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Adoption of Cassava-Legume Intensification Options among Farmers in Innovation Platform of Humidtropics Programme in Southwestern Nigeria

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Abstract: Adoption of cassava-legume intercropping systems is fundamental to increasing the land productivity which increases profit margin of farmers. Therefore, this study investigated the factors influencing farmers' adoption of a cassava-legume intensification options and the profitability of cassava legumes intensification options. Multi-stage sampling procedure was used to select 40 farmers from each of the Innovation platforms from the four Local Government Areas (LGAs) in Osun and Oyo states where the platforms are located to give a sample total of one hundred and sixty (160) respondents for the study. Data were analyzed using descriptive statistics, logit regression technique and farm budgetary analysis. The result showed that cassava-legume farming was dominated by male (78.8%). Majority (95%) was married and had formal education (78.1%). The results further showed that the estimated variable cost of ₦163,532.44 was incurred while total fixed cost was ₦11,079.86. Total revenue generated was ₦297,762.86, while net income and gross margin were ₦123,150.56 and ₦134,230.42. Binary logistic regression result revealed that years of education and farm size had positive relationship with farmers' adoption of cassava-legume intensification options while revenue from cassava- legume intensification options was negatively related to farmers' adoption of cassava-legume intensification options. The results showed that increase in the years of education and farm size will increase the likelihood of choosing cassava-legume among other intensification options while increase in revenue generated may not have effect in the likelihood of choosing cassava-legume among other intensification options. It was concluded that cassava cowpea intercrop was the most preferred by the farmers and was highly profitable. However, there is a need for an increase in the enlightenment of a cassava-legume intensification options through educational programmes, if the level of cassava-legume intercropping systems is to be increased in the study area.

Keywords: economic evaluation; cassava-legume intensification options; humidtropics; regression; adoption.

1. Introduction

Cassava (*Manihot esculenta Crantz*) has been identified as a food crop which has been favored by different cropping system [1]. Cassava has occupied a unique position in the world food economy, which is ascribed to its survival ability where other crops fail. Cassava is a very drought tolerant crop which is capable of growing on different soils across diverse agro-ecological zones giving a satisfactory yield [2]. It is the third largest source of food carbohydrates preceded by rice and maize in tropical countries with a current world production of about 250 million tons (Mt) [3; 4]. It provides basic food for over 700 million people in Africa, Asia, and Latin America [3]. In Nigeria, Cassava supplies about 75% daily calorie intake to over 50 million who consume its product at least once a day and also provides one of the highest returns in value terms to effort invested [5; 6]. It is mainly cultivated by smallholder farmers for its edible starchy tuberous roots (80% carbohydrate) and leaf which is rich in proteins, vitamins and minerals [7]. In more recent past, cassava became an important raw material for the manufacture of products such as starch, tapioca, cassava chips, pellets, adhesives, alcohol, textiles, confectionary, wood, soft drinks and other processed products [8; 9].

However, the production of cassava is either solely done or intercropped, however the intercrop system dominates. The predominance of this system has been occasioned by Nigeria's climate which is basically tropical and favorable for cassava production [1]. Cassava-based intercrop which serves as an insurance against crop failure to smallholder farmers is most times commonly done with short duration crops such as maize, cocoyam, yam, vegetables and legumes [10]. The intercrop of cassava and these crops is considered as agricultural technology and it is a driven force to improve and increase cropping system productivity in agricultural production [11]. The cassava-legume innovation has attracted considerable attention from research institutes and researchers because intercropping cassava with legumes increases cassava yields as well as legume yields. It also reduces inherent crop production and marketing risk, disease severity and enhances weed control [12; 13].

