COST AND RETURNS ANALYSIS OF INTERCROPPED TEA FARMS IN TARABA STATE, NIGERIA

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ABSTRACT

In Taraba state, Nigeria, tea farming is predominant and it provides a source of employment for the local people around the Mambilla plateau and consequently boosts the national economy. This study assessed the costs and returns accruable in tea intercropped farms in Taraba State, Nigeria. A structured questionnaire was used to obtain information from 204 tea farmers in the study area. Descriptive Statistics and Ordinary least square regression was used in the data analysis. About 54% of the tea farmers are in Kakara town while the remaining 46% are in Sabongari, Mayo kusuku and Nyiwa towns. About 97% of the tea farmers are male, 71% are between 31 and 60 years and 84% are married. Four of the ten tea farmers who practice intercropping have no formal education. About 52% belong to cooperative societies. The average total cost per hectare per year and the average gross revenue per hectare per year are ₦8,686.16 *and* ₦6,026,342.45*, respectively. The coefficients of labour cost, weeding, labour cost on other crops, cost of material (file), cost of material (chemical), and cost of material (bag) are all positive and significant. The proportion of the net income to the total cost is 68.6%. Hence, 68.6% of the total cost expended on tea intercrop production was generated as profit. Government at all levels; stakeholders in the tea industry should provide the needed resources for tea farmers to increase their production thus improving their wellbeing.*

***Keywords: Cost, Intercropped farms, Returns, Tea production*.**

INTRODUCTION

Tea (*Camella sinensis*) is a green small tree from the genus Camellia including about eighty-two species (Banerjee, 1992; Kamau, 2008). Out of the *Camellia spp.*, tea is very significant taxonomically and market-wise. It is planted to produce a stimulant distil. There are two major varieties. *Camellia sinensis* var. *assamica* and *Camellia sinensis* var. *sinensis*. The former has fairly big leaves while the latter has few semi-erect leaves. The variety of assamica tea came from the forests of Assam in north-east India while the sinensis tea came from Sichuan province, south-west China (Van der Vossen and Wessel, 2000; Kamau, 2008). With science and breeding, most commercial tea today exhibits vegetative features that are in between these two main types (Mondal *et al.*, 2004). The tea plant can grow up to 15 meters high and has a root system between the taproot to the oblique root system in its natural state (Bonheure, 1990). The total area of land used for tea cultivation in the world is 2600,000 hectares of which 86% and 8% are in Asia and Africa respectively (Famaye, 2006). The major tea-producing nations are China, India, Sri Lanka, Kenya, Indonesia, Turkey, Iran, Georgia, Japan, Vietnam, Bangladesh, Argentina, Malawi, Uganda and Tanzania. The primary crop consists of young tender leaves, which may be withered, rolled, fermented and dried to give different types of teas.

In Africa, the production of tea started in 1903 with the introduction of tea seeds from

India to Kenya and other countries in Africa such as Zimbabwe, Malawi, South Africa, Nigeria and Tanzania. De Bouley from West Cameroon, in 1952, introduced tea to Nigeria (Ipinmoroti *et al.*, 2018; Adedeji, 2006; Kaasboll-Smith, 1965) and rose to become a very significant agricultural crop in Nigeria in 1971. Cocoa Research Institute of Nigeria (CRIN) started its research on tea in 1982 (Ipinmoroti *et al.*, 2002). Tea production started in the Mambilla Plateau of Taraba State in 1982 on a large scale. Nigerian Beverages Production Company (NBPC) started processing and packaging it.

Only about one thousand two hundred hectares of land is presently used for tea production in Mambilla out of five thousand hectares that are proclaimed to be good for its production. The present production of tea is not enough to meet the demand of tea consumers, thus Nigeria is a major importer of tea products with an enormous foreign exchange outflow (Ipinmoroti and Daniel, 2004). Oluyole 2014 reported that in 2008 alone about $ 11 million (N 1.7 billion) was spent on tea importation.

