

Assessing the Contributions of Homestead Farming to Food Security in a Developing Economy: A Case Study of Southeastern Nigeria

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ABSTRACT

This study examined the contributions of homestead farming to food security in southeastern Nigeria. Three hundred homesteads were selected through multistage random sampling techniques. Some data were obtained using structured questionnaire, in-depth interview and focused group discussions. Crop yields were obtained through measurement on the fields and by estimations. Field data collected were subjected to descriptive analysis of simple proportions and percentages, while soil samples were subjected to laboratory analysis before testing for significant difference using t-test. Findings revealed that 25 fruit and other tree crops are dominant in the homestead farms with 40% of these planted and consumed mainly as fruits, while 60% are other tree crops. Thirty-five dominant vegetables, spices and other basic arable crops were identified with some level of ethno-cultural differences displayed. The yields of selected crops and the number of livestock kept indicated that homestead farms contribute remarkably to food security and farm income in southeastern Nigeria in terms of output and provision of varieties of crops relative to distant farms. Some plant species (e.g., *Coula edulis*, *Xylopia aethiopica*), were found to be more endangered. Many soil fertility management practices are currently adopted to sustain crop yield. There are, however, few constraints but if sufficiently addressed could improve the system for the continuous benefit of humanity.

Key Words: Food security; Homestead farming; Contribution; Nigeria

INTRODUCTION

Food is central to well being of any living creature; therefore, food security is of paramount importance. FAO (1992) defined food security as access to food in terms of being adequate in quantity and quality for meeting all the nutritional requirements of a household from one year to the other and within the year. Food security should be a target that any meaningful person or nation aims at achieving. This is particularly necessary because food security constitutes one of the indices for measuring poverty level. A household or individual that spends over 70% of ones total income on food is said to be poor and food insecure. This suggests that such an individual will hardly meet other life's essential needs such as education, healthcare, housing, etc., with the remaining 30% of that income.

Moreover, social harmony may not be guaranteed since a hungry man is known to ever remain an angry man (Ndaeyo, 2004). Generally, food security can be attained via three sources: own production, purchase and aids. Of these, the only dependable one is own production as food aids is transitory (not sure) and can be used as political tool to manipulate the policy and welfare of a nation. On the other hand, purchase is influenced by purchasing power of a nation, which is also affected by inflation.

People in Africa are facing food and agricultural crises, which in the views of Okigbo (1997) is exacerbated

by synergistically interacting demographic, environmental, economic and political crises. He attributed the agricultural and food crises in Africa specifically to: (i) the region lagging behind other regions in yields of major staples and (ii) decline in per capita food production. He opined that by the year 2010, the number of chronically under-nourished people in Africa would amount to 300 million compared to 200 million during the late 1980s. The mean increase in total food production is 1 - 2% per annum, compared to that of per capita food production, which averages 1%, whereas the population growth rate is 3 - 5% per annum, the highest of all major regions of the world. It is therefore not surprising that the region is increasingly relying on food imports and aid to meet this increasing demand. For instance, the total food imports supplied by food aid to Africa amounted to 15.2% in 1995 (FAO, 1996). This lopsided relationship between food demand and supply had earlier compelled the Food and Agricultural organization of United Nations to opine that as the world population is increasing by approximately 1 million every four hours, we may have more than 3000 million people to feed by the year 2025 (FAO, 1994). If they are to be fed adequately, the present food production level will have to be doubled and other strategies/approaches revised and/or encouraged. One of such strategies or approaches that need some level of assessment is the homestead farming. This becomes imperative because, while some people are encouraging the

practice, others seem to discourage it but rather prefer using the land for floricultural purposes.

Homestead farming has been defined in various ways by many authors. Agboola and Isola (1993) defined it as a system involving farming nearly permanently on the fields around the huts and compounds, where the soil have been chemically enriched by household refuse and manure. Brownrigg (1985) deemed it simply as “a system of agricultural production largely conducted by the household members at or near their residence”, whereas Okigbo (1985) stated that it is a specialized agricultural production or farming system within the homestead area, usually surrounding the home of its operators and that it usually constitutes one of a set of fields operated by a farmer or farm family.

