

# Effect of Contract Farming on Productivity and Welfare of Cassava- Based Farmers in South Eastern Nigeria.

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## ABSTRACT

The study was conducted in South Eastern Nigeria using Anambra State as a case study. Eight Local Government Areas (LGAs) were purposively drawn from the study area from which 64 farmers under contract farming were drawn. Also 64 farmers that were not under contract farming were drawn across the LGAs. Staff from Agricultural Development Programme (ADP) and Nigeria Starch Mills, Ihiala, Anambra State assisted in data collected. Data were collected using structured questionnaires and interviews. Data collected were analyzed using frequency tables, means and percentages, Ordinary Least Square (OLS) and Chow's test models. Results from the analyses show that farmers under contract farming had larger land areas of cultivation and relatively younger than farmers not under contract farming. The farmers under contract farming were more educated but had fewer years of farming experience than the farmers that were not under contract farming. Farm size, productivity, net returns, and welfare levels of the farmers under contract farming (5.5 ha, ₦1.8, ₦78520 and ₦14630) were equally higher than those not under contract farming (1.4 ha, ₦1.2, ₦19300 and ₦8900). Furthermore, the result shows that the significant factors that influenced the productivity of the farmers were age, educational status, farm size, farming experience and labour cost. The significant factors that influenced welfare of the farmers were education, total household income, land holding, years of farming experience and cost of production. The Chow's test revealed a significant effect of contract farming on productivity of the farmers. Thus, productivity of contract farmers was significantly higher than productivity of farmers not under contract farming. However, there was no significant difference in the welfare status of both categories of farmers. The major problems facing contract farming in the zone were fund scarcity, lack of credit facilities and high production cost. Based on the findings, it was recommended that contract farming should be given more awareness especially to rural farmers; socio economic and marketing infrastructure should be improved to reduce costs; policies should address the nature of contract farming in Nigeria; more agro allied firms should be established and should be made to target small scale farmers.

**Key words:** contract farming, productivity, welfare.

## Introduction

Contract farming may be defined as an arrangement between a primary producer (farmer) and firm, organization or other intermediaries for supply of a specified quantity of output at a certain price. It may be legalized with an agreement and involvement of a lawyer.

Some benefits of contract farming are as follows :market for produced commodities at regular intervals; higher incomes in periods of excessive output; stabilization of product prices; exposure and empowering farmers to operate in modern farming conditions and maximizing profits.

Cassava, which is the commodity of interest, is gradually becoming the most important crop in Nigeria, not because of output only but the numerous uses and potentials derivable from this commodity (Knipscheeret al, 2007; NAERLS, 2009; Okoye, 2010). Nigeria is aiming at using cassava to energize development in the agricultural sector thereby ensuring higher income, employment and enhanced welfare for participants in the value chain of the commodity.

In recognition of its economic importance and drawing from the international strategy, cassava received a greater national attention and interest in Nigeria in 2002, via the introduction of a presidential initiative on cassava with the intention of increasing output, making cassava a major export crop, improving income of participants and identifying potential contribution of cassava marketing to agricultural development (IITA, 2004, Awoyinfa, 2009). However, contract farming is relatively undeveloped in Nigeria, thus, the challenge to imperically examine contract farming and develop strategies for development.

## Objectives of the Study

1. examine socio economic characteristics of the sampled farmers
2. examine productivity, welfare and the determinants of productivity and welfare of the farmers
3. determine the effect of contract farming on productivity and welfare of the farmers
4. identify problems of contract farming in the study area.

## Methodology

The study was conducted in Anambra State of Nigeria purposively selected based on the level of contract farming. 64 farmers under contract farming and 64 not under contract farming were purposively selected from 8 Local Government Areas (LGAs) at 8 farmers per LGA. The LGAs were Ihiala, Awka North, Ogbaru, Orumba South, Anyamelum, Nnewi South, Nnewi North, and Ekwusigo. Data collected were analyzed using frequency tables, means and percentages, Ordinary Least Square (OLS) regression model and Chow's test.

Productivity was analyzed with OLS, implicitly stated as follow:

$$Y(1,2) = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8) \dots \dots \dots (1)$$

Where: (1,2= farmers under contract farming; farmers not under contract farming)) Y= productivity (Total returns/ Total costs (₦))

X<sub>1</sub> = age in years; X<sub>2</sub> = farming experience in years; X<sub>3</sub> = house hold size; X<sub>4</sub> = educational level in years; X<sub>5</sub> = labour cost (₦); X<sub>6</sub> = amount of credit (₦); X<sub>7</sub> = farm size in ha, X<sub>8</sub> = cost of other inputs (₦).

