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RESOURCE-USE EFFICIENCY IN AGROFORESTRY PRACTICES IN HONG LOCAL GOVERNMENT AREA OF ADAMAWA STATE, NIGERIA

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Abstract
The study examined resource-use efficiency of agro forestry practices in Hong Local Government Area of Adamawa State, Nigeria. The specific objectives were to describe the socio-economic characteristics of agro forestry practitioners; examine the efficiency of resources use in agro forestry practices and to identify the problems associated with agro forestry practices. Data were collected from 120 practitioners using purposive and simple random sampling technique. Input-output relationship of agro forestry was investigated using multiple regression analysis. The finding revealed that male practitioners constitute 60 % in the study area. In addition, they had one form of formal education or the other. The result shows that practitioners did not utilized their productive resource optimally (efficiency level of land, seeds/ seedlings, fertilizer and labor were 15.69, 5.13, 0.61 and 0.46 respectively). The study recommends that for optimum allocation of input resource, profit maximization, labor input should be reduced, and seed/seedling input should be increased by reducing the planting space.

Keywords: *Resource-use efficiency, Agroforestry and Production.*

Background to the Study

Agroforestry is more than a business; it is a way of life, a means of survival and a determinant of well being of future generations. The importance of this sector is more pronounced in the developing countries including Nigeria where it is the main thrust of national survival, such as provision of employment, wood, food and foreign exchange earnings. The role agro forestry has played in the industrial growth and development of most of the industrialized countries in the world cannot be over emphasized. The programme has a very important structure for land and agrarian reform, which will go a long way towards promoting the interest of farmers in the agro forestry sector. Since agro forestry development is the basic tool for economic development, there is the need for proper management of the agro forestry system of farming if the ever- increasing demand for the products are to be met.

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The crucial role of efficiency in increasing agricultural output has been widely recognized by researcher and policy makers. It has remained an area of important research in both developed and developing countries. This is particularly for developing economies where resources are meager and opportunity for developing and adopting better technology are dwindling (Ali and Chaudhary, 1990). The reason behind the measures of efficiency is that if farmers are not making efficient use of existing technologies, then effort designed to improve efficiency would be more cost effective than introducing a new technology as a means of increasing output (Shapiro, 1983).

Efficiency measurement is important because it leads to sustainable resource savings, which have important implication for both policy formulation and farm management (Bravo-ureta and Reiger, 1991). Productive efficiency, which benefits economics, is achieved by determining the extent to which it is possible to raise productivity by improving the neglected resource (Tadesse and Krishanamoorthy, 1997).

This paper therefore, examines whether there is efficient use of resource in agro forestry production in Hong Local Government Area of Adamawa State, since agro forestry is an integral part of the people's live. The benefits of this work lies in providing information on whether the agro forestry practitioners are making efficient use of productive resources in the area.

Methodology

Study Area

Hong Local Government Area of Adamawa State is situated in the central part of Adamawa State and lies between latitude 7°-11°N and 7°-14°E. It has an estimated population of 169.183, which are predominantly farmers. (NPC, 2006)

Source of Data and Sampling Procedures

Data for this study were mainly from primary sources and oral interview. Purposive and simple random samplings were used. The first stage was the choice of Hong Local Government Area of Adamawa State. The second stage is the choice of ADP cells in Hong Local Government Area of Adamawa State. The third stage involved random selection of the cell. There are sixteen cells in the LGA out of wish eight cells were randomly selected and one hundred and twenty agro forestry practitioners were used for the study.. The practitioners were selected in eight cells of the Local Government Area. They include: Hong, Pella, Fachi, Gaya, Garaha, Shagui, Kala'a and Bangshika. This form the basis for primary data collection.

Multiple regressions were used to investigate the influence of various inputs on the output of agro forestry.

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, U)$$

Where

Y = Total value of agro forestry farms output in Naira
X_1 = Land in hectares
X_2 = Seed / seedling (Numbers)
X_3 = Herbicide used (lit)
X_4 = Fertilizer used (Kg)
X_5 = Age of farmers (Years)
X_6 = Farming Experience (Years)
X_7 = Labour (Man-days)
U = Error or random disturbance term.

