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COMPARATIVE ANANALYSIS OF INCOME OF SMALLHOLDER CEREALS AND LEGUMES CROP ENTERPRISES IN NASARAWA STATE - NIGERIA

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ABSTRACT

Purposive, multi-stage and stratified sampling techniques were employed to obtain data on 174 respondents, using structured questionnaire for the study. Data collected were analyzed using descriptive and inferential statistics. Results show that majority of the farmers were male (62.1%). Farmers were in their active age, with mean age of 39 years for both cereals and legumes. Mean gross margin per hectare was N72, 676 and N70, 446 for cereals and legumes respectively. Farm size, labour, seeds, pesticides and fertilisers were the inputs that significantly influenced the output of the farmers with positive F values of 19.018 and 29.017 for cereals and legumes respectively. The results from t-test revealed that there is no significant difference between the incomes of cereals (119,087) and legumes (118,590) farmers at 5 percent level of probability. Age of cereal farmers (4.812)*, age (3.332)*, output (2.019)* for legume farmers respectively were the socioeconomic factors that significantly influenced incomes of respondents in the study area at 5 percent level of probability with significant F value (1.17) at 5% level of probability. Lack of improved seed variety, land tenure system and high cost of inputs were the major constraints faced by the farmers in the study area. It is recommended that effective input delivery system, improved rural transportation system, adult education and training of the farmers be carried out to build up the capacity base of rural producers of cereals and legumes in the study area and Nigeria at large.

Keywords: ***Smallholder, cereals, legumes, comparative analysis***

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1.0 INTRODUCTION

Nigeria is endowed with abundant cereals and legumes crops production potential to satisfy domestic demand, as well as potential to export to other countries (Babatunde, 2008). However, it has become an uphill task to fully utilise the existing potentials to bridge the existing gaps in the domestic and foreign demands. The increase in cereals and legumes consumption in Nigeria is attributed to rapid population growth, Urban residents,' exposure to dietary patterns and rising household income. Cereals are primarily a security crop as well as a cash crop for smallholder farmers who produce them to generate more income. Adedayo, (1985) suggested that the income levels of rural communities may be attributed to certain crucial factors, and understanding these factors may hold the keys to effective rural development policy making, as suggested by Adeyemi and Kupoluyi (2003), that there should be a closer look at the determinants of rural income to provide an in-depth knowledge into the factors that explain low income, yields and poverty in rural regions where, these rural farmers constitute about 90 percent of the total population (Olayemi, 2001; Olatona, 2007). It is obvious that Majority of the farm households in Nigeria either depend entirely on farming and non farming activities for survival and generation of income, or depend on these activities to supplement their main sources of income (World Bank, 1993; Obike *et al.* 2011a). Therefore, productive gains in farming activities are a sine-qua-non for self–sustaining economic development (Mafimisebi and Oluwatosin, 2004; Obike *et al.* 2011b).

The initial distribution of income accruing to the rural farmer via farming stands out as the most quantifiable determinant of the rural standard of living, since it is most realistic factor and the most reliable as majority of the people in the rural areas are predominantly farmers. The determinants of income among the target population therefore serve as social indicators of their standard of living (Olawepo, 2010). Simhon and Fishman (2011) found that income distribution determines how competitive prices are and thereby affect production efficiency and aggregate output.

Several studies have been carried out on farmers' income in Nigeria such as: Babatunde (2008) who analyzed income inequality in rural Nigeria: evidence from farming households' survey data; Olawepo (2010) assessed factors determining rural farmers' income: A rural Nigeria experience; Ibekwe (2010) assessed determinants of income among farm households in Orlu Agricultural Zone of Imo State, Nigeria; Ibekwe *et al.* (2010) assessed determinants of farm and non farm income among farm households in South East Nigeria. Penda and Asogwa (2011) analysed the relationship between efficiency and income among the rural farmers in Nigeria; Obike *et al*. (2011) assessed determinants of incomes among poor farm households of the National Directorate of Employment in Abia state, Nigeria. Adebayo *et al.* (2012) assessed determinants of income diversification among farm households in Kaduna State using the Tobit Regression Model. However, none of these studies compared income of smallholder cereals and legumes crop farmers in Nasarawa State. This gap makes this research imperative in order to justify advice to farmers on enterprise selection and combination.

