelines

In the study area, identification of the limits of the compound farms including any fence or boundary planting separating adjoining farm or other fields where applicable were carried out. Identification of the plant species and their utility classes within the compound farms, stratification of the farm to highlight strata with varying percentage of trees, shrubs and annuals (exploited, unexploited and endangered species) crops and recording of the local names, uses of the plants and mode of propagation were carried out. Plant species were identified by a Botanist and Taxonomist working with the Federal College of Agriculture, Ishiagu, Ebonyi State, Nigeria.

RESULTS AND DISCUSSION

Settlement patterns and species distribution

The distribution of compounds and the existence or otherwise of readily identifiable compound farm space for each compound in each community in the study area were grouped under the following settlement pattern:

Nucleated settlement

Compounds and houses, and household lived along roads and paths and houses backing each other with no readily identifiable compound farm space (Figure 1). The entire settlement was surrounded by fruit trees. This agrees with the finding of Meregini (1999) who stated that compounds and houses aggregated back to back with no identifiable farm space for each household; the settlement surrounded by a narrow belt of fruit trees owned by different persons from different household. In this settlement however, it was observed that tree shrubs and agricultural crops were deliberately used for several purposes simultaneously. Adebagbo (2000) describe as multipurpose system farming as where animal inclusions are allowed to graze in the field.

Isolated settlement

Compounds and houses were found separately from one another in compound farms. The compound farms are easily identified as separated by some natural barriers such as valleys, and flood plains. In the shelter of trees and crops, animal can benefit from both the forage
production and the protection afforded them by the shade which reduces stress (Adebagbo, 2002; Baumer, 1990).

**Dispersed settlement**

In the study area, compounds and houses were found in separate places with each compound or household separated from one another by a recognizable compound farm with live or dead fences. In some cases, it was observed that most compounds or household where separated by flood plains where most farms operations are carried out for annual cropping (Figure 1).

**Distribution of identified plant species:**

The number of the different species of plants identified in the settlement pattern of different communities visited is shown in Table 1. Based on the distribution of compound farms, Afikpo agricultural zone, in both nucleated and dispersed settlement pattern, was observed to produce the highest total plant species (124 and 111 with mean of 31); comprising of woody plant species ranging from 11 - 18, 3 - 5 lives fence species and 11 - 17 food crop species, respectively while Ohoazzara zone produced the lowest total plant species (90 - 99) ranging from 2 - 11 woody plants, 2 - 7 live fence and 9 - 17 arable crop species. However, in isolated settlement pattern identified, Ohoazzara zone produced the highest plant species. (117) ranging from 7 - 18 woody plants, 2 - 8 live fence and 10 - 14 arable crop species, while Afikpo produced the lowest plant species (112) ranging from 9 - 18 woody plants, 2 - 8 live fence, and 10 - 16 arable crop species.

Homestead farming in the study area shows a typical integrated farming system, based upon the technique of agroforestry systems with the woody species interacting temporally and spatially with food (arable) and other crops and livestock.

These trees and shrubs are retained on the farm because of their economic importance such as fruits, fire...
Table 1. Identified Species in the Different Settlement Patterns in the three Zones.