The efficiency of resource-use was determined by computing the ratio between Marginal Value Product (MVP) and Marginal Factor Cost (MFC). The ratio was calculated using:

r = MVP / MFC

Where:
MVP = Marginal Value Product
MFC = Marginal Factor Cost
r = efficiency ratio

A ratio equals one indicates efficiency in resource use, a ratio less than one indicates resources is excessively used, a ratio greater than one indicates resources is underutilized (Iheanacho et al., 2000).

Results and Discussion

Socio-economic Characteristics of Agroforestry Farmers

The socio-economic characteristics of agro forestry practitioners in the study area were summarized in Table 1. The table reveals that majority (89.2%) of the practitioners are relatively young, with mean age of 41 years. The preponderance of the young producers in farming profession means that their productivity is expected to be high since they are active, energetic and can easily adopt agro forestry innovations. The agro forestry practitioners are mostly of male gender, which is attributed to culture of the area. Male are mostly (60%) involved in the production while women spend most of their times in housekeeping and taking care of children few may undertake farming activities and trading.

All (100%) of the respondents acquired one form of education or the other which is a vital component in technology adoption in agro forestry. Education has been discovered to be highly related to effectiveness of work and economic function (Meskel, 2006). One can infer from this that with the preponderance of educated farmers, the adoption of farming technique may not be difficult as they are more likely to learn with ease and disseminate innovations.

The farmers have average household of 7 persons and with mean farming experience of 12years. The farming experience would to large extent affects farming decision and farming experience has positive relationship with technical efficiency. This implies that the more efficient the farmer might be in the use of productive resources (Adewumi and Okunmadewa, 2011).

Multiple Regression Analysis

The explanatory variables used are farm size, seed, fertilizer, herbicides, farming experience, age and labor. Four of these variable inputs had significant effects on practitioners output: farm size, quantity of seed used, quantity of herbicide and amount of labor used. Four functional forms were fitted into the model. They are linear, semi-log, double log and exponential functions. The results were summarized in Table 2. The lead equation (double log) was selected based on the economic criteria, the value of the coefficient of multiple determinations, the standard error of the estimated parameter, statistical test of the F-ratio and the significance of the coefficient of the explanatory variables.

The variables included in the model have explained 93.4% of the variable in the dependent variable (output) as revealed by the coefficient of multiple determinations (R^2). The remaining 6.6% was attributed to the factors included in the error term (Ui). The overall model is significant at 1% as pointed out by the magnitude of F-statistics. Also the error terms are not auto-correlated as indicated by Durbin Watson statistics. The coefficient of (X_1) is positive and statistically significant at 1% level. This implies that a 1% increase in farm size brings about increased output of agro forestry by 21%. This is in line with the findings of Banta and Zira (2013). Crop production can be increased by expanding the area under production statistical significance of herbicide (X_3) at 5%level implies that increase use of herbicide would increase output of agro forestry. One

percentage increase in the use of herbicide would increase output by 5%. Herbicide reduces the cost of hiring labor and helps in cultivating larger area of land (Zira, 2008).

The coefficient of labor(X_7) is positive and significant at 1% level implying that increase in labor would increase output of agro forestry by 28.2% revealed by elastic coefficient. Labour is very essential and needed for farm operations such as fertilizer application, weeding among others. The coefficient of seed is positive and significant at 1% level this implies that increase in the quantity of seed would increase output. The increase in the output of agro forestry is brought about by increase in the size of farm

Estimated Marginal Physical Product and Resource use Efficiency

The ratio of marginal value product to marginal cost was computed for every input in agro forestry production (Table 3). It was observed that the ratio of marginal value product (MVP) to marginal factor cost for fertilizer and labor were less than unity (1) indicating that these inputs were utilized. Optimal resource allocation requires that the marginal value product (MVP) be equal to marginal factor cost. Analysis of marginal value product to marginal factor ratio indicated that land (20277.19) and seed (1745.04) resources were underutilized, while fertilizer (2052.02) and labor (374.35) were over utilized.

Problem Encountered by Agroforestry Practitioners

The results (Table 4) revealed high cost of labor ranked among the problems listed by the practitioners. This may be because of labor intensive nature of agro forestry operations which coinciding with the general needs of labor for the farming season. This is closely followed by high cost of land, high cost of herbicides, lack of credit, high cost of fertilizers, lack of improved seeds / seedlings in that order. These identified problems agreed with the findings of Banta and Zira (2013), who also reported problems encountered by upland rice farmers in Zango-Kataf Local Government Area of Kaduna State, Nigeria.