Intercropping is a multiple-cropping practice that involves growing two or more crops in proximity. Intercropping could also mean the cultivation of two or more crops simultaneously on the same field. The ultimate goal of intercropping is to produce a greater yield on a parcel of land by making use of resources or ecological processes that would otherwise not be utilized by a single crop (Trenbath, 1976). Different types of intercropping, all of which vary across time and space, have been identified (Andrews and Kassam, 1976; Lithourgidis *et al.*, 2011). They include row cropping, alley cropping, mixed cropping, companion planting, relay cropping, inter-seeding, overseeding, smother cropping, planting polycultures and using living mulch (Mohler and Johnson, 2009) The significant types are mixed intercropping which is the most basic form in which the crops are totally mixed in the provided space. Row cropping involves the various crops arranged in alternate rows. Variations include alley cropping, where crops are grown in between rows of trees, and strip cropping, where multiple rows, or a strip, of one crop, are alternated with multiple rows of another crop (Holden *et al.*, 2016). Temporal intercropping uses the practice of sowing a fast-growing crop with a slow-growing crop so that the fast-growing crop is harvested before the slow-growing crop starts to mature. Some farmers practise a sole cropping system and this limit their income compared to farmers that practise intercropping. Farmers that practise sole cropping have to wait for their tea to mature before they can get money while their counterparts that practise intercropping can be feeding or earning income from other crops they grow while waiting for their tea to mature.

This study seeks to show that the tea intercropping system is profitable thus encouraging farmers to practise this system This study, therefore, assessed the economic analysis of tea intercropping production in Taraba State Nigeria.

OBJECTIVES

The main objective of this study is to assess the economic analysis of tea production in Taraba state Nigeria.

Specific Objectives

- To assess the cost and return analysis of intercropped tea farms in the study area, and
- To determine the effect of labour costs and cost of materials on the gross revenue of intercropped tea farms.

METHODOLOGY

The study area is Taraba state. Taraba state is in North East Geopolitical zone of Nigeria with longitudes 110° E and 120° E and latitudes 6.50°N and 80°N, has a scale-tropical climate being on an elevation of about 1,550m above sea level (Oluyole *et al.* 2017). The capital is Jalingo. The people of Taraba state are majorly farmers. Cash crops produced in the state are tea, coffee, cotton and groundnuts (https://infoguidenigeria.com). Arable crops such as rice, sorghum, maize, millet, yam and cassava are also produced in large quantities (Emodi and Albert, 2016). On the Mambilla Plateau and along Benue and Taraba valleys animals such as poultry, cattle, sheep and goats are raised. Communities along river banks engage in fishing all year round. They also are involved in other activities such as cloth-weaving, pottery, dyeing, mat-making carving, blacksmithing and embroidery

Information was obtained from the respondents using a well-structured questionnaire. Tea farmers practising intercropping systems were purposively selected. Two hundred and twenty copies of the questionnaire were distributed. After sorting out missing data, two hundred and four farmer's information was used for analysis.

Town	Number of questionnaires administered N=204	%
Kakara	111	54.4
Sabongari	6	2.9
Mayo kusuku	3	1.5
Nyiwa	84	41.2

Analytical Techniques

Descriptive Statistics, budgetary analysis and linear regression were used in this study.

Descriptive statistics: This involves the use of percentages, frequency and mean.

Budgetary analysis:

Total Cost (TC) = Total Fixed Cost (TFC) + Total Variable Cost (TVC)……... (i)

Gross Revenue (GR) = Total Output (Total number of tons of tea sold) X unit price…… (ii)

Gross Margin (GM) = GR – Total Variable Cost (TVC) ……..... (iii)

Net Income (NI) = GR – Total Fixed Cost (TFC) …… (iv)

Linear Regression Analysis – this was used to estimate the effects of the labour costs and costs of production on the revenue generated from intercropped tea farms. The implicit model is:

$Y_i = \beta_1 x_{il} + \beta_2 x_{i2} + \ldots\ldots\ldots + \beta_p x_{ip} + e_i$ .....(v)

Where:

Y= Revenue from tea and other crops.

ei= error term

X_is are the labour cost of land clearing, the labour cost of planting tea and other crops, the labour cost of weeding, the labour cost of pruning, the labour cost of application of insecticide, the labour cost of fertilizer application, the labour cost of watering, the labour cost of harvesting tea and others, labour cost of others, cost of material (cutlass), cost of material(file), cost of material (plant material of tea seedlings), cost of fertilizer, cost of chemical, cost of basket, cost of bag and Cost of other materials.