This study sought to achieve the following objectives: to; i) describe the socio-economic characteristics of small-holder cereals and legumes crop farmers in Nasarawa State; (ii) assess the level of profitability of small-holder cereals and legumes crop farmers in Nasarawa State; (iii) determine the effect of inputs use on the output of small-holder cereals and legumes crop farmers in Nasarawa State; (iv) estimate the effect of socio-economic variables on income of small-holder cereals and legumes crop farmers in the State; and (v) examine production constraints faced by smallholder cereals and legumes crop farmers in Nasarawa State. The following null hypotheses were postulated and tested based on the objectives: $H0_1$**:** the socio-economic variables have no significant effects on the income of small-scale cereals and legumes crops farmers; $H0_2$: There is no significant relationship between input use and output produced by small-holder cereals and legumes crop farmers; $H0_3$: There is no significant difference between the income of cereals and legumes enterprises; $H0_4$: There is no significant difference within the incomes across cereals and legumes enterprises in Nasarawa State for maize, guinea corn, melon and groundnuts.

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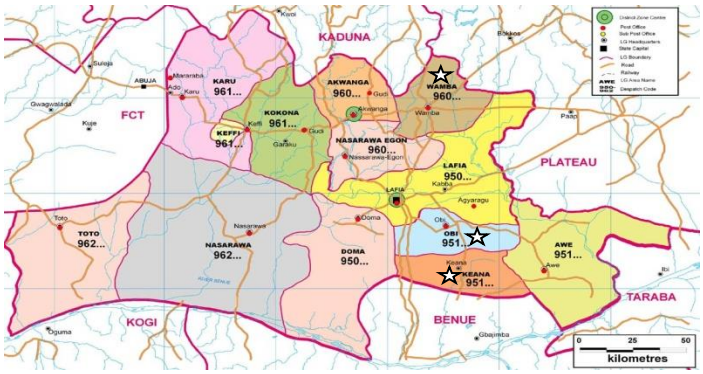
3.0 METHODOLOGY

3.1 The Study Area

This study was conducted in Nasarawa State with capital at Lafia. The state is made up of thirteen local government areas located between latitudes 7º and 9º North of the Equator and longitudes 7º and 10º East of the Greenwich Meridian (Nasarawa State Government, 2006; Abu *et al.* 2012). Nasarawa State covers an area of 27,117 km with estimated population of 1,863,275 people (NPC, 2006; Abu *et al.* 2012). It has a mean temperature range from 25º C in October to about 36º C in March while rainfall varies from 13.73 mm to 145 mm. Alluvial soils are found along the Benue trough and their flood plains. Forest soils rich in humus and laterites are found in most parts of the State with sandy soils in some parts of the State. Solid minerals, salt and bauxite exist (Abu *et al.* 2012). Nasarawa State is an agrarian State with large percentage of the populace engaged in farming and agro-allied activities. The soil texture is sandy loam and very fertile for crops like maize, guinea corn, groundnut, melon, sorghum, cowpea, cassava, and rice. The map of Nasarawa State showing Local Government Areas is shown in figure 1.



Selected communities ☆

Source: Akaamaa, Onoja and Nwakonobi (2014)

Figure 1: Map of the Study Area

2.2 Population and sampling procedure

The population of the study comprised all the smallholder cereals and legumes farmers in Nasarawa State, Nigeria. The sample of 174 respondents was taken by adopting a purposive, multistage and stratified random sampling procedure. The first stage involved a purposive selection of three (3) Local Government Areas from the thirteen Local Governments in the State based on the high concentration of cereals and legumes farmers. The second stage entailed random selection of two (2) Districts from each Local Government Area selected. Third stage entailed stratifying the farmers into four (4) strata: legumes (Groundnut and Melon) and cereals (Maize and Guinea corn). Finally, from a population of 6965 registered farmers of this two crop groups (NADP, 2012), 2.5 percent of each stratum was randomly selected which resulted to a sample size of 174 respondents.

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Table 1: Sample Selection Plan using 2.5%

LGAs	Districts	Maize Farmers	Guinea Corn Farmers	Groundnut Farmers	Melon Farmers	Sample Frame	Sampling Proportion	Sample Size
Obi	Agwatashi	252 (6)	274 (7)	350 (9)	286 (7)	1162	0.025	29
	Adudu	201 (5)	236 (6)	327 (8)	218 (6)	982	0.025	25
Keana	Aloshi	249 (6)	331 (8)	273 (7)	347 (9)	1200	0.025	30
	Giza	245 (6)	227 (5)	235 (6)	351 (9)	1058	0.025	26
Wamba	Nakere	358 (9)	250 (6)	252 (6)	468(12)	1328	0.025	33
	Gbata	327 (8)	268 (7)	263 (7)	377 (9)	1235	0.025	31
Total	**6**	**1632**	**1586**	**1700**	**2047**	**6965**	**0.025**	**174**

*** Values in brackets represent enterprise specific sampled respondents**
Source: NADP 2012 Report.

2.3 Data collection techniques

Primary data were collected through structured questionnaire to the sampled smallholder cereals and legumes farmers with the aid of trained enumerators. The relevant secondary data needed to support the primary data were obtained from text books, bulletins, internet and studies done on other crops. The questionnaire was administered with the aid of trained enumerators.