Other authors (Okafor & Fenandes, 1987; Jensen, 1993; Rugalema *et al.*, 1994) described it as multi-layered stands of annual and perennial plants adjoining residential houses and managed sometimes with some livestock by household labour for food, cash income, social and cultural needs of the family. However, whatever definition or description is given to homestead farming, the bottom line is that it is carried out around the homesteads and involves husbandry of crops and in most cases alongside livestock. This system is practiced mainly in Southeast of Nigeria and is likely they hold on for a longer time. But the question now is to what extent is homestead farming is contributing to food security in this region? With this background, a study was carried out to identify the existing crop and animal species found in homestead farms and assess their contribution to food security in Southeastern Nigeria.

MATERIALS AND METHODS

The study area. The study was conducted in Akwa Ibom, Abia and Ebonyi States of Southeastern Nigeria in 2000 and 2001. Southern Nigeria lies on latitude 4° 15' N and 13° 55' N and longitude 2° 45' E and 14° 40' E and its altitude ranges from 70 to 120 m above sea level. The area enjoys abundant sunshine and rainfall, with two distinct seasons: the rainy season, which begins about March and lasts till the middle of October, and the dry season, which takes up the remaining months. During the rainy season, there is usually a dry spell of uncertain length in about August giving rise to what is usually referred to as “August break”.

Sampling procedure and data collection. A multi-stage random sampling procedure was adopted for the selection of sample areas for this study. Akwa Ibom, Abia and Ebonyi States have populations of 3.2, 2.5 and 1.9 million people, respectively (NAPEP, 2001). From these three states, three local government areas were selected per state, viz: Akwa Ibom- Ini, Nsit Ubuim and Onna; Abia – Ikwuano, Bende and Umuahia South and Ebonyi – Ebonyi, Onicha and Ishielu. Three hundred homesteads were selected with 100 per state. In order to obtain some aspects of data required, structured questionnaire was developed and administered.

In-depth interview and focused group discussions were also made. Crop yields were obtained through measurement in the fields and by estimations. Also soil sample was collected and analyzed (0 – 15 cm depth) to have an idea of the fertility status of the homestead farms compared to distant farms that have been under a near continuous cultivation. The soil chemical parameters determined were: pH in 1:2 (soil: water) ratio using glass electrode (IITA, 1979), organic carbon using Walkley and Black (1934), total N using macro-Kjeldahl procedure (Udo & Ogunwale, 1978), available phosphorous was determined by Bray P-1 method (Bray & Kurtz, 1945), exchangeable bases by Jackson (1964) method and particle size analysis by Bouyoucos (1951) method. Yields of the selected crops were determined on the fields using weighing balance, while some were estimated based on information supplied by the homestead farmers interviewed. Some of the data obtained were subjected to descriptive statistical analysis of simple proportions and percentages, while soil parameters were compared using t-test ($P < 0.05$).

RESULTS AND DISCUSSION

Dominant fruit and tree crops in homestead. The size of a homestead farm varied from community to community. This was said to be influenced by how a particular farm had undergone fragmentation through inheritance or through lack of harmony among members of the production unit. However, results indicated that twenty-five fruit and other tree crops are dominant in the homestead of southeastern Nigeria (Table I). Of these twenty-five crops, ten (40%) are planted and consumed mainly as fruits, while fifteen (60%) are other tree crops. Among the 25 crops, Akwa Ibom State leads in the production of 9 crops, while Abia and Ebonyi states lead in 5 (60%) crops, respectively (Table I). Akwa Ibom State had no record of planting *Ricinus communis*, while no *Theobroma cacao* was recorded in Ebonyi State. *Musa spp*, *Ananas comosus*, *Citrus spp*, *Cocos nucifera* *Kola spp*, *Dacrydis edulis*, *Elaeis guinensis*, *Mangifera indica*, *Psidium guajava* and *Carica papaya* stand out as the most cultivated crops irrespective of the state.

