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Contribution of Cocoa-Based Agroforest to Household Livelihood in Emure Local Government Area Ekiti State

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ABSTRACT

This study assesses the contribution of cocoa-based agroforestry to household livelihood in Emure Local Government Area, Ekiti State. The study was carried out in six farm settlements that were purposively selected in the Local Government. One hundred and twenty pre-tested questionnaires were randomly administered to respondents for the collection of data in the study. The study revealed that 44.17% of the respondents are within the age bracket of 51-70 years while only 5.83% are above 70 years. The majority (41.67%) of respondents have primary education while only 10% are graduates of higher institutions. The result also revealed that 34.17% of respondents operate farm sizes of between 16-20 hectares of land followed by those with over 20 hectares of land (20.83 %). 76.67 % of respondents have farming experience of 11 years and above, while 70.73% of respondents acquired their land through inheritance. The result on agroforestry practices revealed that 29.34% of the respondents are involved in mixed cropping, perennial crop combination, and shifting cultivation respectively. Tree species retained by cocoa agroforestry farmers in the order of preference among others are *Terminalia superba* (6.76 %), *Glicidia sepium* (6.17%), *Milicia excelsa* (5.90%), *Terminalia ivorensis* (5.57%), and *Antiaris africana* (5.04%). While species such as *Mangifera indica*, *Cola nitida*, *Citrus* spp., *Elaeis guniness* and *Cola acuminata* are the fruit trees mostly planted or retained. Food crops mostly cultivated by the respondents are *Colocasia esculenta*, *Musa paradisiaca* and *Musa* spp. Natural products usually harvested in the cocoa plantation include among others *Archantina marginata*, *Agaricus* spp., *Thaumatococcus daniellii*, *Senecio biafrae* and *Aframomum melegueta*. The result also revealed that farmers retain trees on their farms for the following reasons; provision of shade, timber.

INTRODUCTION

Cocoa is an economic crop cultivated in the humid tropics of West Africa, Southeast Asia, South America, and the Caribbean. It is estimated that about 5-6 million smallholder farmers earn most or all of their cash income from cocoa production (Clay, 2004). In Ghana, the cocoa sub-sector accounts for over 20.5% of its export earnings, 3.3% of GDP, and employs 24% of labour force (FASDEP, 2002). It also serves as a major source of livelihoods to smallholder farmers and accounts for 55% of the total household income (IITA, 2002; Asamoah and Baah, 2003). The cocoa sub-sector in Nigeria has benefited immensely from the implementation of several Government policies over the years in an effort to increase production.

Cocoa-based agroforestry system (CAFS) ranks high as a viable way of diversifying land use to improve smallholder farmers livelihoods and conservation of natural resources (Rice and Greenberg, 2000; Duguma et al., 2001; Leakey and Tchoundjeu, 2001; Schroth et al., 2004; Franzen and Borgerhoff, 2007; Smith and Martino, 2007). Cocoa-based agroforestry system contributes to the self-sufficiency of smallholder families through a diversified production of food and cash crops thereby reducing financial and commercialization risk (Ramirez Leakey et al., 2005; Degrande et al., 2006; Steffan-Dewenter et al., 2007).

The adoption of environmentally sound and suitable cocoa production through cocoa agroforestry system has been suggested as a useful technology to improve crop yield in many cocoa-producing countries where marginal lands are increasingly been brought under cultivation (Asare, 2005; Boateng, 2008). The cocoa agroforestry system is the intercropping of cocoa trees with fruits, commercial timber, or fast-growing and high-value timber trees (Duguma et al., 2001). Apart from the additional income to farmers

through the sale of other products, cocoa agroforestry provides food, minimizes risk through diversification, and provides shade for cocoa plants (Duguma et al., 2001; Isaac et al., 2007).