2.4Data analysis Techniques

Descriptive and inferential statistics were used to analyse data. Simple descriptive statistics included, frequencies, percentages and means were used to achieve objectives 1 and 5. Gross margin analysis was used to achieve objective 2. Multiple linear regression was used to achieve objectives 3 and 4. F-test was used to test hypothesis 1 and 2. T- test was used to test hypothesis 3. While ANOVA was used to test hypothesis 4.

2.5 Model Specification

2.6 Gross Margin Analysis Mode

GM = TR – TVC

Where: GM = Gross margin (naira/hectare), TR=Total Revenue (naira/hectare) and TVC=Total Cost (naira/hectare)

2.6.1 Multiple Linear Regressions

$$1)\ Y = \alpha + \sum_{i}^{n} \beta_i X_{i+} \varepsilon_i$$

Where: Y is the output of small-scale farmers (yield/ha), β_{is} are coefficients to be estimated, X_1 to X_5 are inputs variables such that X_1 = Farm size (ha), X_2 = seeds quantity (kg/ha), X_3= Fertilizer quantity (kg/ha), X_4 = Labour (Mandays), X_5 = Herbicides quantity (Litre/ha), ε_i is the random error.

A priori expectation: X_1, X_2, X_3, X_4, X_5 are expected to be positive.

$$2)Y = \alpha + \sum_{i}^{n} \beta_i X_{i+} \varepsilon_i$$

Where: Y is the income (gross margin) of small-scale farmers (cereals and legumes), β_{is} are coefficients to be estimated, X_1 to X_5 are factors affecting farmers income, X_1 = Age (in years), X_2 =

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Education level (number of years spent in formal schooling), X_3= Farmers' output (yield/ha), X_4 = Household size (number of persons in the house), X_5 = Mode of farming (Full time =1, Part time = 0).
A priori expectation: $X_1, X_2, X_3, X_4, X_5$are expected to be positive.

$\varepsilon_i$is the random error

Four functional forms were used such as:
Linear: $Y = \beta 0 + \beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+ \varepsilon_i$
Semi Log: $\ln Y = \beta 0 + \beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5 X_5+ \varepsilon_i$
Double log: $\ln Y = \beta 0 + \beta_1\ln(X_1) +\beta_2\ln(X_2) +\beta_3\ln(X_3) +\beta_4\ln(X_4) +\beta_5\ln(X_5) + \varepsilon_i$
Cobb douglas: $Y = aX_1^{b1}X_2^{b2} X_3^{b3}X_4^{b4} X_5^{b5} +\varepsilon_i$
The best functional form was chosen based on the highest R^2. (Coeficient of multiple determinations)
X_1 to X_5 are factors affecting farmers income, X_1 = Age (in years), X_2 = Education level (number of years spent in formal schooling), X_3= Farmers' output (yield/ha), X_4 = Household size (number of persons in the house), X_5 = Mode of farming (Full time =1, Part time = 0),
A priori expectation: $X_1, X_2, X_3, X_4, X_5$are expected to be positive.
$\varepsilon_i$is the random error

2.6.2 T-test Analysis

The *t* statistic to test whether the means are different can be calculated as follows:

$$t = \frac{\bar{X_1}-\bar{X_2}}{S_{X1X2}\sqrt{\frac{2}{n}}} \text{ Where: } S_{X1X2} = \sqrt{\frac{1}{2}(S_{X1}^2 + S_{X2}^2)}$$

Where $S_{X1X2}$is the pooled standard deviation, 1 = group one, 2 = group two. S_{X1}^2 and $S_{X2}^2$are the unbiased estimators of the variances of the two samples, $S_{X1X2}\sqrt{\frac{2}{n}}$ is the standard error of the difference between two enterprise means.