In light of the above mentioned, the International Institute for Tropical Agriculture (IITA) and the International Fund for Agricultural Development (IFAD) have collaborated to map the Cassava-Legume intensification initiative into the Humidtropics project in Nigeria and works on three components: seed systems, social science/agribusiness, and natural resources management (NRM). Humidtropics a CGIAR Research Program that is led by International Institute of Tropical Agriculture (IITA) aims to improve rain fed smallholder agriculture in the humid tropics of the America, Asia and Africa with the hope to reduce rural poverty, increase food security, improve health, nutrition and to enhance sustainable management of the natural resources. Humidtropics uses an integrated systems research and unique partnership platforms for better impacts on poverty and Eco-systems integrity in which Cassava-Legume Intensification is one of the integrated systems. This Intensification project is drawn into Humidtropics project in Nigeria, engaging "a farmers-involvement approach" which implements options in cassava-legume intensification by carrying along the farmers in Innovation Platforms (IPs) at every stage. To understand rural concerns, the initiative employs a participatory rural evaluation and farmer involvement process. From defining the problem to doing research and consequently identifying answers to agricultural problems in their own setting, the process entails full engagement of stakeholders. The initiative gave best bet alternatives in cassava/legume intensification through one demonstration trial at each Humidtropics Innovation Platform (IP). Different combinations of cassava alone and intercropping (cowpea), fertilizer application, spacing, and cassava growth type were demonstrated (erect, branching). Farmers' preferred alternatives were eventually modified by researchers on the field into three main agronomic packages named Packages A, B, and C, which were adopted by farmers who volunteered to participate in the second stage of the research. Farmers' on-farm trials were conducted in which the project provided agricultural inputs and the farmers provided land and labor. The Humid Tropics initiatives have been implemented successfully in the action sites in Oyo and Osun state, which span four IPs.

Although studies have been conducted on intercropping cassava with legumes, which includes groundnut and cocoyam [14], maize and melon [10], cowpea [15], cowpea and maize [16]; soybean [17; 18] and maize, okra and egusi melon [19], there is still dearth information on the best intensification combination which suites the different agrological zones in South-western part of the country. Scholars have discovered that cassava-legume intercropping systems boost land use efficiency and optimization, potentially increasing farmer profit margins [20; 21; 10; 4]. Also, despite the benefits of combining cassava with legumes, no study has looked into the applicability of the various options accessible to farmers, as well as the factors that influence the farmers' choice and economic returns. Hence there is urgent need to determine the best intensification options that will be acceptable to the farmers in other to improve their total wellbeing and also the factors influencing the farmers' choice of the cassava-legumes intensification options. Consequently, the study investigated the adoption of the intensification options in Cassava-legume cropping systems in Southwestern Nigeria. Specifically, it describes the socio-economic characteristics of farmers in the study area; profiles the intensification options in the cassava-legume cropping systems; determines the factors influencing farmers' adoption of a cassava-legume intensification option; and determines the profitability of cassava legumes intensification options.

The results from this study will not only help to address the problems of trial-and-error methods of selecting best options in the cassava-legume cropping systems but also help in identifying the Cassava-Legume cropping system that will increase the crop yield and farmers' income and also provide valuable information to stakeholders and investors in sustainable cassava intensification in Nigeria. The rest of the paper is organized as follows: Section 2 contains the materials and methods; in section 3, the results and discussion are presented. Finally, section 4 presented the summary of findings, conclusion of the study and recommended some important policies.

2. Materials and Methods

Description of the study area. The study was carried out in Oyo and Osun States of the Southwestern Nigeria, where the Humidtropics Innovation Platforms have been established. Oyo State was carved out of the former Western State of Nigeria in 1976, with Ibadan as its capital. Oyo State has five broad groups; Ibadan, Ibrarapa, Oyo, Oke-ogun and Ogbomoso. On the other hand, Osun State is an inland state with Osogbo as its capital city. It has land area of approximately 14,875 Sq km. Though a landlocked state, it is blessed with presence of many rivers and streams which serves the water needs of the State**.** Osun state has three broad groups; Oyo, Ife/Ijesa and Igbomina. Both States enjoy a similar dual climate condition with the rest of Southwestern States, with a rainy season and dry season. The favorable climate of the area encouraged about 70 percent of the inhabitants to engage in farming. Farmers in the state are predominantly small scale and engage in the cultivation of permanent crops (like cocoa, cashew, and plantain) and food crops (like maize, yam, cassava, millet, rice).