Cocoa agroforestry is also regarded as environmentally preferable for biodiversity conservation to other forms of agricultural activities in tropical forest regions (Power and Flecker, 1998). Research conducted in Latin America indicates that the capacity of cocoa plantations to conserve birds, ants, and other wildlife is greater than in any other anthropogenic land-use system (Rice and Greenberg, 2000; Jimenez and Beer, 1999). In areas like Southwest Nigeria and Eastern Brazil, cocoa agroforests are credited with conservation of the biological diversity of the humid forest zone (Ruf and Schroth, 2004) and the Atlantic forest (Rolim and Chiarello, 2004), compared to farming activities that produce food crops like maize and cereals. In Ghana, Conservation International has had success in using cocoa agroforests as a buffer zone around protected areas (The Kakum National Park Project) in the central region to reduce forest encroachment. Also, in Western Nigeria farmers have been able to increase the diversity of forest trees in cocoa farms by retaining economically valuable timber species such as *Milicia excelsa*, *Triplochiton scleroxylon*, and *Terminalia superba*.

It is important to recognize, however, that even though research suggests that cocoa agroforest is generally environmentally friendly compared to other forms of agriculture, cocoa agroforest does not equate with primary forests (Donald, 2004). According to Rolim and Chiarello (2004), cocoa agroforestry not only supports relatively lower species richness but also impairs natural species succession and gap dynamics compared to floristically and climatically similar sites of secondary or primary rain forest in Nigeria and as a result, tree species of late successions are becoming

rare while pioneer and early secondary species are becoming dominant. This shift in succession pattern is attributed to management practices, which involve the clearing of undergrowth twice a year that eliminates most regeneration, except in a few trees which escape cutting or are deliberately spared.

Acknowledging these limitations, however, does not change the fact that the cocoa agroforestry system provides a real opportunity, compared to other agricultural systems, to conserve biodiversity by providing niches for a variety of faunal and floral species (Noble and Dirzo, 1999; Rolim and Chiarello, 2004). Beyond simple conservation, cocoa agroforest may have positive environmental effects in landscapes already impoverished by human disturbances (Estrada et al., 1997; Reitsma et al., 2001).

In spite of the purported potentials and abilities of the cocoa-based agroforestry system and the various recommendations from researchers and development agencies, there have been a few attempts to use cocoa agroforest on a large scale as a conservation instrument in tropical countries (Parrishe et al., 1998). Furthermore, up to date, there is limited information on biological diversity in cocoa-based agroforestry ecology (Greenberg et al., 2000). More so it has been argued that there is only a limited amount of work that upholds the notion that cocoa farms with diverse shade canopies support greater biodiversity, especially of forest-dependent organisms as compared to other cash crop systems in the low-land tropics (Rice and Greenberg, 2000).

The general objective of this study is to access the contribution of cocoa-based agroforestry to the household livelihood in Emure local government in Ekiti State.

METHODOLOGY

Study Area

The study area (Emure Local Government area) is a municipal local government area that comprises, Emure–Ekiti Township surrounded by some farm settlements. It is located in the southern part of Ekiti State, Southwest Nigeria. Emure-Ekiti is located between longitude 5° 46' east and latitude 7° 44' north. It comprises a total population of 90,645 inhabitants. The estimated terrain elevation above sea level is 378 meters. The rainy season normally starts from late March through October with occasional strong wind and thunderstorms, usually at the onset and the end of the rainy season. The annual rainfall ranges from 1,200mm to 1,500mm. Temperature ranges from 21 °C to 31 °C with little variation throughout the year.

Data collection

This experiment was carried out in Emure local government. Six farm settlements were purposively selected. In each of the settlements, cocoa plantation farms were visited where a pre-tested questionnaire containing both structured and unstructured questions was administered. The questionnaire which sought questions on social-economic characteristics of the respondents, agroforestry practices, and contribution to respondents' household livelihood, were administered to twenty (20) randomly selected cocoa agroforestry farmers in each of the settlements visited. The administration of the questionnaire was by personal interview. This method affords the researcher to retrieve the entire questionnaire for analysis. Since the interview was done right on the farm, the researcher's observation was used to deduce the applicable answer to a question like the distance of the village to the farm.

