Contract Farming and Cashew Production in North Benin: Socio-economic importance and determinants of profitability

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Received on: 22/02/2019 Accepted on: 19/03/2019 Published on: 31/03/2019

ABSTRACT

Aim: The study was aimed to assess on one hand the socio-economic importance of agricultural contracts, then on the other hand the determinants of the profitability of cashew nuts production under contract in North-East of Benin.

Materials and Methods: The data were collected from a sample of 144 farmers (including 72 contracting producers and 72 non-contracting producers) through a questionnaire. The information collected was analyzed from two software packages. The SPSS software allowed to compile the descriptive statistics and then the average comparison test of these two categories of producers. As for the STATA software, it was used to perform a multiple linear regression that allowed to analyze the determinants of the profitability of the production of cashew nuts under contract. In addition, discourse analyzes have been made in order to analyze the social importance of agricultural contracts.

Results: Analysis of the information collected showed that agricultural contracts improve the income of the participating producers. Several variables explain the high income obtained by this category of producers. They are: the age of the producer, the size of the household, the number of farm assets, the level of education, the number of years of schooling, the amount of the loan contracted and all fixed charges.

Conclusion: Improving the level of economic efficiency of the production of cashew nuts under contract therefore necessarily involves targeted actions on these variables. Social importance of the production of cashew nut under contract is felt on the sanitary level, on the educational level, on the social relations between producers, on their living conditions then in the acquisition of rolling stock.

Keywords: Agriculture, Cashew, contract farming, contract profitability, rural economics.

Introduction

The agricultural sector, major lever of economic development occupies 48.2% of assets, contributes over 32% to the formation of the Gross Domestic Product (GDP) and provides more than 80% of Benin's export earnings [1]. Benin's agricultural production is made mainly from food crops and cash crops mainly dominated by cotton and cashew.

The cashew sector has become one of the most important agricultural sectors for Africa in general and West Africa in particular. [2] Cashew has alone accounted for 8% of the total export value in 2008, 7% of agricultural GDP and 3% of GDP [3].

Citation as: Miassi YE, Dossa FK, Labiyi IA, Dossouhoui S and Yabi JA (2019). Contract Farming and Cashew Production in North Benin: Socio-economic importance and determinants of profitability. J. Agri. Res. Adv. 01(01): 29-38.

Cotton production was always the first agricultural export, has been supplanted in 2008 by cashew, who thereby won agricultural products exported by Benin during this year [3]. This sector generates income for both farmers than for other players in the sector (traders, processors, exporters, etc.) and for the state[4].

However, producers also face difficulties in access to land and access to credit, as the entry term production trees after planting than one year [5]. They also suffer from a lack of knowledge about production techniques and have limited access to inputs[6]. Moreover, in addition to the considerable transaction costs[7] which these producers face, they also have inadequate access to information on market opportunities[8].

One of the options developed by the cashew producers to meet the challenges they face is to use the agricultural agreement. Agricultural

contracts now represent a significant and growing form of agricultural organization to the point[9] considers that it affects 15% of agricultural production in developed countries [10]. In addition, the results of case studies[11]indicate that all agricultural producers under contract are improving yields (15 to 20%) and technical knowledge. Other advantages of the contracts have been linked to the ability to facilitate financing, financial guarantees for producers and investment as well as long-term planning. The contracts, by the advantages they offer, can be a good way to reduce costs and increase revenue[12].

However, the benefits of agricultural contracts on the economy and producers living conditions remain too poorly documented to give them their deserved visibility. This partly explains the declining interest that social and economic policy guidelines agreed in contract farming, starting from a perception that the contribution of agricultural insurance are marginal.

It is in this context that fits this study to evaluate both the socio-economic importance of agricultural contracts, and other determinants of profitability cashew production under contract in North is Benin.

Materials and Methods

Study Area

Tchaourou and N'Dali are municipalities located in northeastern Benin. The Tchaourou Commune is bordered to the north by the Parakou Commons Perere and N'Dali south by the Municipality of Ouèssè, to the east by the Federal Republic of Nigeria and west by the municipalities and BassilaDjougou. It covers an area of 7256 km².The town N'Dali on it is limited to the north by the municipalities of Bembèrèkè and Sinendé, south by the municipalities of Parakou and Tchaourou, in the east by the municipalities of N'Dali and west by those Djougou and Péhunco and covers an area of 3748 km². The main types of soil found in these towns are ferruginous. According to [13], the communes of Tchaourou and have respectively N'Dali223,138 inhabitants and 113,604 inhabitants with a density estimated at about 30 inhabitants / km². There are a multitude of ethnic groups, the most dominant of which are the Bariba and Peulhs.