Dominant vegetables, spices and other basic arable crops found in homestead farms. This study revealed some level of ethno-cultural differences in the type of plant species (particularly among vegetables) found in the homestead farms among communities and states surveyed. Thirty-five dominant vegetables, spices and other basic arable crops were found in homestead farms in southeastern Nigeria (Table II). Among the 35 crops, 15 were vegetables (43%), 15 were spices (43%) and other basic crops 14%. Of the dominant vegetable crops identified, Akwa Ibom State leads in the production of seven crops, Abia State leads in four, while Ebonyi leads in the production of eight. *Heinsia crinata*, *Pennisetum purpureum*, *Lasienthera Africanum* were not found in any of the homestead farms in Ebonyi state. The most common vegetable crops found in the three

Table I. Dominant fruits and tree crops found in homestead and their percentage occurrence

S/N	Crop		% Occurrence		
	Scientific name	Common name	AK	AB	EB
1	<i>Citrus</i> spp.	Orange, lime, etc.	78	71	50
2	<i>Cocos nucifera</i>	Coconut	89	86	30
3	<i>Cola</i> spp.	Kolanut	75	62	36
4	<i>Dacryodes edulis</i>	African pear	94	90	82
5	<i>Elaeis guineensis</i>	Oil palm	100	98	53
6	<i>Mangifera indica</i>	Mango	88	91	64
7	<i>Psidium guajava</i>	Guava	86	81	58
8	<i>Raphia hookeri</i>	Raphia palm	84	80	15
9	<i>Treulia africana</i>	African bread fruit	10	30	40
10	<i>Garcinia kola</i>	Bitter kola	32	55	10
11	<i>Persea americana</i>	Avocado pear	43	54	36
12	<i>Irvingia gabonensis</i>	Bush mango	56	89	58
13	<i>Theobroma cacao</i>	Cocoa	32	46	0
14	<i>Coula edulis</i>	African walnut	15	22	10
15	<i>Cola argentea</i>		10	18	12
16	<i>Chrysophyllum albidum</i>	African star/apple	35	56	22
17	<i>Carica papaya</i>	Paw paw	92	96	50
18	<i>Musa</i> spp.	Plantain & Banana	100	100	100
19	<i>Ananas comosus</i>	Pineapple	100	100	98
20	<i>Saccharum officinarum</i>	Sugar cane	15	65	76
21	<i>Anacardium occidentale</i>	Cashew	25	48	70
22	<i>Ammon muricata</i>	Soursop	4	4	8
23	<i>Ricinus communis</i>	Castor bean	0	10	50
24	<i>Ficus carica</i>	Common fig	5	13	7
25	<i>Ficus sycomorus</i>	Sycamore fig	4	6	2

AK, AB and EB = Akwa Ibom, Abia and Ebonyi States.

Source: Field survey (2001)

states are *Gnetum africanum*, *Telfairia occidentalis*, *Abelmoschus esculentus*, *Talinum triangulare*, and *Vernonia amygdalina* (Table II).

Among the spices, Akwa Ibom leads in the production of 2, while Abia and Ebonyi states lead in the production of 15 and 2 spice plants, respectively. Among other basic crops, the three states cultivated 4 crops (*Colocasia/Xanthosoma* spp., *Dioscorea* spp., *Manihot esculenta* & *Zea mays*) in their homestead farms with equal magnitude, while Abia lead in the production of sweet potato (Table II). The types of plant or crop species identified in this study were in consonance with the findings reported earlier by Agom (1997) and Dunn and Agom (1998).

