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Assessment of the Productivity of Resource Use in Taungya and Non -Taungya Land Use in Olokemeji Forest Reserve, Ogun State

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ABSTRACT

Taungya, a form of agro-forestry system is generally a practiced with the intention of developing a more sustainable form of land use that can improve farm productivity and the welfare of rural communities. This study therefore assessed the productivity of resource use in Taungya and Non- Taungya land use in Olokemeji forest reserve, Ogun State. Simple random technique was used to select five (5) villages surrounding the forest reserve. Twenty (20) Taungya farmers and Ten (10) Non-Taungya farmers within each sampled villages were purposively selected. The data were therefore collected using structured questionnaires tailored to obtain information on the resource sources, quantity of resources used, input and output quantities, farm input characteristics, crop production factors, cost of input and income from output were collected.

Data were analyzed using descriptive statistics and regression model.

The finding reveals that most farmers were in their active age and with low educational level. Economic efficiency of resource used showed that seed and farm size were being underutilized, while fertilizer and agrochemicals were over utilized. The result indicates that most of the resources were underutilized by Taungya farmers while they were being over utilized by Non-Taungya farmers. Among the three models adopted the double logarithm was found to be more suitable for predicting the relationship between farm productivity (output) and farm inputs for both Taungya and Non-Taungya system. The regression analysis indicated by the Cobb- Douglas function gave the best fit. The R^2 was highly significant at 1% level with the value of 0.705%.

It is therefore recommended that farmers should be provided with improved planting material to enhance output productivity of crop mix, policies that would grant farmers increased access to farm land and reduce prices of input should also be put in place. Government should emphasize extension services through education to farmer's in both Taungya and non Taungya systems to promote optimally in resource allocation.

Keywords: Taungya and Non- Taungya farmers, Economic efficiency, Productivity, Resource

Introduction

Agriculture in Nigeria as in most other developing countries is dominated by small farm producers (Oladeebo, 2004). Smallholder farmers constitute about 80% of the farming population in Nigeria (Awoke and Okorji, 2004). These small-holder farmers although individually look insignificant, collectively form an important foundation upon which the Nigerian agriculture rests. Several constraints and barriers which appear insurmountable, limit the overall farming activities and if this is anything to go by, the destiny of a developing economy heavily rests on the shoulder of the small producers. Smallholder farmers are farmers whose production capacity falls between 0.1 and 4.99 hectares holding (Federal Office of Statistics, 1999). According to Awoke and Okorji (2004), smallholder farmers are those farmers who produce on small scale, not involved in commercial agriculture but produce on subsistence level, and cultivate less than five hectares of land annually on the average. The question of how efficient smallholder farmer uses farm resources is of considerable interest to agricultural economists. The farm-level efficiency of smallholder resources has important implications for the agricultural development of a nation. Efficient farms make better use of existing resources and produce their output at the lowest cost. Thus, achieving the food security objectives. The efficient method of producing a product is that which uses the least amount of resources to get a given amount of the product (Igben, 2002). Increase inefficiency in arable crop production could present a ray of hope and could lead to an improvement in the welfare of the farmer, reduce land degradation and consequently a reduction in their poverty level and food insecurity, most especially when agroforestry practices are employed.

Agroforestry is a dynamic, ecologically based natural resources management system through which the integration of trees/woody perennials in farm and rangelands, diversifies and sustains production for increased social, economic and environmental benefits (Leaky, 1996). Under pressure of increasing populations, migration and the cultivation of inappropriate lands, traditional farming becomes a major contributor to environmental degradation in developing countries. Because yields in many traditional systems are low, pressure to clear new land for farming continues. However, traditional farmers already responded to the need to sustain production by selectively incorporating multipurpose woody species which they consider useful and effective in enriching the production system biologically (Obi and Tuley, 1973; Okigbo 1976; Kang and Ghuman, 1991).