RESULTS AND DISCUSSIONS

Socio-economic characteristics of tea farmers in Taraba state

Table 1 presented the socio-economic characteristics of tea intercrop farmers in Taraba State. Fifty-four per cent of tea farmers are in Kakara town while the remaining forty-six per cent are in Sabongari, Mayo kusuku and Nyiwa towns. Ninety-seven per cent of the tea farmers are male, and 71% are between 31 and 60 years. The mean age of tea farmers in Taraba state is 43 ± 16years. This is in line with previous works that men are more engaged in farming compared to women because it is labour intensive. Women are more involved with the processing and trading of farm proceeds (Ipinmoroti *et al.*, 2018; Oluyole and Sanusi, 2009)

Eighty-four per cent are married. This could mean an increase in labour availability as family members could help farmers on the farm. Furthermore, four out of ten tea farmers that practise intercropping have no formal education. Fifty-two per cent belong to cooperative societies. The cooperative societies are NACOFTA, Small scale farmers, Mambilla beverage, AFAN, Tea association and Authodox organic tea enterprise. Majority of the tea farmers plant between 1 and 3 varieties of tea with a mean of 1. Eighty per cent of tea farmers intercropped tea with at most two crops. The crops they intercropped with tea are maize, sweet potatoes, beans, guinea corn, guava, pear, cassava, pineapple, and cocoyam among others. Seventy-five per cent cultivated tea and other intercrops on less than and equal to two hectares. Thus majority are smallholder farmers while the remaining twenty-five per cent is cultivated between 3 and 5 hectares. The mean farm size of tea farmers in Taraba state is 22 ± 8 years. Forty-eight per cent of the farmers have farms aged between 11 and 20 years, and 41% are between 21 and 30 years old. The mean age of tea farms in Taraba state is 22 years. Forty-seven per cent of the farmers have between 11 and 20 years of experience in planting tea. The mean years of experience is 22 years.

Table 1: Socio-Economic characteristics of intercropped tea farmers in Taraba State

Variable	Frequency(N=204)	%
Town		
Kakara	111	54.4
Sabongari	6	2.9
Mayo kusuku	3	1.5
Nyiwa	84	41.2
Sex		
Male	198	97.1
Female	6	2.9
Age		
>30	33	16.1
31-60	144	70.5
>60	27	13.4
Mean age	43 ± 16years	
Marital Status		
Single	30	14.7
Married	171	83.8
Divorced	3	1.5
Educational Level		
No formal education	81	39.7
Primary	42	20.6
Secondary	39	19.1
Tertiary	42	20.6
Membership in Cooperative Society		
No	99	48.5
Yes	105	51.5
Number of Tea varieties planted		
1-3	186	91.2
4-5	18	8.8
Mean	1 ± 1	
Number of crops intercropped with tea		
0-2	162	79.5
>2	42	20.5
Farm size(hectares)		
≤ 2	153	75.0
3-5	51	25.0
Mean	3±1	
Age of farm		
0-10	9	4.4
11-20	87	42.7
21-30	84	41.2
31-40	21	10.3
>40	3	1.5
Mean	22 ± 8 years	
Years of experience		
0-10	6	2.9
11-20	96	47.1
21-30	78	38.2
31-40	21	10.3
>40	3	1.5
Mean	22 ± 9 years	

Source: Field survey, 2021

Cost and Returns Analysis of Tea Intercropping System in Taraba State

Table 2 shows the summary of the cost of production and the returns from tea intercrop production. The components of the variable cost are the labour cost of land clearing, the labour cost of planting tea and other crops, the labour cost of weeding, the labour cost of pruning, the labour cost of application of insecticide, the labour cost of fertilizer application, labour cost of watering, the labour cost of harvesting tea and others, labour cost of others, cost of material (plant material of tea seedlings), cost of fertilizer, cost of chemical, cost of basket, cost of bag and cost of other materials.

Table 2 showed the cost and returns on one hectare of tea in the study area. The result shows that the total variable costs for all the farmers were ₦1,099,661.00 while the variable cost for one hectare was ₦2,277.30. The fixed cost and the gross revenue for one hectare of farmland were ₦6,408.86 and ₦6,026,342.45, respectively. The gross margin and the net income per hectare were ₦600,357.40 and ₦596,225.84 respectively. The total cost involved in tea intercropped production and the gross revenue derived were ₦4,194,371.00 and ₦2, 910,000,243.30, respectively while the total cost and gross revenue per hectare were ₦8,686.16 and ₦6,026,342.45, respectively. The proportion of the net income to the total cost on one hectare, therefore, was 68.6%. Hence, 68.6% of the total cost expended on tea intercrop production was generated as profit. Therefore, the tea intercrop production enterprise is profitable in the study area. Oluyole *et al.* (2017) also confirmed that tea production is profitable in Taraba state.

