Cost Effectiveness of Intercropping Patterns by Cashew Farmers in Oyo State, Nigeria

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Abstract— *The study assessed the cost effectiveness of the various intercrops on cashew plantations in Oyo State, Nigeria considering the cost of production, revenue accruable to the farmers at the end of the production season. Multi-stage random sampling procedure was used to select respondents for the study. Two Local Government Areas and 130 cashew farmers were randomly selected. Structured questionnaire was used to elicit information from the respondents. Data collected were analyzed using descriptive statistics and multiple regression analysis. The results reveal that 84.62% were males, 7.69% were graduates of university while 19.23% had primary education. Most (88%) of the respondents were married, the mean years of cashew farming was 23±8.49; age of farmers 48±12.57; household size 5±2.00 persons and farm size2±1.14 hectares. The total revenue accruable to the farmer is ₦109, 237±₦18, 390 ($346.78) from intercropping on cashew plantation while the estimated expenditure on the plantation per season was estimated at ₦47, 084 ±₦5, 134($150.11). The revenue accruable from the different intercrops such as maize is ₦95, 666.67±₦34, 826.56($303.70), cowpea ₦13, 573.33±₦11, 828.19($43.08); cassava and yam ₦50, 066.67±₦18, 167.34($158.94) and from vegetables intercrop ₦5,742.86±₦4, 007.02($18.23). The regression results revealed that maize is the most cost effective intercrop (p<0.01) on cashew plantations in Oyo state, southwest Nigeria during early stages from which high profit can accrue to the farmer. Farmers should be encouraged to intercrop with maize.*

Keywords— cost effectiveness, intercropping, cashew, food security, welfare, Nigeria

Exchange rate: $1=N315

I. INTRODUCTION

Improving the welfare of farmers is so paramount to development economists as that this ensures the sustainability of farmers and their households in the business of production.

Cashew (*Anarcardiumoccidentalae*) is an economic crop in Nigeria which is grown in plantations in 27 states of Nigeria because of the ease of cultivation and need for minimum attention. Also, there had been noticeable decline in cashew productivity at farm levels that cannot be ignored for the benefit of the crop and farmers.

Cashew (*Anacardiumoccidentale*), a native of Brazil, was introduced into India during the latter half of the 16th century for the purpose of afforestation and soil conservation. Work started on cashew in Nigeria in full swing in 1972 this intervention led to yield increase from 0.16ton per hectare in the 1970s to 0.70tons per hectares in the 1990s (Aliyu, 2010).

In Nigeria, current cashew trading and exports is worth 24 billion naira ($160 million)and over one million people depend on the industry. Commercial cultivation of cashew in Nigeria dates back to more than 60 years, while research and development into its production, processing andmarketing started in 1972. The past four decades were marked with introduction of exotic cashew genotypes, selection, cultivation and production from local and exotic varieties. Much discrepancies exist in yield records; current national production of raw nuts is estimated at 836,500 mt on 366,000 ha with an average yield of 2,286 kg/ha. Just about 5% of the produced nuts are processed in Nigeria.There have been many products developed from cashew among which are the roasted nuts, cashew nut shell

liquid **(CNSL),** and from the apple: juice, jam, cashew wine and alcohol among others.

Most cashew trees start bearing fruit in the third or fourth year, and are likely to reach their mature yield by the seventh year if conditions are favorable. The average yield of nuts of a mature tree is in the range of 7-11 kg per annum. Although the cashew tree is capable of living for 50-60 years, most trees produce nuts for about 15-20years.

Initially, intercropping received little attention on cashew plantations. But inter-cropping has become popular with the systematic establishment of large-scale orchards. It is practiced in the first few years (4-5 years) when there is sufficient space between crop rows with the main objective of deriving some income until the cashew starts giving economic returns. To this end, there is dearth of information about the cost and returns on cashew production for smallholders who produce and depend on it as source of income and food security. This paper assessed the cost effectiveness of intercropping system by putting into consideration the revenue accruable to the farmers at the end of the production season compared to the cost of production.

The general objective of this study is to assess the cost effectiveness of intercropping patterns by cashew farmers in the study area.

The specific objectives of the study:

i. assess the cost effectiveness of the various intercrops on cashew plantations;
ii. determine the most ideal and profitable intercrop on cashew plantations;
iii. toassess the constraints faced by cashew farmers in the study area.

II. METHODOLOGY

Multi-stage sampling procedure was used to select respondents for the study. Two Local Government Areas; Ibarapa East and Ibarapa North were randomly selected. In the LGAs two cashew growing communities Eruwa and Lanlate in Ibarapa East; and Igangan and Ayete in Ibarapa North were purposively selected. In the two communities of the LGAs 65 farmers each were selected from the list of ADP Extension Agents contact farmers giving a total of 130 respondents. Structured questionnaire was used to elicit information from the cashew farmers. Data collected were analysed using descriptive and inferential statistics.

III. RESULTS

The analysis of the socio economic characteristics for the study on Table 1 reveals mean age of cashew farmers in the study area as 48 ± 12.57years, which implies that most of the cashew farmers are still relatively in their active and productive years of which is good and can improve cashew production in the state. Also, majority (84%) of the farmers were male with only 26.92% having secondary and no formal education each; 7.69% were university graduates while 19.23% had the National Certificate of Education (NCE) qualifications. Eighty-eight percent were married with 11.54% widowed; 43.48% had over 30 years of cashew farming experience with the mean at 23 ± 8.50 years; mean cashew tree age was 17.94 ± 9.27 years, which implies that the cashew trees are not young either. Mean household size was 5 persons per household. The results further show that 76.92% of the farmers are not members of cashew farmers association, meaning their social capital is low and this definitely will have detrimental effects on the acquisition of trainings for farm improvement, new technologies, marketing information, and access to production resources.