Contributions of homestead farms to food security in southeastern Nigeria. The estimated yields of selected crops determined during the study indicate strongly that homestead farms are contributing to food security in southeastern Nigeria (Table II). For instance, the system contributes 20.4, 7.2, 8.7, 22.3, 21.0, 20.4, 25.6 and 3.5 t ha⁻¹ year⁻¹ of yam, cassava, cocoyam, *Citrus* spp, pineapple, plantain, banana and maize, respectively to Nigeria's food output. Besides this, it is imperative to mention one of the special attributes and benefits derivable from homestead farms. This study revealed that most members of the rural households derived a lot of vitamins, proteins and minerals from the consumption of some crops that can hardly be cultivated in distant farms as field crops from the homesteads. Such crops include *Heinsia crinata*, *Gnetum africanum* *Lasienthera africana*, *Vernonia amygdalina*,

Table II. Dominant vegetables, spices and other basic arable crops found in homestead and their percentage occurrence

S/N	Crop		% Occurrence		
	Scientific name	Common name	AK	AB	EB
1.	<i>Heinsia crinata</i>		60	45	0
2	<i>Gnetum africanum</i>		55	51	12
3	<i>Lycopersicon esculentum</i>	Tomato	10	22	34
4	<i>Telfairia occidentalis</i>	Fluted pumpkin	100	100	90
5	<i>Amaranthus curuentus</i>	African spinach	62	65	70
6	<i>Abelmoschus esculentus</i>	Okra	100	100	100
7	<i>Talinum triangulare</i>	Water leaf	89	73	22
8	<i>Citrullus colocynthis</i>	melon	43	45	56
9	<i>Solanum melongena</i>	Egg plant	25	29	53
10	<i>Pennisetum purpureum</i>	Elephant grass	10	25	0
11	<i>Lasienthera africana</i>		68	53	0
12	<i>Vernonia amygdalina</i>	Bitter leaf	100	100	79
13	<i>Pterocarpus mildbraedii</i>	White camwood	53	94	98
14	<i>Cucumis sativus</i>	Cucumber	11	25	33
15	<i>Corchorus oltorus</i>	Vegetable Jute	5	16	26
16	<i>Tetracarpidium conophorum</i>	Conophor, African wallnut	3	5	0
17	<i>Capsicum</i> spp.	pepper	100	100	100
18	<i>Pentaclethra macrophylla</i>	African oil bean	5	20	11
19	<i>Xylopia aethiopica</i>	Guinea pepper	8	14	5
20	<i>Tetrapleura tetraptera</i>	Aidan tree	10	11	7
21	<i>Aframomum melegueta</i>	Alligator pepper	25	32	18
22	<i>Gongronema latifolia</i>		36	48	20
23	<i>Piper guineense</i>	Guinea black peper	28	52	11
24	<i>Dennettia tripetala</i>	Pepper fruit	13	18	2
25	<i>Zingiber officinale</i>	Ginger	1	12	6
26	<i>Mucuna urens/Achi</i>	Velvet bean	18	38	82
27	<i>Ocimum</i> spp.	Basil/curry/thyme	100	100	89
28	<i>Monodoro myristica</i>	African nutmeg	3	6	0
29	<i>Synsepalum dulcificum</i>	Magic plant	5	8	0
30	<i>Cymbopogon citratus</i>	Lemon grass	24	26	20
31	<i>Colocasia/Xanthosoma</i> spp.	Cocoyams	100	100	100
32	<i>Dioscorea</i> spp.	Yams	100	100	100
33	<i>Manihot esculenta</i>	Cassava	100	100	100
34	<i>Zea mays</i>	Maize	100	100	100
35	<i>Ipomoea batatas</i>	Sweet potato	42	90	55

Source: Field survey (2001)

Pterocarpus mildbreadii, *Gongronema latifolia* *Piper guineense*, *Ocimum* spp. and *Pennisetum pupureum* (Table II). These findings agree with that reported by Fernandez and Nair (1990) that homestead gardens provide various food products and a substantial proportion of the nutritive and caloritic requirements of the local diets. Also, the species diversity and varying production cycles of the different components of the homestead farms ensure continuous production and utilization throughout the year as against what obtained in the distant farms that end within a year with the stoppage of rains. Moreover, homestead farms play a distinct role in biodiversity maintenance and genetic resource conservation.