Note that agricultural production is the main source of income of these populations.

Methodology

To conduct this research, two (02) municipalities were selected in the North East of Benin. These municipalities were chosen for their significant contributions to the cashew production department to which they belong. Four (04) villages (Gbéyèkèrou, Guinirou, Sirarou and Ouénou) were selected in the two cities because of the large number of cashew producers they contain. Therefore, one hundred forty-four (144) producers made object investigation, due to the seventy-two (72) shared by producers. This sample is composed of cashew Contracting producers (72) and non-contracting (72). Note that the sample was made in a simple random order to give all producing the same probability of being selected.

The collected data is related not only to the characteristics of the producers, but also to expenditure and revenue production by producers. The information has been collected on the basis of a previously developed questionnaire.

Statistical Analysis of data

To assess the economic importance of agricultural contracts this study was inspired by the work of [14]. To this end, several calculated profitability indicators were: Gross Product Value (PBV), Value Added (VA), the Gross Operating Income (GOI) and Net Operating Income (NOI). Note that these economic performance indicators were calculated for the two groups of producers (contracting and non-contracting).

Starting studies [15], [16] these indicators can be calculated as follows:

Gross Product Value (GPV): Designating by Q the amount of harvested nuts and the PU kilogram selling price, the Gross Product Value (GPV) is given by: $GPV = Q * PU$

The GPV is for this purpose the revenue made by the producer.

The Value Added (VA): It corresponds to the difference of the Gross Product Value (GPV) and the value of intermediate inputs (CI). Intermediate consumption represent the charges related to the acquisition of insecticides, herbicides, and jute bags.

Its formula is given: $VA = GPV - CI$

Table 1: Model variables summary and the expected signs

Variables	Variable types	Description	
Net Operating Income (NOI)	Quantitative	Dependent Variable: Net Income Operating Value	
Explanatory variables			Expectedsign
Age	Quantitative	Years of farm manager	+
Household size	Quantitative	Number of people who form the household	+
Number of agricultural household assets	Quantitative	Number of agricultural household assets	+
Literacylevel	Qualitative	Literacy level. This variable is set to 0 when the producer can neither read nor write in the local language; 1 when he knows only read and 2 when literate.	+
Level of education	Qualitative	Producer education level. This variable is set to 0 when the producer has no education; 1 to the primary level; 2 for the secondary level, or 3 for university	+
Number of years of schooling	Quantitative	Number of producer schooling years.	+
Mode of adherence to contract farming	Qualitative	Membership Mode agricultural contracts. This variable is set to 1 if the producer has adhered to agricultural contracts by awareness of the group to which it belongs; 2 if he acceded through a friend / a close; or 3 as a parent "	+/-
Area planted	Quantitative	Area down by the interviewee	+
Amount of loantaken	Quantitative	Loan amount that received the producer	+
Variable expenses	Quantitative	Variable expenses related to production	-
Fixed charges	Quantitative	Fixed costs related to the production	-

Source:*Results of literature searches (2017)*

Note that both programs were used in this study. SPSS has achieved the descriptive statistics and the mean comparison test. As for the STATA software, was used to perform econometric regression.

The added value is obtained by deducting from the PBV all expenses directly related to the production. Note that the added value is the wealth that the producer creates. This wealth contributes to this effect to the Gross Domestic Product of the country.

Gross Operating Income (GOI): It is given by the formula: ***GOI = VA- (Labor compensation + financial expenses + taxes)***. To estimate the GOI, it was considered only the hired labor.

Net Operating Income (NOI): This indicator represents the balance of GOI less the value of depreciation. Its formula is given by: ***NOI = GOI-Value of Depreciation***

The NOI expresses the economic gain (or loss) of the agent after all current operating expenses have been paid. The NOI expresses the economic gain (or loss) taking into account the investments made previously. The NOI is thus obtained by deducting from the GPV all the expenses related to the production.