Taungya, a form of agro-forestry system in which short term crops are grown in the early years of the plantation of a woody perennials species in order to utilize the land, control weeds,

reduced establishment cost, generates early income and stimulate the development of the woody perennials species (Etukudo,2000).

As a result of never-ending increase in demand for food and fiber, there is reliance on area expansion to meet the needs of the rapidly increasing human and livestock population and this has resulted in decrease in forest land area. With this problem, difficulties of traditional farming are increasing every day and demand for food is fast exceeding that of supply. It has been observed that farmers would adopt innovations as long as it is profitable and can be practiced with ease and low cost, thus the need to compare the profitability of agro-forestry with traditional farming is paramount. The benefit that accrues to the farmers was investigated and analysis of the productivity of resource used in Taungya system and Non-Taungya system was assessed in Olokemeji Forest Reserve.

METHODOLOGY

Study Area

The study was carried out in in Olokemeji Forest Reserve in Odeda Local Government Area of Ogun State. Farmers practicing Taungya within forest reserve and outside forest reserves were surveyed. Olokemeji forest reserve occupies a total land area of 58.88 km^2 .The reserve, which was established in 1899 is the second forest reserve in Nigeria. The forest reserve is situated between latitude 7^0 20’ and 7^0 50’N and Longitude 3^0 53’ and 3^0 58’E. The site lies approximately 32km West of Ibadan, and 35km North-east of Abeokuta. The topography of the study area is generally undulating, lying at altitude between 90m and 140m above sea level, except for a quartzite ridge near the western side, which rises steeply to over 240m. Olokemeji forest reserve is in the lowland rain forest of South-western Nigeria.

Data Collection

Simple random technique was used to select five (5) villages surrounding the forest reserve. Twenty (20) Taungya farmers and Ten (10) Non-Taungya farmers within each sampled villages were purposively selected. There were 150 respondents. The data were therefore collected using structured questionnaires tailored to obtain information on the resource sources, quantity of resources used, input and output quantities, farm input characteristics, crop production factors, cost of input and income from output were collected. Data were analyzed using Descriptive statistics (tables, frequency and percentage proportions), Gross margin analysis and multiple regression analysis.

Gross margin was analyzed using:

GM = TR - TVC

Net p: = GM -TFC

RRTI = $\frac{\pi}{TC}$ X 100

p = Profit

TR = Total revenue (N)

TVC = Total variable cost (N)

GM = Gross margin (N)

TFC = Total fixed cost (N)

Multiple regression models show the stochastic relationship between the independent variable and the dependent variables. The implicitly from of the production function is given as;

Yi = f (X_1, X_2, X_3, X_4, X_6 U)

Yi = Aggregate value of crop output

X1 = Labour (man day)

X2 = Farm size (hectares)

X3 = Fertilizer used (kg)

X4 = Seed input (₦)

X5 = other inputs (₦)

X6 = Taungya participation= (Taungya farmers =1, otherwise = 0)

U = Error term

b0 : Intercept

The resource use efficiency was determined by considering the marginal product value against the price per unit of input i.e resource use is optimum after running regression analysis of the factors affecting the crop output. Since these variables are expressed in physical quantities in the function estimated. The MVP of such are compared with their unit prices to determine the degree of efficiency in their use.

The resource use is optimum where MVP: Px,

Where. MVP=Margin Value Product, Px = Price per unit of variable input

MVP >Px=Under-utilization of resources,

MVP <Fx= Overutilization of resources,

MVP =Px =Optimum utilization of resources

RESULTS AND DISCUSSION

Socio-economic characteristics

Distribution of respondents according to sex

The sex distribution of the respondents as shown in table 1 indicates that 87% of the respondents were male while 13% were female in the Taungya farming and 92% male and only 8% female in the Non-Taungya system. This revealed that more men were into farming generally while female only come to plant secondary crops (vegetables and pepper) in farms mainly given by their husbands.

Table 1: Distribution of Respondents According to Sex

	Taungya		Non-Taungya	
Sex	Frequency	Percentage	Frequency	Percentage
Male	87	87.0	46	92.0
Female	13	13.0	04	8.0
Total	100	100	50	100.0

Source: Field Survey, 2012.