The study also revealed that homestead farming contributes to protein intake and income of most rural households via domestic livestock husbandry (Table IV). The livestock species found were poultry (chicken, turkey & ducks), sheep, goat, rabbit, cattle and swine. However, the dominant livestock species that cut across the three states are poultry, sheep and goats. Similar findings had earlier been reported by Agboola (1993) that any crop or plant species that are needed for daily consumption or frequent use by the farmer and his household may be found within

Table III. Estimated yields of selected crops grown in homestead (values represent means from the three states)

S/N	Crop	Yield (t ha ⁻¹ year ⁻¹)
1.	Yam	20.4
2	cassava	7.2
3	Cocoyam	8.7
4	Fluted pumpkin (leaves/vines)	1.5
5	Pepper	2.5
6	Okra	4.3
7	<i>Gnetum</i>	0.7
8	<i>Heinsia crinata</i>	6.0
9	<i>Lassienthera africana</i>	4.3
10	Bitterleaf	5.7
11	Waterleaf	12.3
12	<i>Ocimum spp</i>	6.2
13	<i>Pterocarpus mildbreaii</i>	8.9
14	<i>Citrus spp</i>	22.3
15	Pineapple	21.0
16	Plantain	20.4
17	Banana	25.6
18	Maize	3.5
19	Paw paw	10.3

Table IV. Common livestock species found within and around the homesteads and their percentage of occurrence

S/N	Livestock species	% Occurrence		
		AK	AB	EB
1	Poultry (chicken, turkey and ducks)	95 (8)*	94 (7)	97 (12)
2	Sheep	42 (3)	60 (5)	63 (7)
3	Goat	82 (6)	76 (8)	78 (4)
4	Rabbit	11 (2)	20 (4)	9 (2)
5	Cattle	3 (2)	5 (2)	2 (3)
6	Swine (Pig)	9 (4)	12 (6)	1 (5)

* Values in parenthesis represent mean number of species per household where the species were observed.

Source: Field survey (2001)

homesteads as well as livestock kept as sources of food and income. Seymo (1981) in a similar study stated that a well structured homestead farms will guarantee a higher standard of living on food, which is fresh and organically grown and with good life in pleasant surroundings.

Endangered crop or plant species. The study revealed that some crop or plant species are endangered based on their percentage occurrence within the homestead farms. This becomes more evident because forest, where these crops or plants were usually harvested from the wild is fast disappearing due to over-exploitation, population pressure, industrialization and urbanization (Okigbo, 1997). Such crop or plant species include *Treculia africana*, *Ficus carica*, *Coula edulis*, *Cola argentea*, *Tetracarpidium consphorum*, *Pentaclethra macrophylla*, *Xylopiacthiopica*, *Tetraplevra tetraptera*, *Dennettia tripetala*, *Monodora myristica* and *Synsepalum dulcificum* (Table I & II). Therefore, there is pressing need to make conscious efforts to expand and/or develop appropriate programs that can usher in domestication of these species as part of agro-

forestry programme so as to save them from extinction.

Factors making homestead farms successful despite undergoing continuous cropping. Homestead farms are known to be under intensive cultivation. Despite this, they still support crop growth and yield from year to year. Analysis of soils from homestead and distant farms revealed that the former is more fertile than the latter (Table V). Specifically, the values of organic C, total N, available P and basic cations were higher in homestead farms than distant farms. The higher fertility status of soil and better crop growth in homestead farms were attributed to:

(a). Use of household refuse and animal manure. The successful maintenance of soil fertility for better crop growth in homestead farms is partly due to the continuous use or deposition of household refuse and livestock manure on the farms. Lagemann *et al.* (1976) reported that soil fertility for permanent cultivation in homestead farms is usually maintained with household and kitchen refuse, ashes, farm residues, animal manures, human waste, etc., thereby making it more fertile than outer fields. Backyard or homestead plantains have been reported to be highly productive due copious addition of organic matter and kitchen wastes including human wastes and droppings of domestic animals (Obiefuna, 1986; Nweke *et al.*, 1988; Swennen, 1990). The ashes from the household fires are usually scattered around the plantain mats supplying minerals and acting as insecticides against banana weevil (*Cosmopolites sordidus*) & root knot nematodes (*Meloidogynes Spp.*). Consequently, plants in homestead farms grow luxuriantly and produce heavy bunches for many years estimated at 30 - 50 t ha⁻¹ year⁻¹ (Obiefuna, 1986). Ndon (2005) (Personal communication) also stated that yields of coconut in the homestead farms have been found to be higher than those of distant farms due to smoke coming from the kitchen.

(b). Use of mulching and crop residues. Homestead farmers do practice mulch farming including using live mulch and consciously allowing crop residues in the field after harvest. These practices have been found to improve soil total porosity and water infiltration rates (Agboola, 1993). It also conserves soil water by decreasing losses due to run off and evaporation; enhances the activity of soil fauna and improves soil structure; regulates soil temperature; increase organic matter and CEC as well as crop yields (Lal, 1975). The use of live mulch (including trees & shrubs) helps in breaking the impact of raindrops on the soil thereby reducing soil wash and erosion; shading the soil surface continuously from direct rays of the sun, particularly during the day. It suppresses weeds and provides a more favourable micro-climate environment for soil organisms; temporarily conserving nutrients in their ligneous parts and improves drainage from water-logged or saline soils particularly if phreatophytic trees are used (Agboola & Isola, 1993).

Table V. Soil fertility status (0 – 15 cm depth) in homestead and distant farms in southeastern Nigeria

Location	pH	Org.C (%)	Total (N)	AV. P (mg kg ⁻¹)	K	Ca Cmol kg ⁻¹	Mg	Particle size analysis (%)		
								Sand	clay	silt
AK Homestead	5.10	2.10	0.19	236.18	0.16	3.56	2.98	88.9	8.2	2.9
AK Distant	4.94	1.92	0.14	207.66	0.09	1.69	2.03	91.4	6.8	1.8
t-test value	*	*	*	*	*	*	*	*	*	NS
AB Homestead	5.34	1.68	0.18	96.76	0.29	3.75	0.68	90.4	6.3	3.3
AB Distant	5.03	1.25	0.16	45.79	0.11	1.62	0.39	89.5	12.5	2.0
t-test value	NS	*	NS	*	*	*	*	NS	*	NS
EB Homestead	5.06	1.12	0.09	21.38	0.20	2.79	2.43	92.3	6.4	1.3
EB Distant	4.29	0.96	0.08	14.92	0.09	1.31	2.10	88.6	8.0	3.4
t-test value	*	*	NS	*	*	*	NS	NS	NS	*

* = Significant at P<0.05, NS = Not significant; AK, AB and EB = Akwa Ibom, Abia and Ebonyi States

(c). Adoption of multi-storey cropping system. Multi-storey cropping system is a form of mixed cropping, which is the intensification of cropping in time and space dimensions. It involves growing two or more crops on the same field in a year. This system mimics natural environment by having different crop mixtures and are in equilibrium with the environment via their interactive effects. The plants grow at different heights and stabilize the environment and protect it against hazards such as high rainfall intensity, which usually leads to erosion, loss of nutrients and reduced soil temperatures, and promote rapid mineralization.

Some plants form a cover by their characteristic spreading (e.g., melon), some form the lower layer (e.g., pepper), some the middle strata (e.g., cocoyam) and others the upper layer (plantain, yam etc.). The factor responsible for the success of this diversity in growth habit and type of ecosystem is the ability of the different plant species to utilize solar radiation and their solar energy requirement (Agboola, 1993). Those at the lower strata are able to synthesize food at low radiance. Similarly, Ruthenberg (1980) reported a special feature of plantains, some shrubs and tree crops in homestead farms leading of development of multi-storey cropping system. He added that the planting of several crops differing in height, root development, and light requirements allows a more efficient use of solar energy, soil nutrients, and water.