Determinants of welfare were examined as follows:

$$\text{Log PCE}(1,2) = f(Z_1, Z_2, Z_3, Z_4, Z_5, Z_6, Z_7, Z_8, ) \dots \dots \dots (2)$$

Where: (1,2 farmers under contract farming; farmers not under contract farming))

Log PCE = log of Per Capita household Expenditure (expenditure on food, clothing, health care, event, and other social cost) per Adult Equivalent (AE), derived as: AE = 1+0.7 (n<sub>1</sub> - 1) +0.5n<sub>2</sub>

n<sub>1</sub> = number of adults aged 15 years and above, n<sub>2</sub> = number of children aged less than 15 years

Z<sub>1</sub> = age in years; X<sub>2</sub> = farming experience in years; X<sub>3</sub> = household size; X<sub>4</sub> = educational attainment in years; X<sub>5</sub> = sex of household head (male = 1, female = 0), X<sub>6</sub> = total income (₦); X<sub>7</sub> = Size of land holdings in hectares (a proxy for asset endowment), X<sub>8</sub> = total production cost(₦).

The effect of contract farming on the productivity and welfare of the farmers was done using Chow's test. Following Thamoderan *et al* (1982), Onyenweaku(1997), Olamola (1988) who employed this model to examine to impact of a factor on two different categories of respondents, the Chow's test is given as follows:

$$F = \frac{[(Ee_3^2 - (Ee_1^2 + Ee_2^2)) / (K_3 - K_1 - K_2)]}{(Ee_1^2 + Ee_2^2) / (K_1 + K_2)} \dots \dots \dots (3.7)$$

Where Ee<sub>3</sub><sup>2</sup> and K<sub>3</sub> = the error sum of square and degree of freedom respectively of the pooled data. Ee<sub>1</sub><sup>2</sup> and k<sub>1</sub>= the error sum of square and degree of freedom of farmers under contract farming. Ee<sub>2</sub><sup>2</sup> and K<sub>2</sub>= the error sum of square and degree of freedom for farmers not under contract farming.

For test of homogeneity of slope, the Chow's F- statistic is as follows:

$$F = \frac{[(Ee_4^2 - (Ee_1^2 + Ee_2^2)) / (K_4 - K_1 - K_2)]}{(Ee_1^2 + Ee_2^2) / (K_1 + K_2)} \dots \dots \dots (3.8)$$

Where Ee<sub>4</sub><sup>2</sup> and K<sub>4</sub> = the error sum of square and degree of freedom respectively for the pooled data with a dummy variable of value one (1) for farmers under contract farming and zero (0) for farmers not under contract farming. Other variables are as earlier defined.

For the test of differences in intercepts, the Chow's F-statistics is calculated as follows:

$$F = \frac{[(Ee_3^2 - Ee_4^2) / (K_3 - K_4)]}{(Ee_4^2 / K_4)} \dots \dots \dots (3.9)$$

All variables as earlier defined. If the F calculated exceeds the tabulated F value, then the intercepts are assumed to be different for the two groups of cassava – based farmers and it means value contract farming has effect on productivity and or welfare of the farmers.

The mean age for farmers under contract farming was 48 years while for farmers that were not under contract farming was 53. Sex of the respondents shows that fewer females were involved in contract farming. This may be due to nature of contract farming requiring some measure of regular large outputs as most female farmer operate at lower capacities.

Mean household size of the farmers under contract farming and those not under contract farming were almost the same. Farming experience shows a mean of 8.4 years for farmers under contract farming and 11.7 for others not under contract farming. Educational attainment of farmers under contract farming was higher than those not under contract farming. This is because enlightened farmers are more amenable to change and modern opportunities.

**Results and Discussion from the study**  
**Socioeconomic Characteristics of the Respondents**

**Table 1: Socioeconomic characteristics of the respondents.**

Farmers (Under Contract farming)			Farmers (not under contract farming)	
<u>Age</u>	Freq.	%	Freq	%
31 – 40	11	17	8	25
41 – 50	32	50	18	28
51 – 60	15	23	22	34
61 – 70	6	9	16	44
Mean	48		53	
<u>Sex</u>				
Male	51	80	34	53
Female	13	20	30	47
<u>HH Size</u>				
1 – 4	19	30	15	23
5 – 8	30	47	36	56
9 – 12	15	23	13	20
Mean	6.5		6.4	
<u>Farming experience</u>				
1 – 5	6	9	9	5
6 – 10	13	20	16	25
11 – 15	10	16	20	41
16 – 20	16	25	19	30
Mean	8.4		11.7	
<u>Educational attainment</u>				
No formal Education	5	8	10	16
Primary	17	27	22	34
Secondary	30	47	28	44
Tertiary	12	19	4	6.0

Source: Field survey, 2013.