2.6.3 Analysis of Variance (ANOVA)

The analysis of variance (ANOVA) is a parametric statistic. Its main purpose is that of comparing the variation between the mean across enterprises with the mean variation within the enterprise.
There are a number of concepts which must be stated:

i. Sum of squares total: These are the total summation of squares parameters (SST), the between sum of squares (SSB) and the within sum of squares (SSW).
ii. Mean squares: There are two mean squares namely: the mean square between (MSB) and the mean square within (MSW).
iii. F-test or F- ratio is the quotient of MSB and MSW i.e $F - ratio = \frac{MSB}{MSW}$

(i) $SST = \sum X^2 - \frac{(sx)^2}{N}$

(ii) $SSB = \frac{(sx)^2}{n_1} + \frac{(sx)^2}{n_2} + \frac{(sx)^2}{n_3} + \frac{(sx)^2}{n_4} + \frac{(sx)^2}{N}$, (iii) $SSW = SST - SSB$

Where: N = total number of observations on all the samples, n_1 = total number of observations on enterprise 1, n_2 = total number of observations on enterprise 2, n_3 = total number of observations on enterprise 3, n_4 = total number of observations on enterprise 4

3.0 RESULTS AND DISCUSSION

3.1 Socio-economic Characteristics of the Respondents

The socio economic characteristics of the respondents are presented in table 2. The distribution of respondent based on sex shows that majority (62.1%) of the faremers (cereals and legumes) involved in production are males while 38.9% are females. Males dominance in the study area is a pointer to the belief in the study area that women are supposed to stay at home and in the farm while men struggle for survival through such farm activities. This is probably because farming requires a lot of energy and is labour intensive, involving going to the farm daily. This result agrees with the findings of Baruwa (2013) and Effiong (2005) reporting that crop production and marketing is a male-dominated enterprise in Edo State of Nigeria. Also Umar ***et al.*** (2011) who reported high male dominance in sesame production in the study area.

The age of the respondents, ranging between 21 and 40 years were predominant with 48.9%. While 44.5% of the respondents are between the ages of 41 and 60 years. The mean age of the farmers was 39 years. This suggests that most of the cereals and legumes farmers in the study area are within the age bracket of active work.The implication of the foregoing result is that cereals and legumes farmers in the study area enjoy higher patronage of the young people who are energetic enough to withstand the stress involved in the farming, and are active, innovative and capable of making a meaningful impact in cereals and legumes farming if adequately motivated, wih inputs and education.This result agrees with the findings of Yusuf (2005) that most farmers are within their active years and can make positive contribution to agricultural production.

Majority (62.1%) of the respondents are married as against 35% single. The high proportion of married respondents indicates that family labour could be available for cereals and legumes farmers, as opined by Baruwa , (2013) who reported that majority or 66% of pineapple producers in Edo State were married.

As regard the household size, 66.1% of the respondents had 5-8 persons in their household, 32.2% of the respondents had 9 – 12 persons per household, 1.5% had above 12 persons per household. The average household size was 8 persons per household indicating that cereals and legumes farmers in the study area have a relatively large household size. This implies that additional labour could be hired to work on the farm especially where the farm size is large. This assertion agrees with those of Idiong, (2006) and Ogungbile, Tabo and Rahman (2002) who reported that a relatively large household size enhances the availability of labour, but could favour or disfavour adoption index according to Ovharhe and Okoedo-Okojie (2011). Most respondents (48.2 percent) had secondary education, 21.8 percent had post secondary education, implying that most respondents were educated. This means a good proportion of the producers are literate enough effective communication in doing their business in the study area.Also new technology can be easily transferred to those producers as opined in (Jongur and Ahmed, 2008), and Effiong (2005). These scholars concluded that lierate farmers are capable of taking better decisions for better efficiency Ekunwe, Orewa and Emokaro (2008). This result disagrees with the findings of Luka and Yahaya (2012) that most sesame farmers were not well educated in the study area.

Most farmers (66.7 percent) had farming experience between 11and15 years. Only 14.9 percent of the respondents had greater than 15 years farming experience. The average years of experience were 13. This implies that most of the farmers have long experience in production with the ability to manage risk and make quick decision resulting in better performance as in Maddison (2006) who opined that educated and experienced farmers have more knowledge and information about climate change and agronomic practices that they can adopt in response.

The mean income of the respondents was N 118,839. Majority of the respondents (59.2 percent) fell in the income bracket of betwen N 100,000- 200,000 whereas 33.9 percent of them were in the income bracket of between N200, 000 and 400,000. This suggests that the farmers are low income earners.