Distribution of respondents according to age

The age distribution shown in table 2 below indicates that 36% of Taungya and 16% of Non-Taungya farmers' fall within the age bracket 31 - 40 years, 29 of the Taungya and Non- Taungya farmers falls within the age bracket of 41- 50 years. The least number of respondents were found in the 2l years and less than 30 years age bracket. Only 19% and l4% of the respondents in Taungya and Non-Taungya is older than 50 years. This implies that farmers consist of young and energetic individual capable of boosting agricultural production with promptly supplied available farm resources.

Table 2: Distribution of respondents according to Age

	Taungya		**Non taungya**	
Age range	Frequency	Percentage	Frequency	Percentage
21-30	16	16.0	4	8.0
31-40	36	36.0	16	32.0
41-50	29	29.0	16	32.0
Above 50	19	19.0	14	28.
Total	100	100.0	50	100.0

Source: Field Survey, 2012

Distribution of respondents according to educational status

The educational level of farmers is known to affect their farming activities. Result from this study as shown in table 3 reveals that only 4% of the respondents in the Taungya have secondary school education and only 1% in the Non-Taungya farming while about 32% and 11% are farmers with primary school qualifications the Taungya and Non-Taungya respectively. 64% and 38%o of the farmers in Taungya and Non-Taungya have no formal education while only 1% of the Taungya farmers have a form of tertiary education. Thus, the result shows that many farmers of the educational classes sees the advantage of the Taungya system, this could be as a result of extension contacts and the high awareness of the environmental importance and the more diversified earning on group of farmers.

Table 3: Distribution of respondents according to educational status

	Taungya		Non Taungya	
Educational status	Frequency	percentage	Frequency	Percentage
Non-formal	64	64.0	38	76.0
Primary	32	32.0	11	22.0
Secondary	4	4.0	1	2.0
Tertiary	1	1.0	-	-
Total	100	100.0	50	100.0

Source: Field Survey, 2012

Distribution of respondents according to annual Income

The distribution of farmers according to their annual income indicate that just 7% and 14% of the farmers in the Taungya practice and none in the Non-Taungya system lived above ₦250,000, while 12% lives between ₦200,000 in both systems and 15% and 13% lives below ₦100,000 (Table 4). This is an indication that most of the resources used by these farmers are not effectively utilized.

Table 4: Distribution of respondents according to annual income

	Taungya		Non Taungya	
Annual income	Frequency	percentage	Frequency	Percentage
50,000 Naira or Less	15	15.0	13	26.0
50001-100,000	26	26.0	15	22.0
100001-150000	26	26.0	8	30.0
150001-200000	12	12.0	14	16.0
200001-250000	14	14.0	-	28.0

250001 or more	7	7.0	-	-
Total	100	100.0	50	100

Source: Field Survey, 20l2

Regression Estimates for Taungya and Non-Taungya farmers

The regression estimates for both Taungya and Non-Taungya farmers is shown in table 5. This result shows that the variable distributed negative and positive coefficients within and across the models. However, the coefficient of determination (R^2) was found to be same for both linear and semi-logarithm models with value of 0.561 or 56.1% while that of double logarithm was found to be 0.705 or 70.5% respectively. The results obtained is an indication that strong relationship exist in the variables computed between Taungya farmers and Non-Taungya farmers, hence double logarithm models were found to be best among the models used since it has the highest coefficient of determination (R^2 : 0.705) and relatively high t-statistic value. Similar findings were observed by Okojie (2008) who reported double logarithm as lead equation for meeting the a-prior expectation of signs and economic theory in the study conducted to examine the analysis of resource use productivity in Taungya and traditional farming in Ogun State Nigeria. The implication of the result obtained in the table is that more input can still be sufficiently and effectively used to increase production.