Table 1. Distribution of respondents in the study area.

Farm settlements	No. of respondents
Oge	20
Ajebamidele	20
Akeye	20
Owode	20
Eporo	20
Sasaye	20
Total 6	120

RESULTS

Socio-economic characteristics of the respondents

The distribution of respondents by age shows that 44.17% of the respondents are within the age bracket of 51-70 years while only 5.83 % are above 70 years (Table 2). The result on age revealed that 66.67% are male

while 33.33 % are female. The result on educational background revealed that the majority (41.67%) of respondents have primary education while only 10% are graduates of higher institutions. The result on family size shows that 33.33% of respondents have a household size of 6-10 members while 12.5% of respondent's have a household size of more than 20 members.

Table 2. Distribution of respondents by socio-economic characteristics.

Age	Frequency	Percentage
<30 years	17	14.17
31-50 years	43	35.83
51-70 years	53	44.17
>70 years	7	5.83
Sex		
Male	80	66.67
Female	40	33.33
Educational background		
No formal education	23	19.16
Primary	50	41.67
Secondary	35	29.17
Tertiary	12	10.00
Household size		
1-5	30	25.00
6-10	40	33.33
11-15	35	29.17
>20	15	12.5
Total	120	100

Source: field work (2018)

Respondents farming practices

Results in Table 3 revealed that 34.17% of respondents operate farm sizes of between 16-20 hectares of land followed by those with over 20 hectares of land (20.83 %). Table 4 shows that 76.67 % of respondents have

farming experience of 11 years and above. While table 5 revealed that 70.73% of respondents acquired their land through inheritance. The result in table 6 revealed that self and family members accounted for 31.83% of respondents 'sources of labour while 14.32% are through group labour.

Table 3. Distribution of respondents by farm size.

Farm size	Frequency	Percentage (%)
<1-5 hectares	9	7.50
6-10 hectares	21	17.50
11-15 hectares	24	20.00
16-20 hectares	41	34.17
>20 hectares	25	20.83
Total	120	100

Source: Fieldwork (2018)

Table 4. Distribution of respondents by farming experience

Farming experience	Frequency	Percentage (%)
1-5 years	10	8.33
6-10 years	18	15.00
11-15 years	44	36.67
>15 years	48	40.00
Total	120	100

Source: Fieldwork (2018)

Table 5. Distribution of respondents by land ownership

Land ownership	Frequency	Percentage (%)
Inheritance	116	70.73
Gift	15	9.15
Leasehold	5	3.05
Purchase	28	17.07
Total	164*	100

Source: Fieldwork (2018)

*Multiple responses

Table 6. Distribution of respondents by sources of labour.

Sources of labour	Frequency	Percentage (%)
Self	120	31.83
Family member	120	31.83
Hired labour	83	22.02
Group labour	54	14.32
Total	377*	100

Source: Fieldwork (2018) *Multiple responses

Agroforestry practices in the study area

The result in Table 7 shows that 29.34% of the respondents are involved in mixed cropping, perennial crop combination, and shifting cultivation while 11.98% of respondents are involved in mono-cropping. The result on tree species retained (Table 8) shows that *Terminalia superba* has the highest frequency (6.76 %) followed by *Glicidia sepium* (6.17 %), *Milicia excelsa* (5.90%), *Terminalia ivorensis* (5.57 %) and *Antiaris africana* (5.04 %) respectively. While the least tree species retained by the respondent's is *Ceiba petandra* with 1.33 %. The result in Table 9 revealed that species such as *Mangifera indica*, *Cola nitida*, *Citrus* spp., *Elaeis guiness*, and *Cola acuminata* are the fruit trees mostly planted or retained by respondents in the study area.