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Table 2: Distribution of Respondents by Socio-economic Characteristics

Variable	Mean	Frequency	Percentage
Sex			
Male		108	62.1
Female		66	37.9
		174	100
Age	39(years)		
1-20		11	6.3
21-40		85	48.9
41-60		78	44.5
		174	100
Marital Status			
Single		61	35.1
Married		106	62.1
Divorced/Widowed		5	2.9
		174	100
Household Size	8		
1-4		1	0.6
5-8		115	66.1
9-12		56	32.2
>12		3	1.5
		174	100
Education Level	9(years)		
0-6		52	29.9
7-12		84	48.2
>12		38	21.8
		174	100
Farm Experience	13(years)		
1-5		2	0
6-10		30	17.2
11-15		116	66.7
>15		26	14.9
		174	100
Income	118,839		
1-200,000		103	59.2
200,001-400,000		59	33.9
400,001-600,000		11	6.3
600,001-800,000		0	0
800,001-1,000,000		1	0
>1,000,000		1	0
		174	100

Source : Field Survey data, 2016.

3.2 **Profitability of Cereals and Legumes Production in the Study Area**

3.2.1 **Cost and returns/Gross margin analyses of cereals and legumes production**

The mean cost incurred on labour in table 3 is N27, 626 constituting 59.6 percent of the mean total variable cost.The mean cost of seeds (N5,886) constituted 12.7 percent of the mean total variable cost. The mean cost of pesticides (N5,927.5) constituted 12.8 percent of the mean total variable cost. Cost of fertilizer (N3,633) was 0.86 percent of the mean total variable cost. The mean revenue N119,087 was earned by cereal respndents. The highest farmer had N52, 300 for labour constituting 62.9 percent of the total cost, cost for seeds and pesticides was N20, 000 each constituting 24 percent of the total cost of production. Cost of fertilizer was N19, 000 constituting 22.8 percent of its total cost of production. The computed profitability ratio as presented in Table 3 for cereals and legumes farmers were 1.6 and 1.5 for cereals and legumes, Cereal and legumes production enterprises could be profitable as evidenced by this study. Technical efficiencies of 2.6 for both enterprises cereals and legumes were greater than unity. Producers were technically efficient, making gains in thier investments.

In table 3 for legumes, the mean cost on labour stood at N27, 502, constituting 59.6 percent of the mean total variable cost. The mean cost of seeds (N6, 327) constituted 13.7 percent of the mean total variable cost. The mean cost of pesticides (N6, 023) constituted 13.1 percent of the mean total variable cost. Similarly the mean cost of fertilizer (N4, 932.9) constituted 10.7 percent of the mean total variable cost. The mean revenue earned per legume product stood at N118, 590. Cost for fertilizers and pesticides were N24, 000 each constituting 27 percent of the total cost of production. Cost of seeds was N25, 000 constituting 27.8 percent of its total cost of production. The computed profitability ratio as presented in Table 3 for legumes farmers was 1.5 This means that for every N100 invested by the farmer, he/she gains N150 in the study area. Hence, legume producers are not operating at a loss.

3.2.2 Gross Margin Analysis of Cereals and Legumes Production in the Study Area

Results on gross margin both on table 3 show that cereals production had a mean gross margin per hectare of N72.767.8, the minimum gross margin was N35, 800 and the maximum gross margin per hectare was N99, 700 in the study area.

The table shows that legumes production had a mean gross margin per hectare of N70, 446, the minimum gross margin was N6, 300 and the maximum gross margin per hectare obtained was N99, 200 in the study area, indicating similar levels of gross margin from both crops.

The above values of gross margin when compared with those of (91,338.26 Naira/ha) obtained by Odoemenem and Inakwu (2011) in their study on economic analysis of rice production in Cross River State Nigeria and (39,050 Naira/ha) obtained by Ohen and Ajah (2012) in their study on Cost and return analysis in small scale rice production in Cross River State, Nigeria shows a decrease in the level of profitability. This could be due to increase in operating cost of respondent farmers in a rising inflationary economy of Nigeria.

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Table 3. Cost/Returns Analyses for Cereals and Legumes Production

Variable	Mean		Minimum		Maximum	
	Cereals	Legumes	Cereals	Legumes	Cereals	Legumes
Cost of labour	27,626	27,502	19,000	19,000	52,300	60,000
Cost of seeds	5,886	6,327.6	500	500	20,000	25,000
Cost of pesticidess	5,927.5	6,023	0	0	20,000	24,000
Cost of fertilizers	3,633.75	4,932.9	0	0	19,000	24,000
Cost of Implement	3,320	3,357.5	1,500	1,500	13,000	14,400
Total variable cost	46,316.6	46,143	25,500	23,500	83,100	89,800
Total Revenue	119,087	118,590	80,000	70,000	171,000	180,000
Gross Margin / Ha	72,767.8	70,446	35,800	6,300	99,700	99,200
Profitability ratio π/TC	1.6	1.5				
Efficiency Ratio TR/TC	2.6	2.6				

Source : Field Survey data, 2016.