Table 5: Regression estimates for both Taungya and Non- Taungya farmers

	Linear		Semi log		Double log	
Variables	Coefficient	(t-value)	Coefficient	(t-value)	Coefficient	(t-value)
b0	38109.195	3.522	384040.204	4.503	13.087	22.098
b1	-1.341	-3.142	-10465.197	-3.069	-0.096	-4.075
b2	24847.031	9.571	68113.345	9.372	0.640	12.677
b3	-0.458	-2.762	-20666.684	-2.943	-0.113	-2.316
b4	0.431	0.308	-4689.496	-0.697	0.17	-0.355
b5	-6-361	-1.727	-6864.168	-1.001	-0.065	-1.366
b6	59471.410	6.439	7775.702	6.134	0.610	6.967
R-2	0.561		0.561		0.705	
F value	32.680		32.767		60.220	

B6 = Taungya participation (Taungya farmers = 1, otherwise = 0)

Table 6: shows the resource efficiency ratio for both Taungya and Non-Taungya The result shows that one variable (labour) was found to be approxirnately equal to unity. This is an indication that labour was found to be efficiently used in the combined farming system. Two

variables (farm size and other) were found to be above unity. This is an indication that they were being underutilized thus have negative impact on the productivity. Two variables inputs (fertilizer and seed) were found to be lesser than unity. This shows that these two resources were being excessively used or over used as this will have negative impact on the productivity. The two farming system could be said to have some advantages over the other in terms of outputs. This implies that any of the farming system adopted will in return leads to high productivity having put into consideration the required inputs for optimal yield. This finding is in consonance with the findings of Okojie (2008) who reported high R-2 and relatively high F -statistic value. The efficiency measures for the Taungya and Non-Taungya systems were undertaken by calculating the MVP (marginal value product) and dividing it byy MFC (marginal factor cost). The marginal value product of labour X1, Farrn size X2, Fertilizer X3, Seeds X4 and other Inputs X5 were computed and compared to their unit prices. The marginal value products of these resources were compared to determine the degree of efficiency in their use where this ratio was less than 1, it was a situation of resource over-utilization where it was greater than 1. It is a situation of non-optimal use of resources (resource underutilization) and where the ratio was equal to 1.Comparing the ratio of MVP to MFC shows that the resources were underused or being underutilized by farmers. This might be responsible for the low productivity experienced by farmers operating under Taungya farming system. Hence increase in the utilization of these resources, will in turn increase the output of farmers in the study area. This result is in accordance with the finding of Taru *et al*., (2008) who reported that the resources were not efficiently used by farmers in Adamawa State for groundnut production. According to this finding there is need for farmer operating under Taungya farming system to improve their productivity and efficiency of resource use among Taungya farmers

Table 6: Marginal value productivity and efficiency measure for both Taungya and Non-Taungya farmers

Input	Bi	MVP	MFC	MVP/MFC
X_1	-0.064	1013.265	1000	1.01
X_2	0.749	2067.49	2500	8.27
X_3	0.042	878.265	1200	0.73
X_4	0.361	1001.725	1500	0.66
X_5	0.412	2793.07	1600	1.74

Costs and returns analysis (Gross margin)

Farming may not be for the purpose of only satisfying the household food need or subsistence but the farmers may be interested in selling their output for income generation. Thus, farmers like any other entrepreneur would be interested in the profitability of the farm enterprise. Gross margin for both Taungya and Non- Taungya farming analysis shows that cost of labour were found to be the same for the two farming systems per hectare. This was as a result of the fact that the labourers charged per hectare. Cost of seed, fertilizer and pesticides were found higher in the Non- Taungya farming because it accommodates more seeds, pesticides and fertilizer than Taungya system due to absence of trees. Thus, there was difference in the gross rnargin and profit obtained for both farming system. This could be attributed to the fact that Non-Taungya had the opportunity in terms of space and no tree canopy to hinder the growth of its produce while canopy cover poses an hinderrance to growth of the farm produce in Taungya system consequently, the efficiency levels were found higher in Non-Taungya system. This is an indication that it uses the space given more effectively than Taungya system.