| Settlement Pattern | Agric Zone | Communities | WPS | LFS | TCS | Total | Mean |
|--------------------|------------|-------------|-----|-----|-----|-------|------|
| Nucleated          | Abakaliki  | Abomege     | 12  | 2   | 9   | 105   | 2.63 |
|                    |            | Iboko       | 11  | 5   | 12  |       |      |
|                    |            | Ngbo        | 9   | 3   | 10  | 15    |      |
|                    |            | Amagu       | 15  | 9   | 18  |       |      |
|                    | Afikpo     | Oso Edda    | 18  | 3   | 13  |       |      |
|                    |            | Amagbara    | 13  | 4   | 11  |       |      |
|                    |            | Amaezu      | 11  | 5   | 17  | 124   | 31   |
|                    |            | Ukpa        | 13  | 3   | 13  |       |      |
|                    | Ohoazzara  | Ishiagu     | 6   | 3   | 13  |       |      |
|                    |            | Uburu       | 4   | 2   | 9   |       |      |
|                    |            | Isu         | 11  | 7   | 10  | 90    | 22.5 |
|                    |            | Onicha      | 8   | 3   | 14  |       |      |
| Isolated           | Abakaliki  | Abomege     | 6   | 4   | 12  | 114   | 28.5 |
|                    |            | Iboko       | 12  | 6   | 9   |       |      |
|                    |            | Ngbo        | 9   | 3   | 10  |       |      |
|                    |            | Amagu       | 17  | 8   | 18  |       |      |
|                    | Afikpo     | Oso Edda    | 9   | 4   | 15  |       |      |
|                    |            | Amagbara    | 14  | 2   | 14  |       |      |
|                    |            | Amaezu      | 18  | 3   | 16  | 112   | 30.5 |
|                    |            | Ukpa        | 12  | 5   | 10  |       |      |
|                    | Ohoazzara  | Ishiagu     | 14  | 2   | 10  |       |      |
|                    |            | Uburu       | 7   | 6   | 14  |       |      |
|                    |            | Isu         | 11  | 4   | 11  | 117   | 21.3 |
|                    |            | Onicha      | 18  | 8   | 12  |       |      |
| Dispersed          | Abakaliki  | Abomege     | 3   | 2   | 10  | 10    |      |
|                    |            | Iboko       | 8   | 5   | 11  |       |      |
|                    |            | Ngbo        | 10  | 7   | 14  | 110   | 27.5 |
|                    |            | Amagu       | 15  | 7   | 18  |       |      |
|                    | Afikpo     | Oso Edda    | 12  | 3   | 15  |       |      |
|                    |            | Amagbara    | 14  | 2   | 10  |       |      |
|                    |            | Amaezu      | 9   | 5   | 16  | 111   | 27.8 |
|                    |            | Ukpa        | 9   | 3   | 13  |       |      |
|                    | Ohoazzara  | Ishiagu     | 6   | 2   | 15  |       |      |
|                    |            | Uburu       | 8   | 5   | 17  |       |      |
|                    |            | Isu         | 2   | 5   | 12  | 99    | 24.8 |
|                    |            | Onicha      | 8   | 3   | 16  |       |      |

WPS = woody plant species; LFS = live fence species; TCS = total crop species.
stock feeds (fodder) and in the control of soil erosion and soil fertility.

**Various plant species identified in the study area**

Homestead farms surveyed in the three Agricultural zones had a total of 156 various plant species. These plant species identified ranged from woody plant species to arable crop species that are planted and/or protected for a variety of purposes in the compound farms. The number of plant species identified in any one compound ranged from 1 to 20 frequency rating, and a core of 20 species were observed at high frequencies on the majority of homestead farms (Table 2). The different woody species are mainly used as food, timber and firewood, some of which are unexploited. Thirty six (36) other different woody plant species used primarily for fence, hedge-grow and boundary demarcation were also identified. Meregini (1999) had earlier identified woody plant species used for fence and boundary demarcation in compound farms in Imo, Abia and Ebonyi State compound gardening. Fifty seven (57) different arable and other field crops including root and tuber crops, leguminous crops, cereals, vegetable species and herbs were identified (Table 2). These species constitutes mostly indigenous species and few exotic species introduced into the farms. Ogbu et al. (2007) and Ekundaya (2007) had earlier observed that species in compound farms play crucial roles in the culture of most people. Some are taken raw as fruits for refreshment, others as seasoning agents for cooking, and some as supplements in traditional herbal (medicine) preparation. Among the total number of plant species identified, 15 were classified as species of most considerable values because they were observed in all the communities.

**Unexploited plant species**

Many useful plant species identified in the area were unexploited in some communities visited. These species grow wild and sometimes used as fuel wood for woody species (Table 3). Okpeke (1987) earlier stated that there are many tree species in the tropics which are potentially useful but still remain unknown to the international market and are not exploited. Attention has not been given to these useful plant species to fully utilize their resources. Many compound farmers have known the values of some of the plant species but they do not pay adequate attention to increase and improve on their production. Some of these species occur naturally and are incorporated into the homestead. However, due to inappropriate technique in propagation, lack of knowledge and lack of market demand, less attention is given to the species.

**Endangered plant species**

The survey conducted revealed other plant species in the communities visited as endangered species (Table 4). Twelve (12) plant species were observed as endangered. Meregini (1999) stated that, these are plant generic resources which could be lost readily if attempts are not made to conserve them. These plant species have potential values but farmers do not have the knowledge of maintaining, multiplying and managing them and as such much attention is not given to these species of plant. This could be as a result of long gestation period, extensive height or size at maturity, non-availability of planting space and lack of knowledge or appropriate propagation technique (Meregini, 1999). The demands for the products from some of the endangered species were observed to be low, and some were lost through deforestation especially those in the wild state. On the other hand, some endangered species and other plant species found in the area visited notwithstanding stand as a mean of halting the vicious cycle of deforestation, soil erosion control and other environmental problems facing the ecological zones of the farming settlements.