3.3 Input and Output Relationship in Cereals and Legumes Production in the Study Area

The effect of input (farm size, labour, seeds, pesticides and fertilizer) on output was estimated using regression analysis models on cereals and legumes as summarized on Table4. The double log functional form had the best fit to the estimations.

For cereals, the highest coefficient of determination(R^2) of 0.562 was obtained implying that farm size, labour, seeds, pesticides and fertilizer contributed to 56.2 percent of total variation in output for cereals, with labour having a significant positve effect on cereal output. This implies that increase in labour by unity will increase cereal output by the value of its coefficient, as reported in Oniah *et al.* (2008) that the coefficients of labour and pesticides were significant at 5 percent in small scale swamp rice production in Obubra Local Government Area of Cross River State, Nigeria.

The F-value (19.018) and significant at 5 percent implying that farm size, labour, seeds, pesticides and fertilizer significantly related output of cereals. Therefore, the hypothesis which stipulated that there is no significant effect between input use and output for cereals is rejected

The return to scale (0.775) with respect to farm size, labour, quantity of fertilizer and pesticides used, being positive implies that technically small scale cereals farmers are in stage II of their production cycle as the output is increasing at decreasing rate relative to quantity of input use. This also implies that a unit increase in all inputs leads to 0.775 percent increase in output.

Legumes as in (table 4), found Double - log functional form to have the highest coefficient of determination(R^2) 0.62, implying that farm size, labour, seeds, pesticides and fertilizer contributed to 62 percent to the variation of output for legumes. Specifically, labour and fertilizer were found positive and significantly influenced legume output at 5 percent level of probability. This implies that increases in labour and fertilizer by unity will also increase legume output by the value of their coefficients respectively and this result is in line with the a priori expectation. This conforms with the finding of Umeh and Atarborth (2011) who reported that seeds use by Nigerian farmers were significant at 5 percent level of probability. The coefficient of seeds and pesticides were however negative and significant at 5 percent level of probability. This implies that increase in seed and pesticide application by unity will reduce legume output by the value

of their coefficient. This result is contrary to the a priori expectation, and agrees with the findings of Ahmadu and Erhabor (2012) who found that the estimated coefficient of fertilizer was negative for legume farmers in Taraba State, Nigeria. However, estimated coefficient for farm size for legumes enterprise was not significant.

F-value (29.017) significant at 5 percent implies that farm size, labour, seeds, pesticides and fertilizer collectively had significant effect on output of legumes. Therefore, the hypothesis which stipulated that there is no significant effect between input use and output for legume production is rejected.

The return to scale coefficient (0.465) with respect to farm size, labour, quantity of fertilizer and pesticides being positve shows that technically small scale cereals farmers are in stage II of their production cycle with output increasing at decreasing rate relative to quantity of input used

Table 4: Regression Estimates of Input-Output Relationship for Cereals and Legumes in Nasarawa State

Variables	**Linear**		**Exponential**		**Double – log**		**Semi – log**	
	Cereals	**Legumes +**	**Cereals**	**Legumes**	**Cereals +**	**Legumes**	**Cereals**	**Legumes**
Constant	6.602	943.870	1207.949	1558.96	7.043	7.08	802.623	606.274
	(3.602)	(4.473)	(32.114)*	(25.068)*	(20.615)*	(5.004))*	(3.184)	(33.195)
Labour	0.578	0.615	0.534	0.524	0.515	0.551	0.563	0.549
	(6.868)	(8.446)*	(6.318)	(7.265)*	(6.220)*	(7.661)*	(6.664)*	(7.231)
Quantity of seed	-0.074	0.220	-0.088	0.024	-0.140	-0.003	-0.115	0.058
	(0.903)	(0.347)	(1.068)	(0.364)	(1.730)	(0.045)	(1.385)	(0.880)
Quantity pesticide	-o.229	-0.187	-0.171	-0.082	-0.083	-0.168	0.305	-0.132
	(2.711)*	(2.795)*	(2.016)**	(1.047)	(0.928)	(2.152)**	(3.491)*	(1.901)
Quantity Fertilizer	0.243	0.215	0.320	0.350	0.395	0.252	0.305	0.311
	(2.907)*	(3.103)*	(3.814)*	(4.761)*	(4.615)	(3.444)*	(3.305)*	(4.310)*
Farm size	0.149	-0.067	0.117	-0.155	0.088	-0.167	0.130	-0.066
	(1.744)	(0.947)	(1.365)	(1.960)**	(1.014)	(2.118)**	(1.463)	(0.898)
R2	0.558	0.653	0.555	0.620	0.562	0.622	0.544	0.602
Adjusted R2	0.528	0.634	0.525	0.598	0.533	0.601	0.513	0.624
F	(18.684)*	(33.151)*	(18.482)*	(28.681)*	(19.018)*	(29.017)*	(17.623)*	(29.181)*