The result on food crops planted by the respondents in Table 10 shows that *Colocasia esculenta*, *Musa paradisiaca*, and *Musa* spp. with 15 % each are the crops mostly cultivated by the respondents these were followed by *Ananas comosus* and *Dioscorea cayenensis* with 14.38 % and 12.75 % respectively. Table 11 shows other natural products harvested by the respondents in the cocoa plantation. These products include among others *Archantina marginata*, *Agaricus* spp., *Thaumatococcus daniellii*, *Senecio bialfrae*, and *Aframomum melegueta*. Table 12 shows the reason why the respondent's plant /retain trees in their cocoa plantation. The result revealed that provision of shade has the highest value (15.38 %) followed by timber production (14.87 %), firewood (11.92 %), and fruit production (10.77 %) respectively.

Table 7. Distribution of respondents by the farming system

Farming system	Frequency	Percentage (%)
Mono-cropping	49	11.98
mixed-cropping	120	29.34
Perennial crop-combination	120	29.34
Shifting cultivation	120	29.34
Total	409*	100

Source: Fieldwork (2018)

*Multiple responses

Table 8. Distribution of respondents by trees species retained

Local name	Scientific name	Frequency	Percentage (%)
Isin	<i>Bligha sapida</i>	40	2.65
Iroko	<i>Milicia excels</i>	89	5.90
Araba	<i>Ceiba petandra</i>	20	1.33
Agbalumo	<i>Chrysophllum albidum</i>	25	1.66
Oganwo	<i>Khaya</i> spp.	42	2.78
Arere	<i>Triplochyton schleroxylon</i>	68	4.51
Igba/Iru	<i>Parkia biglobosa</i>	30	1.98
Agunmaniye	<i>Glicidia sepium</i>	93	6.17
Ahun	<i>Alstonia boonei</i>	35	2.32
Omo	<i>Cordia milleni</i>	47	3.12
Afara	<i>Terminalia superba</i>	102	6.76
Idi	<i>Terminalia ivorensis</i>	84	5.57

Oriro	<i>Antiaris africana</i>	76	5.04
Osun	<i>Pterocarpus osun</i>	22	1.46
Ira	<i>Bridelia ferruginea</i>	31	2.05
Oporoporo	<i>Pterygota macrocarpa</i>	58	3.84
Oriro	<i>Vitex doniana</i>	13	0.01
Epin	<i>Ficus exasperate</i>	44	2.91
Elemi	<i>Dacryodes edulis</i>	23	1.52
Akomu	<i>Pycnanthus africana</i>	58	3.84
Agbonyin	<i>Piptadenastrum africanum</i>	61	4.05
Ofun	<i>Mansonia altissima</i>	66	4.37
Opepe	<i>Nauclea diderrichii</i>	28	1.86
Iyeye	<i>Spondias mombin</i>	53	3.51
Iya	<i>Daniella oliveri</i>	62	4.11
Awewe	<i>Margaritaria discoideus</i>	22	1.46
Ayere	<i>Albizia glaberrima</i>	47	3.12
Ijebo	<i>Entandrophragma utile</i>	68	4.51
Ita	<i>Celtiss zenkeri</i>	60	3.97
Ito	<i>Landolphia spp.</i>	41	2.72
Total		1,508*	100

Sources: Fieldwork (2018)

*Multiple responses

Table 9. Distribution of respondents by fruit trees planted/retained in the plantation

Local name	Scientific name	Frequency	Percentage (%)
Mango	<i>Mangifera indica</i>	120	12.83
Obi gbanja	<i>Cola nitida</i>	120	12.83
Oro	<i>Irvingia garbonensis</i>	36	3.85
Agbalumo	<i>Chrysophillum albidum</i>	73	7.81
Orogbo	<i>Garcinia kola</i>	46	4.92
Osan	<i>Citrus spp.</i>	120	12.83
Kaju	<i>Anacardium occidentale</i>	114	12.19
Ope	<i>Elaeis guinensis</i>	120	12.83
Obi abata	<i>Cola acuminata</i>	120	12.83
Awusa	<i>Plukenetia conophorum</i>	66	7.02
Total		935*	100