Conclusion and Recommendations

The study revealed the existence of inefficiency in agro forestry production in Hong Local Government Area of Adamawa State, Nigeria. Most of the practitioners were male, with an average household size of 7 persons. All the practitioners were literate and had one form of formal education or the other. The agro forestry practitioners in the study area did not utilized the productive resource optimally. Hence, the practitioners were inefficient in the use of input resource.

The results shows that the major problems affecting agro forestry productivity in the study area are: high cost of labor, high cost of land, high cost of herbicides, lack of credit, high cost of fertilizer, lack of improved seeds / seedlings and pest and diseases.

The study recommends that for optimum allocation of input resource, profit maximization, labor input should be reduced, and improved seed / seedling input should be increased by reducing the planting space this will help the practitioners in boosting agro forestry production in the study area.

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Appendix

Table 1: Socio-Economic Characteristics of Agroforestry Practitioners

Variables	Frequency	Percentage
SEX		
Male	72	60
Female	48	40
Total	120	100
AGE		
20-39	32	26.7
40-59	75	62.5
60 and Above	13	10.8
Total	120	100
FARMING EXPERIENCE		
1-10	40	33.3
11-20	59	49.2
21 and Above	21	17.5
Total	120	100
FAMILY SIZE		
? 2	3	2.5
3-5	42	35
6-8	59	49.2
? 8	16	13.3
Total	120	100
EDUCATIONAL LEVEL		
No. Formal education	0	00.0
Primary	50	41.7
Secondary	43	35.8
Tertiary	27	22.5
Total	120	100

Source: Field Survey, 2014.

Table 2: Regression Analysis Result

Functional Form	Linear	Exponential	Cob-Douglas #	Semi-Log
Output	Y	In Y	In Y	Y
Constant	-107.626	0.732	0.862	-1758.236
X_1	1.672	0.0004022	0.111	-11408.527
	(19.50)	(0.007)	(0.58)***	(1340.2346)
X_2	25.162	0.000175	0.345	12506.381
	(1.150)**	(0.001)	(0.53)***	(1352.89)***
X_3	47.084	0.01614	0.427	93.571
	(33.680)	(0.013)**	(0.024)**	(508.487)***
X_4	2.011	0.001272	0.01755	-1512.877
	(0.752)***	(0.000)***	(0.17)	(306.264)
X_5	6.110	0.004573	0.0634	240.628
	(8.188)	(0.002)**	(0.150)	(2289.355)***

X_6	-0.527	-0.002562	0.03521	-789.147
	(9.899)	(0.003)	(0.46)	(1001.655)
X_7	33.670	0.0006282	0.282	16275.156
	(6.518)***	(0.002)	(0.64)***	(1308.380)***
S	237.253	0.074	0.187	3225.266
F	2010.020***	57.433***	235.440***	178.745***
R^2	98.2	80.1	93.4	91.3
DW	2.11	1.79	2.10	1.99

Sources: Field Survey, 2014. Figure in Parenthesis are respective (Standard Error)
*** 1%Parenthesis of Significance, ** 5% Parenthesis of Significance,
R^2 coefficient of determination, # leads equation

Table 3: Resource Use Efficiency

Variable	MPP	MVP	MFC	MVP/MFC
Land (X_1)	20, 2777.19	304,145.85	19,384.30	15.69
Seed/Seedling(X_2)	1,745.04	8,725.20	1,699.85	5.13
Fertilizer (X_4)	2,052.02	1,251.73	2,043.11	0.61
Labour (X_7)	374.35	168.46	364.05	0.46

Source: Field Survey, 2014.

Table 4: Problems Encountered by Agroforestry Practitioners

Type of Problem	Frequency	Percentage	Ranking
High cost of labor	29	24.2	1
High cost of land	22	18.3	2
High cost of herbicide	19	15.8	3
lack of credit	17	14.2	4
High cost of fertilizer	15	12.5	5
Lack of improved seeds/seedlings	11	9.2	6
Pest and disease	7	5.8	7
Total	120	100	

Source: Field Survey, 2014.