**Conclusion**

Homestead farms in a traditional concept has been modernized to agroforestry systems that integrate crops and/or livestock with trees and shrubs (Beetz 2002), that is associated with continuous availability of a variety of fresh food materials almost all the year round. Homestead farms were seen to be possible, resulting in biological interactions that provide multiple benefits including diversified income sources, increased biological production and improved habitat for both humans and wildlife. The adoption of homestead farm is to increase the economic stability and has been identified to be highly sustainable both in food security and in ecological balance of the environment, through the interaction existing between various plant species, the environment and the livestock.

From the survey, it was observed that a well designed and structured compound farm will increase higher standard of living and food security, and as such policies on settlement scheme will help in self-reliance and food sufficiency production and decent technology on ecological stability, protection and conservation. The distribution and species composition of most of the compound farms visited in the survey are largely comparable with most compound farms in some other parts of the country including Abia, Imo and Anambra States (Meregini, 1999; IITA, 1985; Okigbo, 1990). The analysis of homestead farms revealed the growing adoption of agroforestry among some of the communities with sustained environmental and economic benefits. There is the need to build upon the success stories in the communities in order to minimize the problems of poverty, food insecurity and environmental degradation. The paper offered recommendations based upon education and research, to rehabilitate homestead farms. It is believed that settlement pattern that allows for substantial room for compound farming may be more progressive and sustainable.
Table 2. Plant species of considerable values.

| Specie                        | Common Name            | Local Name | FR | PU       | PM       |
|-------------------------------|------------------------|------------|----|----------|----------|
| Magnifera indica             | Mango                  | Maguru     | 6  | Edible   | Seed     |
| Pterecapus soyanlon*         | Pterecapus*            | Oha        | 15 | Edible   | stem     |
| Irvingia gabonensis          | Bush mango*            | Ogbono     | 9  | Edible/seed | Seed   |
| Treculia africana            | Bread fruit*           | Ukwu       | 6  | Edible   | Seed     |
| Pentacletha macrophylla      | African oil bean       | Ukpaka     | 4  | Edible   | Seed     |
| Cocos nucifera               | Coconut                | Akibekee   | 3  | Edible   | Nut      |
| Elaeis guineensis            | Oil palm               | Nkwu       | 6  | Edible/seed | Kernel/seed |
| Raphia hockeri               | Raphia palm            | Ngwo       | 2  | Palm wine | seed     |
| Dicrypedes edulis            | Native pear/bush butter| Ube        | 9  | Edible   | seed     |
| Dennettia tripetala          | Pepper fruit           | Mnimi      | 1  | Edible/seed | Seed   |
| Carica papaya                | Pawpaw                 | Mgbirimgbi/Okwu bekee | 20 | Edible fruit | seed |
| Citrus sinensis*             | Orange*                | Oroma/Epe  | 10 | Edible   | seed     |
| Cola nitida                  | Cola                   | Oji        | 3  | Edible   | Seed     |
| Musa Spp AAA                 | Banana                 | Unene      | 9  | Edible   | Sucker   |
| Musa Spp AAB                 | Plantain               | Jiloko/Abriza | 7 | Edible   | Sucker   |
| Psidium guajava              | Guava                  | Gwova      | 3  | Edible   | Seed     |
| Afzelia racemosa             | Mahorgamy              | Akparata    | 5  | Edible   | Seed     |
| Baffia nitida                | Baffia                 | -          | 8  | Live fence | Stem cutting |
| Langenaria sinceraria        | Calabash               | Akpuroba   | 3  | Live fence /pot | Stem cutting/seed |
| Jatropha curcas              | Jatropha/Physic nut    | -          | 10 | Live fence | Stem cutting |
| Markhamia tomentosa          | -                      | Okeogirisi | 7  | Live fence | Stem cutting |
| Newbouldia laevis            | -                      | Ogoriri    | 9  | Live fence | Stem cutting |
| -                             | -                      | Nmingina   | 3  | Live fence | Stem cutting |
| Spondia mombin               | Plum tree              | Ijikara    | 10 | Live fence | Stem     |
| Oryza sativa*                | Rice                   | Osikapa    | 20 | Edible grain | Seed |
| Abielmoschus esculentus*     | Okra                   | Okwuru     | 20 | Edible fruit | Seed |
| Allium cepa                  | Onion                  | Ayabasa    | 6  | Edible bulb | Bulb    |
| Allium sativum               | Garlic                 | Ayabasa oyibo | 1 | Edible Leaf/bulb | Bulb |
| Vernonia amygdalina*          | Bitter leaf            | olugbu     | 8  | Edible leaf | Stem cutting |
| Amaranthus hybridus           | Green                  | Inine      | 7  | Edible leaf | Stem cutting |
| Talinum triangulare          | Waterleaf              | -          | 1  | Edible leaf | Stem cutting |
| Telfairia occidentalis*      | Fluted pumpkin         | Ugu        | 10 | Edible   | Leaf/Seed |
| Cucurbita maxima*            | Pumpkin                | -          | 5  | Edible Leaf/Fruit | Seed |
| Solanum melongena            | Egg plant              | Aghara     | 7  | Edible Leaf/Fruit | Seed |
| Ricinus communis             | Castor oil             | Ogiri      | 7  | Edible Seed/Oil | Seed |
| Zea mays*                    | Maize                  | Oka        | 10 | Edible seed | Seed     |
| Cola pachycarpa              | Monkey cola            | Achicha    | 1  | Edible fruit | Seed |
| Colocasia esculentus          | Cocoyam                | Ede ofe    | 7  | Edible corn | Corn/cormel |
| Dioscorea rotunda*           | White Yam              | Jiocha     | 10 | Edible stem | Stem tuber |