Table 2: Cost and Returns Analysis

S/N	Item	Amount (Naira)
1.	Total Variable cost	1,099,661
2	Average Variable Cost/ha	2277.30
3	Total Fixed Cost	3,094,710
4	Average Fixed Cost/ha	6408.86
5	Total Cost	4,194,371
6	Average Total Cost/ha	8686.16
7	Gross Revenue	2,910,000,243.3
8.	Average Gross Revenue/ha	6,026,342.45
9.	Gross Margin	289,900,581.9
10	Gross Margin/ha	600,357.40
11.	Net Income	287,905,533.3
12.	Net Income/ha	596,225.84
13	The proportion of net income to the total cost	68.6%

Source: Field survey, 2021.

Effect of labour costs and cost of materials on the gross revenue

Table 3 shows the result of the regression analysis. The result shows that the regressors can explain 60.7% of the variations in the dependant variables, that is, the coefficient of determination (R^2) was 60.7%. The F-ratio for the model was

16.89. Hence, the overall equation is significant at p<0.01. The coefficients for the labour cost on weeding, labour cost on other crops, cost of file, cost of chemical, and cost of bag were all positive and significant. However, while the cost of file was significant at a 1% level of probability; the labour cost on weeding, labour cost on other crops and cost of bag were significant at a 5% level of probability. The positivity of the coefficients of the inputs shows that the enterprise conforms to the rule of the economics of scale, that is, the more output generated, the more inputs that will be needed to be able to cope with the increased output. Invariably, more output brings about more revenue. Therefore, an increase in all these inputs (labour cost on weeding, labour cost on other crops, cost of file, cost of chemical application, and cost of bag) is necessary to generate more revenue on intercropped tea farming in the study area. While the labour cost of pruning and the labour cost for other crops are significant at a 1% level of probability, the cost of insecticide is significant at a 5% level of probability and the cost of cutlass is significant at a 10% level of probability. The negative sign of the coefficients of the inputs indicates that as the costs of the input decrease, the revenue that is generated from the enterprise increases.

Table 3: Effect of labour costs and costs of materials on revenue

Variable	Coefficient	Standard Error	T	P>|t|
Labour costs				
Land clearing	-8.31	8.57	-0.97	0.334
Planting tea and others	-2.44	20.77	-0.12	0.907
Weeding	72.61**	29.10	2.49	0.01
Pruning	-181.99***	52.09	-3.49	0.00
Application of insecticide	-89.16**	40.16	-2.22	0.03
Fertilizer application	31.82	33.91	0.94	0.35
Watering	-182.31***	64.92	-2.81	0.00
Harvest tea and others	4.61	9.38	0.49	0.62
Others	196.40**	96.64	2.03	0.04
Cost Material				
Cutlass	-188.70*	98.05	2.03	0.06
File	606.36***	38.53	15.74	0.00
Planting material of tea	-1.20	9.01	-0.13	0.89
Fertilizer	7.23	12.77	0.57	0.57
Chemical	35.72*	18.63	1.92	0.06
Basket	17.62	50.87	0.35	0.73
Bag	131.47**	59.16	2.22	0.03
Others	-1973.37***	193.25	-10.21	0.00
Constant	2.15e+07***	2895	7.44	0.00
R-squared	0.607			
Prob> F	0.000			

Source: Field survey, 2021 *** P<0.01 significant at 1%, ** P<0.05 significant at 5%, * P<0.1 significant at 10%

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CONCLUSION

This study assessed the cost and return analysis of tea intercropping in the study area and also determined the effect of labour costs and the cost of materials on the gross revenue of the tea intercropping system. The total variable cost for all the farmers was ₦1,099,661.00 while the average variable cost per hectare was ₦8686.16. The average fixed cost and the average gross revenue were ₦6408.86 and ₦6,026,342.45 while the gross margin and the net income per hectare were ₦600,357.40 and ₦596,225.84 respectively. Variables such as (labour cost on weeding, labour cost on other crops, cost of file, cost of chemical application, and cost of bag were important determinants of revenue in tea intercrop production in the study area. The proportion of the net income to the total cost, therefore, was 68.6%. Hence, 68.6% of the total cost expended on tea intercrop production was generated as profit. Therefore, the tea intercropped enterprise is profitable in the study area.

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