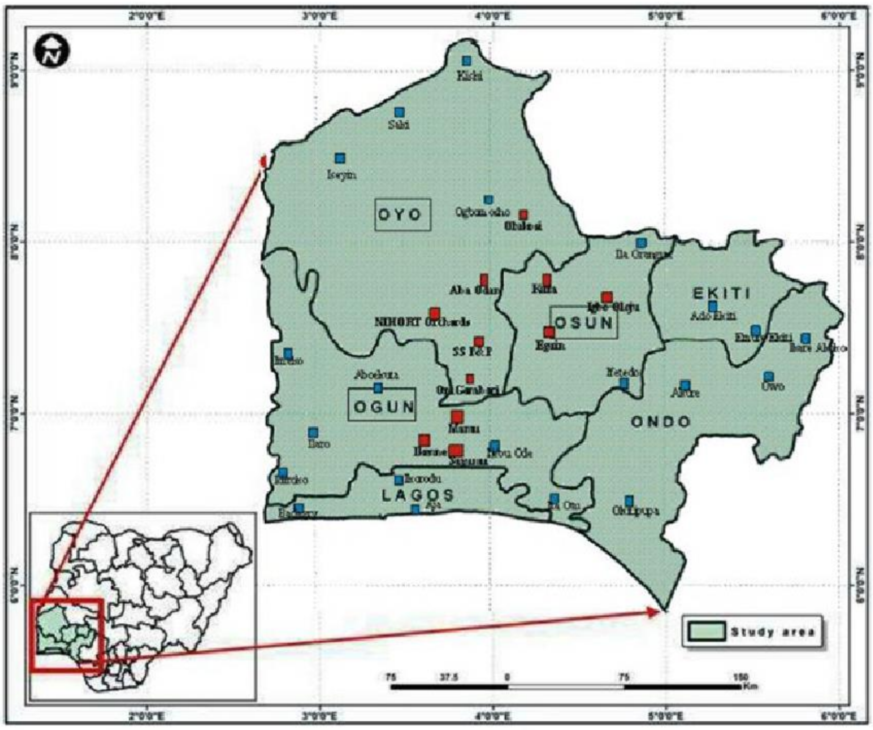

Figure 1. Map of Southwestern Nigeria.

Sampling procedure. A multi-stage sampling procedure was used for this study. The first stage involved purposive selection of Oyo and Osun States which were the host Humidtropics research project. In the second stage, purposive selection of 2 Local Government Areas (LGAs) from each of the states where Innovation Platforms were established. Third stage involved purposive selection of the existing Innovation Platform (IP) at each of the 4 LGAs while the fourth stage involved proportion to size selection of farmers from each IP giving a number of 160 random farmers across the 4 IPs.

Method of data collection. Primary data were used for this study. A well -structured questionnaire was administered to each of the selected farmers in sample frame. The questionnaire captured the farmer's socio economics characteristics, intensification program participations and factors responsible, on-farm trial production of cassava/legume, challenges and necessary interventions.

Method of data analysis. Firstly, descriptive statistics (mean, percentages and frequency distribution) were used to describe the socioeconomic characteristics of farmers. The Data were further analyzed with the aid of farm budgetary analysis and logit regression model

Descriptive statistics (mean, frequency and standard deviation) were used to describe the socio-economic characteristics of farmers objective (i) and the same descriptive statistics were also used to achieve to profile the Cassava- Legumes Intensification Options in the study area objective (ii).

The decision to adopt an improved agricultural technology depends on certain socio-economic and demographic factors [22;23;24], including farm households' asset and socio-economic characteristics, features of the technology proposed, perception of need, and the risk bearing capacity of the farmers. It is important to isolate these factors to inform policy actions towards promoting farmer participation and acceptance of trial results. This study recognized the influence socioeconomic and demographic characteristics of farmers on farmers' decision to adopt or not to adopt an agricultural technology. Logit regression model was used to isolate the factors influencing farmers' choice of cassava-legume intensification options (objective iii). In most cases, analytical models used to assess the adoption of agricultural technology are based on the dichotomous approach of describing whether or not a farmer adopts a technology or not [25]. The dichotomous (yes and no) approach has been found to be more appropriately measured by discrete choice framework otherwise known as Qualitative models. Prominent among the models are the Probit, and Logit models with principal features of having an endogenous random variable assuming values of 1 (Yes) and 0 (No) [26]. The binary models are designed with both deterministic and random utility components in order to accommodate unknown and unobserved attribute of an alternative in the individual utility function. Usually, the probability of selecting an alternative by farmer is based on the premise that the utility derivable from such choice would exceed that from any other alternative in the pool.