Sources: Fieldwork (2018)

*Multiple responses

Table 10. Distribution of respondents by food crops planted in cocoa plantation

Local name	Scientific name	Frequency	Percentage (%)
Isu (Alo)	<i>Dioscorea cayenensis</i>	102	12.75
Ege	<i>Manihot esculenta</i>	85	10.63
Koko	<i>Colocasia esculenta</i>	120	15.00
Ata	<i>Capsicum spp.</i>	68	8.50
Opeoyinbo	<i>Ananas comosus</i>	115	14.38

Ogedewewe	<i>Musa spp.</i>	120	15.00
Ogedeagbagba	<i>Musa paradisiaca</i>	120	15.00
Ibepe	<i>Carica papaya</i>	85	10.63
Anomo	<i>Ipomoea batatas</i>	53	6.63
Total		800*	100

Source: Fieldwork (2018)

*Multiple responses

Table11. Natural products in cocoa-agroforest and their uses

Local name	Scientific name	Uses/Benefits
Igbin	<i>Archantina marginata</i>	Meat, income, medicinal
Osu/Olu	<i>Agaricus spp.</i>	Spices, income
Oyin	<i>Apis mellifera</i>	Sweetener, income, medicinal
Etu	<i>Sylvicarpra graminia</i>	Meat, income
Iyere	<i>Piper guineense</i>	Spice, income, medicinal
Ewuro	<i>Vernonia amygdalina</i>	Vegetable, medicinal
Eriru	<i>Xylopia aethiopica</i>	Medicinal, income
Atale	<i>Zinginber officinale</i>	Medicinal, income, cultural
Rorowo	<i>Senecio biafrae</i>	Vegetable, medicinal, income
Ewe iran	<i>Thaumatococcus daniellii</i>	Wrapping, income, Roofing
Arindan	<i>Tetrapleurate traptera</i>	Medicinal, cultural, income
Atare	<i>Aframomum melegueta</i>	Medicinal, cultural, income, spice
Ario	<i>Monodora myristica</i>	Income, medicinal

Source: Fieldwork (2018)

Table 12. Respondents' reason for planting /retaining tree in the cocoa plantation.

Reasons	Frequency	Percentage (%)
Fruit production	84	10.77
Shading	120	15.38
Soil fertility	75	9.62
Medicinal uses	67	8.59
Timber production	116	14.87
Fire wood	93	11.92
Wind control	48	6.15
Boundary demarcation	56	7.18
Staking/support	45	5.77
Biodiversity conservation	32	4.10
Erosion control	44	5.64
Total	780*	100

Source: Fieldwork (2018)

*Multiple responses

Contribution of cocoa agroforest to household livelihood

The result on the average annual income from cocoa agroforest farm (Table 13) shows that 45 % of the respondents generate over

₦1,000,000 annually while 32 % made ₦501,000 - ₦1,000,000. Only about 4.17 % of the respondents made less than ₦100,000 per annum. The result in Table14 shows that income generation is the greatest benefit of

cocoa agroforest to the respondents with 29.27 % followed by the provision of food (25.61 %), the economy of labour (23.41 %), and insurance against crop failure (21.71 %) respectively.

Table 13. Distribution of respondents by average annual income from cocoa agroforest

Average annual income (₦)	Frequency	Percentage (%)
<100,000	5	4.17
100,000-250,000	12	10.00
251,000-500,000	17	14.16
501,000-1,000,000	32	26.67
>1,000,000	54	45.00
Total	120	100

Source: Fieldwork (2018)

Table 14. Benefits of cocoa-agroforest to respondents

Benefits	Frequency	Percentage (%)
Economy of labour	96	23.41
Insurance against crop failure	89	21.71
Income generation	120	29.27
Provision of food	105	25.61
Total	410*	100

Source: Fieldwork (2018)