(d). Other techniques used in maintaining soil fertility and crop yield are use of appropriate tillage system(s) as determined by the agro-environment of the homestead farmer. Such include zero tillage and mound tillage. The use of “spot burning” (where it is un-avoidable) and proper drainage also help to maintain the integrity of the soil.

Constraints inherent in the system. Homestead farming, where it is not well planned and managed could pose some constraints. Some of these include over-crowding of crops/tree species around the homesteads thereby making the homesteads look bushy. This is particularly observable, where plantain/banana (without proper sucker management) and tree crops such as *Dacryodes edulis*, *Mangifera indica*, *Treculia africana*, *Garcinia kola*, *Irvingia gabonensis* and *Chrysophyllum albidum* are grown in mixture. This also creates some health problems as they harbour mosquito and other dangerous insects, snakes, etc. that can bite homestead

dwellers, which could lead to death. This could however be overcome by educating the farmers on proper planning and management of the fields. Destruction of farm crops by livestock (domestic animals) that are either not confined or tethered is a common feature that is capable of bringing conflict among homestead farmers. Stray animals do go into the homestead farms, feed on them, destroy and reduce crop yields. This can be overcome through confinement and tethering of domestic animals and by proper fencing of the farms. Presently, some farmers use fishing net to keep away domestic animals. Population pressure, industrialization and urbanization would likely pose problems to the system in future.

CONCLUSIONS

Homestead farms contribute remarkably to food security and farm income of Nigeria in term of output and provision of variety of plants compared to distant farms. This has been made possible through adoption of some soil fertility maintenance practices. The farmers adopt such approaches as: use of household refuse and animal manure, mulching and crop residue management, use of multi-storey cropping system and appropriate tillage and burning techniques. Some crops or plants species were however found to be endangered based on the percentage occurrence in the homestead farms. Therefore there is need to develop appropriate agro-forestry program to incorporate the planting of these crops/plants by farmers. There are, however, few constraints, which if sufficiently addressed could improve the system for the benefit of humanity.

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REFERENCES

- Agboola, A.A., 1993. Farming systems in Nigeria. In: Aiyelari, E.A., E.O. Lucas, M.O. Abattan and O.A. Akinboade, (eds.), *Fundamentals of Agriculture*, pp: 14–40. Afrika link Books, Ibadan, Nigeria
- Agboola, A.A. and O. Isola, 1993. *Role of Farming Systems in the Recultivation and Popularization of Lost Crops*. A paper presented at a workshop on lost crops of Nigeria on the 28th day of January at the University of Agriculture, Abeokuta, Ogun State, Nigeria
- Agom, D., 1997. Importance of trees in home gardens in Obiokpok Village, Akwa Ibom State. *The Nigerian Field*, 62: 49–53
- Bouyoucos, G.H., 1951. A recalibration of the hydrometer for making mechanical analysis of soils. *Agron. J.*, 43: 434–8