According to [27], the logit equation is written as

$$P_i = F(Z_i) = F(\gamma + \sum \lambda_i X_i) = \frac{1}{1+e^{-z_i}} \quad (1)$$

The odds ratio implies the ratio of the probability (Pi) that a farmer will adopt to the probability (1-Pi) that the farmer will not adopt the technology:

$$(1-P_i) = \frac{1}{1+e^{-z_i}}$$

Therefore

$$\frac{P_i}{1-P_i} = \frac{1+e^{z_i}}{1+e^{-z_i}} = e^{z_i}$$

The natural log of equation (3), will give:

$$Z_i = \ln\left(\frac{P_i}{1-P_i}\right) = \gamma + \lambda_1 X_1 + \lambda_2 X_2 + \ldots + \lambda_n X_n$$

If the disturbance term (u_i) is taken into account, the logit model becomes:

$$Z_i = \gamma + \sum_{i=1}^{n} \lambda_i X_i + u_i$$

Equation (3) was estimated by maximum likelihood method. This procedure does not require assumptions of normality or homoskedasticity of errors in predictor variables.

If Z is the random variable (dichotomous), it can then be assumed that Yi takes on the values 0 or 1,

where λ ' represents the vector of parameters associated with the factors *X*. Assuming the probability that farmer *n* would choose cassava-legume among other intensification options is equal to the proportion of cassava-legume farmers using that technology.

The empirical model is implicitly expressed as

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + Ui \ldots$$

Y = Adoption of cassava-legume intensification options (1= adopted, 0 = otherwise).

The explanatory variables are: X_1 = Age of respondents (years); X_2 = Years of education (years); X_3 = Household size (Numbers); X_4 = Farm size (Ha); X_5 = Extension visits (Yes or No); X_6 = Revenue from cassava-legume (N); Ui= error term. This study incorporates the independent variable based on review of existing literature. The explanatory variables included in this study would be those variables which were expected to have influence on the adoption of the agricultural technology. These include age, education of the farmer, household size, farm size, extension visits and revenue from cassava-legume. "*a priori*" expectation for the explanatory variables is as follow: Age is expected to have either a positive or negative relationship with the rate of use of a technology while education is positively related to it [28; 29]. According to [30; 31], farm household size and farms size could either positively or negatively influence the use of a particular technology. The number of contacts with extension agent is positively related to the use of the agricultural technology, the revenue realized from the particular technology also positively influence the use of such technology [32].

Table 1. Description of variables.

Variables	**Units**	**Expected signs**	**Studies**
Age	Years	±	[28]
Education	Years of education	+	[29]
Farm house hold size	Number of members	±	[30]
Farm size	Hectares	±	[31]
No of contact with extension agent	Number of times	+	[33]
Revenue fron cassava-legume	Naira	+	[32]

Budgeting analysis (the on-farm trial farmer's input and output as well as their market prices were used as proxy) was used to determine and compare the costs and returns of the intensification options. This was used to determine the economic benefits (profitability) of the adoption of the intensification option in the study area. While the gross margin could be regarded as the difference between the annual total revenue for each respondent and the variable costs directly associated with them, profitability is a measure of the level of performance using the available resources.
The equation can be expressed as:

$$\lambda = TR - TC \quad (3)$$

$$GM = TR - TVC \quad (4)$$

$$TC = TVC + TFC \quad (5)$$

$$TR = PQ \quad (6)$$

Where;

TC= Total Cost (₦); TVC = Total Variable Cost (₦); TFC = Total Fixed Cost (₦); GM = Gross Margin (₦); ƛ = Net Farm Income (₦); P = Price of cassava and legumes /Ton (₦); Q = Output of cassava and legumes (Ton).

3. Results and Discussion

The socio-economic characteristics of the respondents were presented in Table 1. Most (78.8%) of the respondents were male. This suggests that farming operations in cassava-legume intercrop is largely dominated by men. The mean age of the respondents is 53.88±13.72 years. This is an indication that the respondents engaged in cassava-legume intensification options are in their active and economic age and could easily utilize new techniques for production. Majority (95.0%) of the respondents were married. This means that cassava-legume intensification farmers are dominated by the married and there is a tendency that family labour would be available for various farm operations. The mean household size is 5.93±2.95. This suggests that the household size of the farmers was relatively large which could serve as source of family labour in cassava-legume intensification production. The mean years of farming experience is 27.46±12.04 years. This suggests that the farmers have many years of farming experience. Most (78.1%) of the respondents had formal education. This can be interpreted that there is high level of literacy among cassava-legume intensification farmers in the study area. This will enhance rational decision making in the use of intensification options.