FR = Frequency rating; PU = part used; * most considerable value; PM = propagation material.
Table 3. Unexploited/Low rating plant species.

| Specie             | Common Name | Local Name | FR | PU               | Status |
|--------------------|-------------|------------|----|------------------|--------|
| Cola edulis        | Tree walnut | Udi        | 1  | Edible seed      | B      |
| Brachystegia eurycoma | Bay plant  | Achi       | 2  | Edible seed*     | W      |
| Dennettia tripetala | Pepper fruit| Mmimi      | 1  | Edible fruit/seed | C      |
| Buchoxia carnacea  | -           | Uke        | 1  | Edible seed*     | W      |
| Cola lepidota      | Monkey cola | Ochicha    | 2  | Edible fruit     | B      |
| Garcinia cola      | Bitter cola | Akilu      | 2  | Edible seed      | B      |
| Pleukenctia conophorah | Climbing walnut | Ukpa   | 1  | Edible seed      | B      |
| Aframomum melegueta | Alligator pepper | Ose oji   | 2  | Edible seed      | B      |
| Piper guineense    | Black pepper| Uziza      | 2  | Edible leaf/seed | W1     |
| Murraya koenigii   | Curry leaf  | Curry      | 2  | Edible leaf      | C1     |
| Phaseolus vulgaris | Beans       | Akidi      | 2  | Edible leaf/seed | C      |
| Ricinus communis   | Castor oil  | Ogiri      | 2  | Edible seed      | C1     |
| Mucuna slobanai    | Horse eye bean | Okobo/Ukpo | Edible seed | B2     |
| Ocimum viride      | Basil leaf  | Nchonwu    | Edible leaf | C1     |
| Arachis hypogaea   | Groundnut   | Ahuekere   | Edible seed | C      |

Fr = Frequency rating; PU = Part used; Status: B, Both; C = Cultivated; W2, Wild; 1 = used mostly as seasoners; 2 = used as thickeners.

Table 4. Endangered plant species.

| Specie         | Common Name | Local Name | PU | Status |
|----------------|-------------|------------|----|--------|
| Gnetum africana | Gnetum      | Ugazi      | Edible leaf | W     |
| Gongronema latifolium | Clove | Utazi      | Edible leaf | W1    |
| Pergularia doemina | African flavour | Osirisa | Edible leaf | W1    |
| Atzelia africana | Mahorgany   | Akparata   | Edible seed | W2    |
| Brachystegia eurycoma | Bay plant | Achi       | Edible seed | W2    |
| Detorium microcapum | -          | Ofor       | Edible seed | W2    |
| Parkia biglobosa | Locust bean | Ogiriokpi  | Edible seed | W1    |
| Alchonea laxiflora | -           | -          | Edible leaf | W1    |
| Tetrapleura tetrapetra | -           | Uhokirio   | Edible pod  | W1    |
| Heinsia pulchella | Bush apple  | -          | Edible seed | W     |
| Heinsia cynreta   | -           | -          | Edible leaf | W     |
| Hidelgardia barteri | Parachute plant | Utuku | Live fence | W     |
| Cola lepidota    | Monkey cola | Ochichaoche| Edible fruit| W     |
| Cola pochycerpa  | Money cola  | Ochich odo | Edible fruit| W     |

PU = Principal use/uses; W = wild; 1 = used mostly as seasoners; 2 = used mostly as thickeners.

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