Source: Field survey Result, 2016. * significant at 1%, ** significant at 5%
+ Lead equation (functional form)

3.4 Regression Analysis for Socioeconomic Factors Influencing Income of Cereals and Legumes in the Study Area

Regression analysis selected socioeconomic factors that influenced income of farmers as shownin table5. Out of the four functional forms fitted to the data, the semi-log form was chosen as the lead equation on the basis of coefficient of determination, F-ratio, number of significant variables, sign of the coefficients and *a priori* expectation. The tablealso shows that the R^2 (coefficient of determination) was found to be 0.39, the model accounted for only 40% changes in income. Age and mode of farming according to the result had significant and positive influence on the income of the cereal farmers in the study area, implying that increase in age, increases respondent income. This is contrary to the *a priori* expectation which predicted that older farmers are less commercial in their orientation and more subsistent. They

see no need to engage in investment which needs credit. In the alternative, given the low age bracket in which most producers operated, increased age could mean higher experience in production and better equiped to read, interpret, information and better adoption of innovations that increase efficiency and production culminating into better income generation. The mode of farming had positive and statistically significant influence on the income of cereals farmers. This means that the farming methods employed by the farmers influenced their incomes. This agrees with the *a priori* expectation. The implication is that full time farmers devote more time and attention in adopting innovations that increase their production that yield higher sales income.The R^2 (coefficient of determination) in table 5 was found to be 0.374, thus 37.4% variation in legumes farmers' income is accounted for by variations in the selected explanatory variables.s The R^2 (adjusted) (31.9%) is in conformity with the R^2 value of (.374). Age and output variables had significant and positive influence on the income of the legume farmers. It follows that income of legume farmers increases with age and output by the value of their estimated coefficents. This is contrary to the *a priori* expectation which predicted that older farmers are less commercial in their orientation and more subsistent. They see no need to engage in investment which needs credit. This however, goes emperical to support that in a population of young agile and energetic labour force, enterpreneurs would better acquire capital with increased age to become richer and better investors.

Table 5 : Socio-Economic Characteristics on Income (Cereals and Legumes)

Variable	Linear		Exponential		Double Log		Semi – Log	
	Cereals +	Legumes	Cereals	Legumes	Cereals	Legumes	Cereals	Legumes +
Constant	47988.879	76522.522 (7.448)*	11.10	11.348 (126.203)*	7331	7.914 (7.843)*	- 47217.421	- 373454.852 (3.189)*
Age	0.479 (5.811)*	0.357 (3.185)*	0.432 (4.959)*	0.317 (2.710)*	0.446 (4.096)*	0.402 (3.332)*	0.498 (4.812)*	0.442 (3.805)*
Education	0.146 (1.790)	0.014 (0.147)	0.151 (1.776)	0.013 (0.132)	0.148 (1.383)	0.044 (0.397)	0.139 (1.374)	0.042 (0.398)
Household size	0.188 (2.160)**	0.029 (0.296)	0.194 (2.126)**	0.032 (0.308)	-0.040 (0.375)	-0.038 (0.347)	-0.024 (0.232)	-0.043 (0.359)
Output	0.191 (2.186)**	0.306 (2.680)*	0.177 (1.928)	0.285 (2.392)**	0.016 (1.516)	0.245 (2.019)**	0.178 (1.680)	0.254 (2.174)**
Mode of farming	0.121 (1.485)	0.100 (1.017)	0.111 (1.301)	0.910 (0.885)	0.171 (1.620)	0.119 (1.065)	0.194 (1.983)**	0.120 (1.121)
R^2	0.427	0.353	0.37	0.293	0.326	0.324	0.39	0.374
Adjusted R^2	0.394	0.309	0.334	0.244	0.271	0.265	0.342	0.319
F	(13.096)*	(7.961)*	(10.324)*	(6.047)*	(5.986)*	(5.464)*	(7.970)*	(6.811)*

Source: Field survey Result, 2016. * significant at 1%, ** significant at 5%
+ Lead equation (functional form)

3.5 Constraints Faced by Smallholder Cereals and Legumes Farmers in the Study Area

Table 6shows the constraints faced by cereals and legumes crops producers in Nasarawa State of Nigeria, which are ranked from one upwards in increasing severity. The result revealed that the most common problem faced by the farmers was access to improved seed variety, with 85.1 percent multiple response from farmers. This ranked 1st. The farmers are

poor and are therefore constrained to use open phenotype seeds reserved from previous year's harvest. Thus increase in productivity and efficiency is far fetched.