Table 1. Socio-economic characteristics of respondents.

Variables	Respondents
Age (years)	53.88(±13.72)
Male (%)	78.8
Married (%)	95
Formal education (%)	78.1
Household size (#)	5.93 (±2.45)
Years of farming experience	26.46(±12.04)

Various intensification options of cassava-legume cropping systems are presented in Table 2. Majority (43.1%) of the farmers planted different cassava varieties, out of which 33.1% preferred intercropping of cassava with legume while 23.8% engaged in sole cassava cropping. Among the farmers that intercropped cassava with legume, 83.0% intercropped with cowpea; 11.3% intercropped with melon while 5.7% intercropped with both cowpea and melon. It is very obvious in the findings that cowpea is the only major legume that farmers intercropped cassava with. This has the potentiality of meeting the dietary needs of the farmers and also enhance income.

Table 2. Profiling the intensification options in the cassava-legume cropping systems.

Types of cropping system	Frequency	Percent
Sole cassava cropping	38	23.8
Intercropping of cassava with legume	53	33.1
Different cassava varieties	69	43.1
Total	**160**	**100.0**
Intercrop with Legume		
Yes	53	33.1
No	107	66.9
Total	**160**	**100.0**
Types of Cassava-Legume Intensification Options		
Cassava and Cowpea	44	83.0
Cassava and Melon	6	11.3
Cassava, Cowpea and Melon	3	5.7
Total	**53**	**100.0**

The profiling of the farmers according to different packages of cassava-legume intensification options collected is revealed in Table 3. About 51.9% of the farmers were aware of cassava-legume intensification options while 48.1% did not hear about it. The result also revealed that 81.9% of the farmers heard about the 3 Packages (A, B or C) in September, 2014 while 96.4% of them got the information through IFAD via the humid tropic project. The results presented that only 44.6% of the farmers who heard about any of the 3 packages were still currently utilizing or practicing the technology. Interestingly, 100.0% of the farmers who were currently utilizing the technology wished to continue with it. However, 76.1%, 82.6% and 91.3% of the farmers who were not currently utilizing the cassava-legume technology were willing to accept package A, B and C respectively. The indication of these results is that more than half of the farmers in the study area were aware of intensification options of cassava-legume technology while more than two-third of the farmers had IFAD as their source of information. Only 33.6% were currently utilizing the technology and were willing to continue with it while over two-third of other farmers who were not currently utilizing the technology were willing to accept the technology.

Factors influencing farmers' adoption of cassava-legume intensification options is presented in Table 4. The log-likelihood was -94.959 with a chi-square value of 13.30. The model is significant at 5%. This shows that the model is of good fit. Years of education of the farmers was statistically significant at 10% and positively influenced farmers' adoption of cassava-legume intensification options. This indicates that an increase in the years of education of the farmers will likely increase the likelihood of choosing the intercrop of cassava with legume among other intensification options by 1.4%. In addition, farm size of the respondents was statistically significant at 5% and positively influenced farmers' adoption of cassava-legume intensification options. This suggests that additional increase in size of the farm by one hectare of land area cultivated by the farmers will increase the likelihood of choosing cassava-legume intercrop than other intensification options by 17.8%.

Table 3. Profiling information on cassava-legume options.