- Bray, R.H. and L.T. Kurtz, 1945. Determination of total organic and available forms of phosphorus in soils. *Soil Sci. Soc. America*, 59: 39–45
- Brownrigg, I., 1985. *Home Gardening In 8th International Development, What the Literature Shows*. League for International Food Education, Washington, D.C., U.S.A
- Dunn, J. and D. Agom, 1998. Tree use in Igonigoni and Abo Mkpang, Cross River state, Nigeria: A comparison of two villages located in areas with different vegetation types. *Global Ecol. Biogeogr. Letters*, 2: 196–206
- Fernandez, E.C. and P.K. Nair, 1990. *An Evaluation of the Structure and Function of Tropical Home Gardens*. UNU press, Tokyo
- FAO (Food & Agriculture organization of the United Nations), 1992. *Better Nutrition at Home: Improving Household Food Security*, pp: 9–10. Nutrition: The global challenge. FAO, Rome
- FAO, 1994. *Sustainable Agriculture and Rural Development*. Part 1: Latin America and Asia. Development Education Exchange papers, July 37. FAO, Rome
- FAO, 1996. *Food Crops and Shortages*. Global Information and early warning system on food and agriculture. No 5. FAO, Rome
- IITA (International Institute of Tropical Agriculture), 1979. *Selected Methods in Soil and Plant Analysis*, 3rd edition, p: 34. Manual series No 1. IITA, Ibadan, Nigeria
- Jensen, H., 1993. Productivity and nutrient recycling of Javanese home garden. *Agro-forestry System*, 24: 187–201
- Jackson, M.L., 1964. *Soil Chemical Analysis*. Prentice Hall Inc. Englewood cliffs, New Jersey, U.S.A
- Lagemann, J., 1976. Land use, soil fertility and agricultural productivity as influenced by population density in eastern Nigeria. In: *IITA Farming Systems and Other Programs Staff Papers 1971–78 (Supplement)*, pp: 39–49. Ibadan, Library and Documentation center, IITA
- Lal, R., 1975. *Role of Mulching Techniques in Tropical Soil and Water Management*, p: 38. IITA Technical Bulletin No. 1, Ibadan, Nigeria, IITA
- NAPEP (National Poverty Eradication Programme), 2001. *Operational Guidelines for the State Poverty Eradication Councils (SPECS) and the State Co-ordination Committees*, p: 45. August
- Ndaeyo, N.U., 2004. *Agricultural Exhibition: A Strategy for Food Security and Development*. A paper presented on the occasion of Ini Local government Area Agricultural show held on 24th February at Council Headquarters, Odoro Ikpe, Ini L.G.A, Akwa Ibom State, Nigeria
- Nweke, F.I., J.E. Njoku and G.F. Wilson, 1988. Productivity and limitations of plantain (*Musa spp.* CV ABB) production in compound gardens in southeastern Nigeria. *Fruits*, 43: 161–6
- Obiefuna, J.C., 1986. The effects of sawdust and increasing levels of nitrogen on the weed growth and yield of falsehorn plantains (*Musa AAB*). *Biol. Agric. Horti.*, 3: 353–9
- Okafor, J.C. and E.C. Fenandes, 1987. Compound farms of southeastern Nigeria: A predominant Agro-forestry home garden system with small livestock. *Agro-forestry System*, 5: 153–68
- Okigbo, B.N., 1985. *Home Garden in Tropical Africa*. A paper presented at the first International Workshop on Tropical Home Gardens, 2 - 9 December, Bandung, Indonesia
- Okigbo, B.N., 1997. Peculiarities of traditional African agriculture and their potential use in designing sustainable agricultural systems. *African Crop Science Conference Proceedings*, 3: 23–40
- Rugalema, G.H., A.A. Okting and F.H. Johnson, 1994. The home garden Agro-forestry system of Bukoba District. North Western Tanzania. *Farming Systems*, 26: 53–64
- Ruthenberg, H., 1980. *Farming System in the Tropics*. Longmans, London
- Seymo, J., 1981. *The Complete Book of Self-sufficiency*. Corgi books
- Swennen, R., 1990. *Plantain Cultivation Under West Africa Conditions*, pp: 1–2. A reference Manual IITA, Ibadan, Nigeria
- Udo, E.J. and J.A. Ogunwale, 1978. *Laboratory Manual for the Analysis of Soil, Plant and Water Samples*, pp: 22–6. Department of Agronomy, University of Ibadan, Nigeria
- Walkley, A. and I.A. Black, 1934. An examination of the Detsareff method for a proposed modification of the chromic acid titration method. *Soil Soc. America Proc.*, 37: 29–38

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