**Farm Size, Productivity and Profits**

The farm average size, productivity and profits (monthly) of the respondents are shown in Table 2.

**Table 2: farm size, productivity, profits and PCE.**

Farmers under contract farming	Farmers not under contract farming	
Farm size	5.5	1.4
Productivity	₦1.8	₦1.2
Profits	₦78,520	₦19,300
PCE	₦14630	₦8900

Source: field survey, 2013

From Table 2, the average farm size for farmers under contract farming was 5.5ha while that of farmers not under contract farming was 1.4 ha. This shows that farmers under contract farming had more access to larger farming areas. The productivity of farmers under contract farming was ₦1.8 while those not under contract farmer was 1.2. This is the return made from every ₦1 invested in the business. The profit (net return) recorded by farmers under contract farming was ₦78,520 compared to ₦19,300 recorded by the cassava based farmers not under contract farming This agrees with Adeniyi (2010) and Oyakhilomen ( 2013). This is in view of the volume of output and sales of these farmers. The Per Capital Expenditure of farmers under contract farming was ₦14630 while for farmers not under contract farming had ₦8900

### Determinants of productivity of the farmers

The determinants of productivity of the farmers is shown in Table 3.0

Table 3.0: determinants of productivity of the farmers

Contract farmers					Non Contract Farmers			
Contract farmers	Linear	Semi log +	DL	Exponential	Linear	Semi log +	DL	Exponential
Constant	1.887 (3.00)***	-710 (3.50)***	-.158 (-0.19)	-1.01 (-0.38)	2.10 (5.20)***	.791 (3.76)***	.563 (0.64)	1.175 (0.70)
X <sub>1</sub>	-.0203 (-2.17)*	-.007 (-2.43)*	-.377 (-2.46)**	-1.03 (-2.12)**	-.010 (-1.56)*	-.005 (-1.62)*	-.313 (-1.72)*	-.570 (-1.63)*
X <sub>2</sub>	.047 (1.65)*	.013 (1.41)	.010 (1.11)	.394 (1.36)	-.022 (-1.61)*	-.014 (-1.89)*	-.089 (-1.26)	-.133 (-0.98)
X <sub>3</sub>	-.047 (-1.11)	-.015 (-1.07)	-.069 (-0.78)	-.247 (-0.87)	-.010 (-0.41)	-.012 (-0.94)	-.007 (-0.09)	.072 (0.49)
X <sub>4</sub>	.064 (2.91)***	.022 (3.20)***	0.76 (1.82)*	221 (1.68)*	.013 (0.88)	.008 (1.09)	.032 (0.86)	.049 (0.68)
X <sub>5</sub>	4.15e-07 (1.22)	1.48e-07 (1.37)	.139 (2.72)***	.390 (2.40)**	1.08e-07 (2.00)**	5.54e-07 (1.97)*	0.79 (2.05)**	.161 (2.19)**
X <sub>6</sub>	1.49e-07 (1.02)	4.76e-08 (1.02)	.010 (2.00)**	.031 (1.87)*	1.00e-06 (1.36)	4.04e-07 (1.05)	.010 (1.73)*	.023 (2.04)**
X <sub>7</sub>	.130 (2.61)***	.043 (2.72)***	.208 (2.10)**	.617 (1.96)*	.139 (1.84)*	.068 (1.72)*	.139 (2.22)**	.281 (2.34)**
X <sub>8</sub>	-9.40e-08 (-0.40)	-3.20e-08 (-0.43)	.008 (0.22)	.043 (0.37)	-3.38e-08 (-0.07)	-3.63e-08 (-0.14)	.032 (0.87)	.076 (1.07)
R <sup>2</sup>	0.74	0.76	0.75	0.71	0.69	0.69	0.63	0.62
R <sup>2</sup>	0.70	0.73	0.71	0.69	0.57	0.56	0.55	0.53
F – ratio	7.98***	8.75***	8.09***	7.07***	3.96***	3.76***	3.28***	3.28***

Source: Field survey data, 2013, \*, \*\*, \*\*\* = significant at 10%, 5%, 1% respectively. Figures in parenthesis are t-ratios, + = lead equation.