CONCLUSION AND RECOMMENDATION

Farmers in both Taungya and Non-Taungya farming system were of active age group capable of, enhancing resource productivity with available and promptly supplied inputs. The low level of education of respondents was not such that could limit the attainment of optimal farm productivity. Analysis of inefficiency effects reveal that farmers' personal characteristics do not contribute to farm inefficiency. The results show that labour and farm size are significant determinants of farm outputs and the resources were not efficiently utilized for both Taungya and Non-Taungya farmers'. Double logarithm model were found to be more suitable in establishing the relationship between the farmers output and inputs for both Taungya and Non-Taungya farming system. Attainment of increase in food production means that farmers have to maximize the use of resource for better productivity. There has been the preference in adopting the Non-Taungya farming system over Taungya system for cultivating arable crops, despite the fact that Taungya system aids environmental sustainability and also gives quicker return to investment than Non-Taungya system.

It is therefore recommended that farmers should also be provided with improved planting materials to boost productivity in the area in order to reduce over utilization of planting materials. Provision of adequate extension and supportive services of government with a view of improving farming technique with technological innovations. The extension education should emphasize reduction in the over utilization of labour and fertilizer especially in the Taungya farming system where there is nutrient recycling resulting from litter fall from the tree component.

REFERENCES

Awoke M. U. and C. Okorji (2004). The Determination and Analysis of Constraints in Resource Use Efficiency in Multiple Cropping Systems by Smallholder Farmers in Ebonyi State, Nigeria Africa Development" 2004; vol. xxix. No 3, Pp. 58-69.

Eyoh, E.O. and Igben, S. I. (2002) Agricultural Economics: An introduction to Basic Concepts and Principles. Bedst Print Business Press, Uyo, Nigeria. Pp 238

Etukudu, I. (2000) Forest: our divine treasure,lst edition, Dorand Publishers, Uyo, Nigeria, Pp 92-99.Society, Series A. 120.253-281.

Federal office of Statistics (FOS), (1999). Poverty and Agricultural Sector In Nigeria, Poverty incidence of Farmers by Region, FOS. Pp 22-23.

Leaky, R.. (1996). Definition of Agroforestry revisited. Agoforestry today 9(1):5-6.

Kang, B.T. and Ghuman B.S. (1991) Alley Cropping as a sustainable system In: Moldenhaur, W.C., Hudson, N.W., Sheng, T. C., Lee, S. W. (eds) development of Conservation farming on hill slopes. Soil and water conservation society, Ankeny, I.O

Obi, J. K. and Tuley, P. (1973). The bush fallow andley farming in the oil palm belt of Southeastern Nigeria. Misc. report 161, Land Resources Division, Ministry of Oversea Development (ODM). UK

Okigbo, B. N. (1976) Role of legumes in small holdings of the humid tropics. In J. Vincent, A.S. Whitney and J. Bose (eds,) Exploiting the legume rhizobium symbiosis in tropical agriculture. Department of Agronomy and soil Science, University of Hawaii, Honolulu

Okojie, L.O (2008): A comparative analysis of resource use productivity in Taungya and Traditional farming on Ogunstate,Nigeria. 'Nigerian Journal of Tropical Agriculture Vol. 10, 306-14pp.

Oladeebo J.O., Ambe-Lamidi A.I. (2007): profitability, input Elasticities and Economic Efficiency of Poultry Production among Youth Farmers in Ogun state, Nigeria. International Journal of Poultry Science 5 (12): 991-998, 2007, Asian Networkfor Scientific information, 2007 994. Ladoke Akintola University of Technology, Ogbomoso, Nigeria.

Taru, V. B, Kyagya L Z, MsheliaS.I and Adebayo E. F (2008): Economic efficiency of resource use in groundnut production in Adamawa state of Nigeria' WorldJournal of Agricultural Sciences Vol. 4:895-900pp.