Packages	**A**		**B**		**C**	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Have You Heard It?						
Yes	83	51.9	83	51.9	83	51.9
No	77	48.1	77	48.1	77	48.1
Total	160	100.0	160	100.0	160	100.0
What Month and Year did You hear about it?						
Feb, 2015	1	1.2	1	1.2	1	1.2
May, 2014	14	16.9	14	16.9	14	16.9
Sept, 2014	68	81.9	68	81.9	68	81.9
Total	83	100.0	83	100.0	83	100.0
Source of Information						
IFAD	80	96.4	80	96.4	80	96.4
IITA	3	13.6	3	13.6	3	13.6
Total	83	100.0	83	100.0	83	100.0
Are you Currently Utilizing it?						
Yes	37	44.6	37	44.6	37	44.6
No	46	55.4	46	55.4	46	55.4
Total	83	100.0	83	100.0	83	100.0
If Yes, Do You Wish to Continue?						
Yes	37	100.0	37	100.0	37	100.0
If No, Will You Want to Accept it?						
Yes	35	76.1	38	82.6	42	91.3
No	11	23.9	8	17.4	4	8.7
Total	46	100.0	46	100.0	46	100.0

There is a positive relationship between years of education and farmers' adoption of cassava-legume intensification options which implies that farmers increased their adoption as they advanced in education. Education gives farmers the ability or capacity to obtain, process and use the relevant information about a new technology [34; 35; 36]. Educated farmers easily adopt a technology when they are enlightened about a new technology. Therefore, it is assumed that a farmer who has gained formal education can critically analyze and make own decisions about adopting agricultural technology [37; 38]. There is a positive relationship between farm size and farmers' adoption of cassava-legume intensification options which implies that those who have larger farm size among the farmers devote more of their farmland to the cultivation of cassava-legume intensification options. As expected, farmers with larger farms are assumed to adopt new technology. This could be linked to the fact that farmers with large farms may want to experiment with new technologies on their large farmlands as their production won't be compromised, if the technologies failed. On the other hand, it could be due to the fact that farmers with large farm size may want to maximise profit and hence, are more likely to practice cassava-legume intensification options from their large expanse of farmland.

On the contrary, the revenue generated from cassava-legume intensification options was significant at 10% but negatively related to farmers' adoption of cassava-legume intensification options. This implies that as the revenue generated from cassava-legume intensification options increases, the chance of choosing intercropping of cassava with legume among other intensification options decreases by 0.8%. There is a negative relationship between income and farmers' adoption of cassava-legume intensification options. However, the negative impact of income on farmers' adoption of cassava-legume intensification options in this study is unexpected. Agricultural technology adoption usually comes at a cost and with some level of risk and uncertainty, hence for farmers with adequate accumulated resources may not want to invest in new agricultural technology because of the risk involved. This is not in agreement with the findings of several researchers who have reported a positive relationship between farm income and adoption of innovation [39; 40]. This study is in agreement with [41] that reported negative relationship between income and adoption of agricultural technologies arising from risk avoidance on the part of otherwise financially able farmers. The result could also imply that the majority of the farmers who have access in terms of information on procurement at one point or another, with little differences observed regarding their financial capabilities.

Table 4. Determination of factors influencing farmers' adoption of cassava-legume intensification options.

Variables	Coefficient	Std. Error	T-value	Marginal Effect
Constant	-2.48682**	1.0979	-2.265	
Age of respondents	0.01978	0.014408	1.373	0.004315
Years of education	0.066413*	0.039486	1.682	0.014488*
Household size	0.0003	0.060438	0.004962	6.54E-05
Farm size	0.814689**	0.318612	2.557	0.177727**
Extension visits	0.003164	0.063983	0.04945	0.00069
Revenue from cassava-legume	-0.00374*	0.00.22	-1.684	-0.000816*
Log-likelihood	-94.959			
Chi-square	13.30			
p-value	0.0385			

The costs, returns and profitability of cassava-legume cropping system are presented in Table 5. It was found that variable inputs constitute about 93.65% of the total cost of production while fixed inputs only accounted for 6.35% of the total cost of production. Labour cost accounted for 69.96% which indicate that more than two-third of the total expenditures was spent on labours. The cost of transportation made up 8.99%; Cost of cassava stem accounted for 4.72% of the total cost of production while cost of herbicides was 4.53%. Meanwhile other variable inputs accounted for 5.44% of the total cost of production. The mean value of total variable cost and total fixed cost were ₦163,532.44 and ₦11,079.86, respectively. Mean value of the total revenue was ₦297,762.86 while the Net Farm Income was ₦123,150.56 which implies that enterprise is profitable. The gross margin was ₦134,230.42. Profitability ratios included in this study to measure the performance of the enterprise are profit margin which gives a value of 41.36% indicating that for every ₦1.00 generated from the enterprise a net income of ₦0.41 is earned, while the value of per capital outlay gives 0.71 implies that from every ₦1.00 invested into the enterprise, a net income of ₦0.71 is realizable. Operating Cash Expenses Ratio whose value is 0.68 shows that from every ₦1.00 generated from the enterprise, ₦0.68 is invested respectively as running cost into the enterprise. Also, Benefit-Cost Ratio of 1.47 implying that for every ₦1.00 investment on cassava-legume intercrop, ₦1.47 is realizable. All these ratios affirm that cassava-legume cropping system is profitable. This implies that the adoption of cassava-legume cropping options in the study area leads to more profitability in cassava-legume cropping system. This corroborates the finding of [42; 43]