From Table 3.0, for the contract farmers the Semi log functional form was chosen as the lead equation based on number of significant variables, value of R<sup>2</sup>, F-ratio and uniformity to *apriori* expectation. The result shows that for contract farmers, the significant variables that influenced their productivity were X<sub>1</sub>(age) X<sub>4</sub>(educational level) and X<sub>7</sub> (farm size). X<sub>1</sub> (age) was negatively significant showing that as age increased, productivity reduced This agrees with Henri-Ukohaet *al* (2010); Mkpado and Onuoha (2010). X<sub>4</sub> (educational level) was positively significant showing that as educational level increased productivity. X<sub>7</sub> (farm size) was positively significant showing that as farm size increased, productivity increased.

For the non contract cassava based farmers, the semi log functional form was also chosen based on aforementioned reasons and for comparism. From the result, the significant variables that influenced their productivity were X<sub>1</sub> (age), X<sub>2</sub>(farming experience), X<sub>5</sub> (labour cost) and X<sub>7</sub> (farm size). Age was negatively significant showing that as one advances in age, productivity reduces. Farming experience, labour cost and farm size were all positively significant, showing that as these variables increased, productivity increased accordingly. Determinants of productivity of the pooled data without dummy and pooled data with dummy equally supported these results. The dummy was also positively significant.

#### Test for difference in productivity

The Chow's test for difference in productivity is shown in Table 4.0.

Table 4.0: Test for differences in productivity.

Nature of analysis/household type	Error sum of squares	Degree of freedom	Calculated F
Tests for productivity effects			
Contract farmers	2.8009	55	3.55***
Non-contract farmers	3.0643	55	
Pooled data	7.5711	119	
Tests of homogeneity of slop contract farmers	2.8009	50	1.64*
Non-contract farmers	3.0643	50	
Pooled data with dummy	6.5668	118*	
Tests for differences in a intercept			
Pooled data	7.5711	119	18.05***
Pooled data with dummy	6.56668	118	

Source: field survey, 2013.

Table 4.0 shows the significance of the tests for productivity effects, tests of homogeneity of slope and differences in intercept. This result therefore, shows that there was a significant effect of contract farming on productivity. The productivity of the farmers under contract farming was significantly higher than the productivity of non-contract farmers in the study area.

**Determinants of welfare of the farmers.**

The determinant of the farmers' welfare as examined using the Per Capita Expenditure (PCE) is shown Table 5.0

**Table 5.0: Determinants of welfare of the farmers**

Variables	Contract farmers				Non Contract farmers			
	Linear	Semi log	DL	Exponential	Linear	Semi log	DL	Exponential
Constant	860 (0.08)	8.98 (17.11)***	5.84 (2.40)**	-67102.23 (-1.29)	10979.81 (2.06)**	9.32 (19.44)***	8.65 (3.76)***	-7997.35 (0.31)
X <sub>1</sub>	-39.99 (-0.24)	-.001 (-0.18)	-.183 (-0.45)	-5029.45 (-0.58)	2.722 (0.03)	-.00 (-0.24)	-.08 (-0.19)	7.74 (0.00)
X <sub>2</sub>	37.05 (0.08)	-.003 (0.16)	.043 (0.19)	2058.54 (0.42)	-413.36 (-2.18)**	.03 (1.91)*	-.24 (-1.97)*	-289.92 (1.64)*
X <sub>3</sub>	-492.95 (-0.65)	-.044 (-1.20)	-.067 (-0.28)	1371.41 (0.27)	-107.17 (-0.33)	-.01 (-0.33)	-.01 (-0.04)	323.50 (0.15)
X <sub>4</sub>	1052.13 (2.80)***	0.44 (2.47)**	.143 (1.33)	3951.64 (1.73)*	-84.72 (-0.42)	.01 (0.35)	.00 (0.03)	-659.53 (-0.67)
X <sub>5</sub>	2833.08 (0.82)	.132 (0.80)	.181 (1.08)	3898.81 (1.09)	514.69 (0.31)	.04 (0.28)	.04 (0.27)	647.53 (0.38)
X <sub>6</sub>	.005 (1.99)*	2.23 e- 07 (1.70)*	.195 (1.78)*	4771.18 (1.70)*	-.00 (-0.22)	-1.56e-08 (-0.07)	-.016 (-0.13)	-591.90 (-0.43)
X <sub>7</sub>	1590.24 (1.69)*	.083 (1.85)*	.721 (2.90)***	13305.06 (2.51)***	1809.63 (1.67)*	.09 (1.95)*	.08 (1.71)	2126.62 (1.92)*
X <sub>8</sub>	.000	2.72e – 08 (0.57)	.030 (0.27)	282.51 (0.21)	.01 (2.14)**	2.56e – 07 (1.68)*	.19 (1.71)*	1135.77 (2.25)**
R <sup>2</sup>	0.63	0.61	0.58	0.60	0.62	0.61	0.56	0.59
R <sup>-2</sup>	0.60	0.59	0.55	0.59	0.59	0.58	0.53	0.57
F ratio	4.47***	3.80***	3.55***	3.75***	3.91***	3.58***	2.73***	3.11***