The primary occupation of cashew farmers shows that 46.15% are involved in full-time farming, 19.23% in trading while only 15.38% are civil servants; this implies that the cashew farmers will be more dedicated to improving their crop given necessary incentives such as credit, participatory research assistance for increased output, income and sustainable livelihood. The mean farm size is 2.09 ± 1.14 hectares; with about 61.5% of them having several crops intercropped with cashew.

Most farmers planted large sized nuts 52%, 43% planted medium while only 5% planted the small nuts. About 78% of the farmers practice manual weeding using hired labour; weeding twice a year and spending between N30, 000 and N35, 000 as costs of weeding. Close to 86% of the cashew farmers do not use fertilizers because the crop is reported as hardy in nature but not withstanding, poor usage of fertilizer may probably be due to lack of funds. The most prevalent insect pests on cashew plantations are the Stem girdler and the Tailor ants; these the farmers control using pesticides. The Gammalin-20 which has been banned for usage of farms is still popularly used among the farmers; farmers pay as much as N700 per bucket for the removal of cashew nuts from the apples.

The mean total revenue from intercrops on cashew at N109, 237.14±18,390.99 and expenditure at N47, 084±5,134.02; the total gain was N78, 044.29±15,491.26 this implies that it is actually profitable to plant and intercrop in cashew plantations because of the low expenditure and high returns which serves as the safety net and income for cashew farmers before economic yield. This result conforms to the

findings of Lawal*et al*, 2011 on the profitability of value addition on cashew fruits that every activity on cashew plantation brings forth profit to the farming households.

The revenue generated from maizeintercrop was N95, 666.67±34,826.56; cowpea was N13, 573.33±11,828.19; from cassava /yam intercrop N50, 066.67±18, 167.34 while revenue from vegetables was N5, 742.86±4,007.02 per annum. The amounts stated above are the sales proceeds from the farms irrespective of household consumptions. The revenue from the cowpea and vegetable was lower than that of maize may be due to the fact that these are main household diets, while lower revenue from cassava-yam intercrop may also be due to household consumption smoothing purposes.

Table.1: Socio-economic and farm characteristics of Cashew farmers

Variables	Mean	Standard Deviation
Age of farmer	48.84	12.57
Year of cashew farming experience	23.26	8.49
Age of cashew trees	17.94	9.27
Household size	5.00	2.00
Farm size	2.09	1.14
Total Revenue	109,237.14	18,390.99
Total expenditure47, 084.00	5, 134.02	
Intercrop Revenue		
Maize	95, 666.67	34,826.56
Cowpea	13, 573.33	11, 828.19
Cassava/yam	50, 066.67	18, 167.34
Vegetables5, 742.86	4, 007.02	

Source: Field Survey, 2016

Regression analysis was conducted on the variables to determine the contributions of each of the selected independent variables and total gain from intercropping on cashew plantations (Table 2). The results yielded an R^2 value of 0.99 revealing that the variables in the regression model put together explain 99.0% of the variance in total gain from intercropping on cashew plantations. The result further shows that two (2) of the variables significantly predicted the farmers total gain from intercropping on cashew plantation these are maize (β= 0.99) and cassava/yam (β= 0.60). These predictors had direct relationships to total gain from intercropping on cashew plantation. The most important predictor was therefore found to be maize. Cowpea and vegetable intercrop did not contribute significantly to the total gains from the cashew intercrops. This result may be due to the use of these intercrops to suit household consumption needs before the leftover were offered for sales. Hence, their contributions to total gain were not statistically significant.

Table.2: Regression Results of Determinants of Total Gain on Cashew plantations

Variables Intercrops	Beta	standard error	t-value	Sig
Intercept	-23056.01	1463.71	-2.09	0.0129
Maize	0.99	0.02	47.47	0.0001*
Cowpea	0.58	0.34	0.90	0.39
Cassava/yam	0.60	0.07	8.50	0.0001*
Vegetables	1.59	1.22	1.30	0.23
Pr>F	<0.0001			
R-Square	0.9964	Adj R-square	0.9948	

Source: Field survey, 2016

Constraints to Cashew Production

The major constraints to production and marketing of cashew are identified and ranked by the farming households as: lack of funds for purchase of pesticides, fire outbreaks in dry seasons, poor market access for nuts, problems of animal pests and pilfering these were ranked 62%, 68%, 70%, 50% and 42% respectively (Table 3). And this indicates that poor market access for the nuts processed is ranked the most important constraint followed by fire outbreak in dry seasons, then lack of funds, problems of animal pests and pilfering of nuts and fruits.

Table.3: Major constraints to Cashew production among farming households

	Constraints	Percentage	Ranking
1.	lack of funds for purchase of pesticides	62	3RD
2.	fire outbreaks in dry seasons	68	2ND
3.	poor market access for nuts	70	1ST
4.	problems of animal pests	50	4TH
5.	Pilfering	42	5TH

Source: Survey data, 2016

IV. CONCLUSIONS AND RECOMMENDATIONS

This study concludes that maize cassava/yam are the most cost effective intercrop on cashew plantations in the study area. The most severe constraints was poor market access to nuts which could be due to poor access to market information. From these empirical results, this study recommends planting maize and cassava/yam as major commercial and cost effective intercrops on cashew plantations in southwest Nigeria while cowpea/vegetable intercrops may be planted as subsistent intercrops in cashew plantation and also for the additional benefits of soil health improvement, amelioration and nutrition from Nitrogen released from the cowpea to the plantation.

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