Land tenure system was also identified as one of the key constraint in cereals and legume production and ranked 2nd. Land tenure is centrally linked to many issues. It is the main support to subsistence, also the main vector for investment options and a tool for accummulation of wealth that can be transferred to the next generation. Access to land is therefore a cornerstone for poverty reduction, among those group of rural investors.

Good majority of farmers are also faced with the problem of high cost of fertilizer and agrochemical (77.6 percent), this ranked 3rd and could be due to the fact that fertilizer, pesticides, herbicides and other agrochemicals used are imported and therefore attract higher cost. Lack of extension visits and agents (70.7 percent) was another constraint which ranked 4th. Limited access to credit (64.9 percent) ranked 5th. Respondents reason was based on lack of demanded collatoral by credit institutions. Poor marketing systems (57.5 percent) ranked 6th and was due to the fact that organized middle men with statutory regulatory backing that give them advantage over producers. Insect and disease attack (52.3 percent) was ranked 7th as important natural factors limiting the production of cereals and legumes in several ways, which is capable of 100 percent losses, as explained in Sight and Ahmad (1997); Odoemenem and Inakwu, (2011). Poor storage facility (45.9 percent) ranked 8th. Most respondents stored their produce in living rooms without any form of improved storage facility.

Table 6: Constraints Faced in Cereal and Legume Production

Variable	Frequency	Percentage	Rank
Seed variety	148	85.1	1
Land Tenure System	136	78.2	2
Cost of inputs	135	77.6	3
Lack of extension visit	123	70.7	4
Lack of Credit	113	64.9	5
Poor Marketing System	100	57.5	6
Pest/Disease Problems	91	52.3	7
Poor Storage Facility	79	45.9	8

Source: Field survey data, 2016 ***Multiple responses recorded**

4.6 Test of Hypothesis

4.6.1 ANOVA Test for Significant Difference Between Groups for Income of Cereals and Legumes and Within Group of Farmers

Table 7 shows that F value (1.17) is significant at 5% level of probability for the significant difference in income within groups. Therefore the null hypothesis 4 which stipulated that there is no signficant difference in income within groups is rejected.

Also, table 7 shows that F-value (1.324) is not significant for the difference in income between group of farmers, therefore the null hypothesis 4 which stipulated that there is no significant difference in income between group of farmers is accepted

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Table 7 : ANOVA FOR DIFFERENCE OF INCOME WITHIN GROUP AND ACROSS CROP GROUPS

	Sum of squares	Df	F	Sig.	Decision Rule
Within group	175.272	117	1.717	0.013	Reject H_0
Between group	48.000	55	1.324	0.233	Accept H_0
Total	223.272	172			

Source: Field survey Result, 2016.

3.6.2 Result of T-test

The result of the t-test on income of cereals and legumes in able 8. shows that incomes are not significantly different. The null hypothesis 3 which stipulated that there is no significant difference in the incomes of cereals and legumes enterprises is accepted.

Table 8: Test of Difference Between Input Used and OutputObtained in Cereals and Legumes Production

	T	Df	Sig (2 tailed)	Decision Rule
Equal varianceassumed	-1.280	77	0.204	Accept H0
Equal variance not assumed	-1.273	15.090	0.207	

4.0 CONCLUSION AND RECOMMENDATION

The study concludes that majority of respondent farmers were married and were at the productive age group of 20-40 years, an indication that family labour exist. Both cereals and legume production in the study area is profitable and the farmers are operationally efficient. Socioeconomic factors significantly influence farmers income, however there is no significant diference between incomes of cereals and legumes enterprises. Farm inputs (farm size, labour, seeds, pesticides and fertilizer) significantly influenced cereals and legumes production in Nasarawa State, Nigeria. While lack of improved seed, high cost of fertilizer and pesticides, land tenure system, lack of extension agents, limited access to credit, poor marketing system, poor storage facility, insect and disease attack are the constraints to cereals and legumes production in Nasarawa State, Nigeria.

It is recommended that:

1. Readily available farming inputs (inorganic fertilizers, improve seeds and chemicals) be put in place with credit facilities, improved marketing system and good storage facilities to check waste.
2. Agricultural research institutes need refocusing in terms of content in order to make them more responsive to cereals and legumes crops farmers' peculiar needs and the emerging challenges in agricultural sector in general.

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