Source: field Survey, 2013.

From Table 5.0, the determinants of welfare for the contract farmers were X<sub>4</sub>(educational level) X<sub>6</sub>(total household income) and X<sub>7</sub> (land holding) It shows that as X<sub>4</sub> increased, the welfare of the farmers equally increased. X<sub>6</sub> was also positively significantly showing that as total house hold income increased, welfare of the farmers increased. Land holding was positively significant showing a direct relationship with welfare implying that increase in X<sub>7</sub> increased welfare.

For the non-contract farmers, the significant determinants of welfare were X<sub>2</sub>(years of experience), X<sub>7</sub>(land holding) and X<sub>8</sub>(total cost of production). X<sub>2</sub> was positively significant which means that as X<sub>2</sub> (years of experience) increased, welfare increased. However, X<sub>7</sub> (land holding) was positively significant showing that as it increased welfare of the farmers increased This conforms with Adams and Page (2005); Ukoha, *et al* (2007). This also applies to X<sub>8</sub> (total cost of production) which had a direct relationship with welfare.

Determinants of welfare of the farmers in pooled data without dummy and pooled with dummy reinforced the findings.

**Test for differences in welfare**

The test for differences in welfare of the farmers is shown in Table 4.4.

**Table 6.0 :Test for differences in welfare of the farmers.**

Nature of analysis/household type	Error sum of squares	Degree of freedom	Calculated F
Test for welfare effects			1.24
contract farmers	8.714e + 09	55	
Non-contract farmers	2.0431e + 09	55	
Pooled data	1.1847e + 09	119	
Test for homogeneity slope			1.39
Contract farmers	8.7149e + 09	50	
Non contract farmers	2.043e +09	50	
Pooled data with dummy	1.1847e + 10	118	
Test for differences in intercept			0.00
Pooled data	1.1847e + 10	119	
Pooled data with dummy	1.1847e + 10	118	

Source: Field survey,2013.

Table 4.4 shows the test for differences in welfare of the farmers. From the results of the test of welfare effects, test of homogeneity of slope and test for differences in intercept, there was no significant difference in welfare status of the farmers under contract farming from those not under contract farming. Therefore, contract farming had no significant effect on welfare of the farmers, though it had significant effect on their productivity. This may be because of the unorganized forms of contract farming in the area.

**Problems facing the farmers and the firms.**

The problems faced by the farmers and the firms under contract farming is as shown in Table 7

**Table 7: problems faced by the farmers and the firms**

Problems	Contract Farmers		Non contract farmers		Firms	
	Freq	%	Freq	%	Freq	%
Funds	59	92	62	97	6	60
High production cost	47	73	56	88	8	80
Price instability	44	68	60	94	3	30
Market Access	28	44	58	91	2	20
Govt/market changes	32	52	20	31	5	50
Credit facilities	49	77	59	92	6	60

Source: Field survey, 2013, no. of respondent = 64, firms = 10.

From Table 7.0, the major problems faced by farmers under contract farming were scarcity of funds, lack of credit facilities, and high production cost. The major problems faced by the farmers not under contract farming were fund scarcity, high production cost, price instability, market access and credit facilities. This is because farmers that were not under contract farming find it more difficult to access markets during glut and also tend to have more challenges in accessing credit facilities.

For the firms involved in contract farming, their major problems were high production costs, funds and credit facilities. These are common problems affecting most enterprises in many developing economies.

### CONCLUSION AND RECOMMENDATIONS

Findings from the study show that farmers under contract farming were relatively better off in terms of net returns, productivity and welfare. Contract farming yet to have a significant effect on welfare of the farmers because of frailties in operation of contract farming in the study area but had a significant effect on productivity. It is recommended that more enlightenment for farmers and encouragement of firms to engage farmers. Proper policies should address the shortcomings in the system. There is need for more agro allied firms.

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