Table 5. Budgetary analysis of intensification options in cassava- legume cropping systems in Southwestern Nigeria.

S/N	Items	Mean amount	%TC
1	**REVENUE**		
I	Quantity of Cassava (kg)	6379.91	
II	Price per kg (₦)	37.64	
A1	**Revenue**	**240,139.81**	
I	Quantity of melon (kg)	10.67	
II	Price per kg (₦)	600.00	
A2	**Revenue**	**6,402.00**	
I	Quantity of cowpea (kg)	196.46	
II	Price per kg (₦)	260.72	
A3	**Revenue**	**51,221.05**	
A	**Total Revenue**	**297,762.86**	
2	**VARIABLE COSTS**		
I	Cost of Cassava stem	8242.06	4.72
II	Cost of Melon seeds	550.00	0.31
III	Cost of Cowpea seeds	2,428.50	1.39
IV	Cost of Herbicide	7,918.44	4.53
V	Cost of Insecticide	1,170.31	0.67
VI	Cost of Fertilizer	5,363.75	3.07
VII	Cost of Transportation	15,703.13	8.99
VIII	Cost of Labour	122,156.25	69.96
B	**Total Variable Cost (TVC)**	**163,532.44**	93.65
C	**Gross margin (TR-TC)**	**134,230.42**	
3	**FIXED COSTS**		
I	Cost of Cutlass	5384.64	3.08
II	Cost of Hoe	1391.61	0.80
III	Cost of Knapsack Sprayer	1932.94	1.11
IV	Cost of Wheel Barrow	864.21	0.49
VIII	Cost of storage	1506.46	0.86
D	**Total fixed cost**	**11,079.86**	6.35
E	Total Cost (TC) = (TFC + TVC)	174,612.30	100.00
F	Net Income (NI) = (GM - TFC)	123,150.56	
G	Profit Margin = F/A *100	41.36	
H	Return per Capital Outlay = F/E	0.71	
I	Operating Cash Expenses Ratio = B/A	0.68	
J	Benefit Cost Ratio = A/E	1.47	
K	Net Farm Income Ratio = F/C	0.92	

4. Conclusions

This study investigated the factors influencing farmers' adoption of a cassava-legume intensification option and the profitability of cassava legumes intensification options. Multi-stage sampling procedure was used to select 40 farmers from each of the Innovation platforms from the four Local Government Areas (LGAs) in Osun and Oyo states where the platforms are located to give a sample total of one hundred and sixty respondents for the study. Data were analyzed using descriptive statistics, logit regression technique and farm budgetary analysis. The study showed that farmers were over 40 years of age with formal educational level. The farming household size is relatively high as well as their farming experience. Almost half of the respondents chose different cassava varieties as their preferred cassava-legume intensification options with cassava-cowpea being the most cultivated and highly profitable. Farmers in the study area could improve their profit margin through the intercropping of cassava with legume. Additional increase in years of education and farm size of the respondents will increase the likelihood of choosing cassava-legume intercrop among other intensification options. Based on the findings of the study, the following recommendations are suggested in order to improve cassava-legume intensification technology in the study area:

i. Farmer should be encouraged to acquire more formal education as this will help them to adopt new innovation technology that will enhance their productivity.
ii. Farmers need to expand their land holding capacity so as to be able to expand their production through cassava-legume intercrop for increased profit.

Since cassava– cowpea intensification option is most accepted by farmers, farmers should be encouraged to expand the cultivation of this option as it will enhance revenue and promote farmers household food security and dietary needs.

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