*Multiple responses

DISCUSSION

Results from this study revealed that thirty (30) different tree species were either planted or retained by farmers in their cocoa plantations in the study area. Some of the tree species retained or planted in order of preference include *Terminalia superba*, *Glicidia sepium*, *Milicia excelsa*, *Terminalia ivorensis* and *Antiaris africana*. The high number of trees retained by farmer's shows that they acknowledge the importance of trees to their livelihood. Observation from this study revealed that trees are planted or retained for different purposes Some of the reasons mentioned by farmers for retaining these trees include the provision of shade, provision of food (fruit), boundary demarcation, firewood, and income generation among others. The provision of

goods and services observed in this study is in agreement with the submission of ICRAF (1997) who reported that trees were cherished for their social, economic, and environmental benefit. *Gilircidia sepium* is particularly planted for staking and later serve as a shade tree for protecting the young cocoa tree from excessive heat. Also, trees like *Terminalia* and *Milicia* are retained for timber production to generate income when sawn into the log. This observation further proves that cocoa agroforestry is a system that gives room for the diversification of products from a piece of land. This assertion agrees with the submission of Cerda et al., 2014 that cocoa agroforest plantation is a dependable source of timber production in Central America.

Agroforestry practices in the study area

Results obtained in this study revealed that mixed cropping, perennial crop combination, and shifting cultivation are the dominant farming practices in the study area. This farming practice allows the integration of both crops and trees simultaneously on the same piece of land. Under this system, farmers plant various kinds of crops on the same piece of land to provide a wide range of products for their immediate household needs (Olujobi and Oke, 2005). The preponderance of these farming systems indicates that farmers in the study area have long been involved in agroforestry practice whereby farmers intercropped both tree crops with other crops. This was evident in the types of fruit tree crops such as *Mangifera indica*, *Cola nitida*, *Citrus* spp., *Elaeis guinness*, and *Cola acuminata* that were intercropped with food crops like *Colocasia esculenta*, *Musa paradisiaca*, *Ananas comosus*, and *Dioscorea cayenensis*. The cultivation of these sets of crops by farmers in their cocoa plantations has given rise to an agroforestry practice known as perennial tree/crop combination which is another form of simultaneous agroforestry.

Contributions to household livelihood in the study area

The result on the average annual income from cocoa agroforestry farms revealed that the majority of the respondents generate over ₦ 1,000,000 annually. The result from this study revealed that money generated from cocoa agroforestry farms has contributed immensely to household livelihood in terms of income generation. Other benefits derived by farmers from their cocoa agroforestry farm are the provision of food, insurance against crop failure, and economy of labour. The contributions of cocoa agroforestry to household livelihood and its environmental benefit cannot be over-emphasized especially in the area of food security. Households with poor food

access and or poor food utilization tend to suffer more illness or other physical debilitations thereby impairing their productivity. Food production constitutes one of the most basic livelihood activities and can be a critical situation especially in rural households (Woller, 2018). Other natural products such as *Archantina marginata*, *Agaricus* spp., *Thaumatococcus daniellii*, *Senecio biafrae*, and *Aframomum melegueta* harvested by the respondents in the cocoa plantation ensure regular supplies of the household needs of the agroforestry farmers in and out of cocoa season (Edusah, 2011).

CONCLUSION

The study revealed that the majority of the respondents in the study area are full-time farmers who operate on a large scale with a long year of farming experience. The study has also revealed that mixed-cropping, shifting cultivation and perennial crop-combination are the major agroforestry systems practiced by farmers in the study area. Moreover, it has been revealed that the cocoa agroforestry system has greatly benefited the farmers in terms of a wide range of products derived from the system. The study also revealed that the system has contributed greatly to the socio-economic wellbeing of the people in terms of income generation, provision of food, insurance against crop failure, and biodiversity conservation.

Consequent to the results in the study it is recommended that since farmers in the study area are already aware of the benefits derived from cocoa-based agroforestry, Government should encourage the farmers by giving them incentives in form of loans and farm input.

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