Thereafter, a mean comparison test highlighting the Net Operating Income obtained by these two categories of producers was made. Thus, for this indicator, the average of the contracting producer groups and those non-contracting producers respectively $\overline{X1}$ and $\overline{X2}$. The t-test averages for independent samples was used to check if there is a significant difference between the two averages. The statistic t is: $t = \frac{\overline{X1} + \overline{X2}}{S\sqrt{\frac{1}{n1}+\frac{1}{n2}}}$

with:

n_1: size of the sample 1; n_2: size of the sample 2; x_1: mean of sample 1; x_2: mean of sample 2; S: sample variance.

In practice after checking normality and independence of data, it will be tested initially homogeneity of variances of the two groups and that of their average as follows: $h_0 : s^2_1 = s^2_2$ against the alternative hypothesis $h_1 : s^2_1 \# s^2_2$

Thus the used statistical software will give the value of Statistics Levene, ddl and its significance p probability for homogeneity of variance s^2_1 and s^2_2 of the two groups. If the given p is below the threshold of 5%, we conclude that the variances are equal. Thereafter it will be tested the difference in average net incomes of both adoption groups: $h_0 : x_1 = x_2$ against the alternative hypothesis $h_1 : x_1 \# x_2$.

The software will also provide the value of the Fisher statistic for the difference of the two, the DDL and its significance probability p. If the given p is less than the threshold then we conclude that the difference between the average income per hectare of the contracting producers and the non-contracting, observed at the operating account is significant if $\propto < 5\%$. In other words, participation in contract farming has a significant effect on income of the contracting producers.

Analysis of the comments gathered during interviews and focus groups organized was used to analyze the social significance of the production of cashew contract. Analyzes of speech based on the studies [17] have been made to that effect. This study is also proposed to analyze the determinants of the profitability of cashew production under contract. For this purpose this study was inspired by the work of [18], [19] and a multiple linear regression model was conducted on the basis of seventy-two (72) participants producers to agricultural contracts. For example, multiple linear regression can be written as follows: $y = \alpha_0 + \alpha_1 x_i + \varepsilon_i$

Where: y is the dependent variable, the explanatory variables xi, α is a constant called " ordered in origin " and ε_i the error term of the model.

Presentation of the variables included in the model

Two types of variables are included in the regression model shot comprises: the dependent variable and the explanatory variables.

The dependent variable is the net operating income of contracting farmers. It is therefore a question of identified and analyzed the factors influencing the income of the contracting producers. So many variables called " explanatory " were introduced in the regression model.

The explanatory variables introduced in the empirical model are: age of the producer (***Age***), household size (***Mena***), the number of agricultural household assets (***ActifM***), the literacy level (***Alpha***), the level instruction (***Inst***), the number of years of schooling (***AnSco***), the mode of adherence to contract farming (***Adhe***), area planted (***Sup***), the amount of loan taken (***Mont***), variable costs (***CV***), and fixed costs (***CF***).

Various reasons for the incorporation of these variables in the regression model.

Age: The age variable is expressed in years. Several studies identify age as a parameter determining the profitability of agricultural production. Indeed, the more the producer is aged, the more it gains experience enabling it to improve the financial performance of its operations. This variable has been introduced into the model to see if it has an influence on the net income of cashew producers under contract. The age would have a positive effect on the adoption of this innovation.

Mena: This variable refers to the number of people who form the household producer. Household size is a potential labor source and allows the producer to increase its production under contract. It therefore positively influence the net income of the producer.

ActfM: This variable represents the number of agricultural workers producer of household. The number of assets would have a positive effect on the profitability of production for cashew production requires a requirement in terms of labor.

Alpha and ***Inst***: Educated producers will have a higher income than their uneducated counterparts. The effect of literacy and education on the net income would be positive.

AnSco: This variable is the number of years of schooling of the producer successfully. The number of years of schooling may be a predictor of the profitability of cashew production. A positive sign is expected. This sign is justified by the fact the most educated producers will have higher net income for the least educated producers.

Adhe: According to the producers themselves, the mode of adherence to contract farming would be a critical variable in the profitability of cashew production. A distinction is due mainly to three (3) membership modes: membership by awareness group, the membership through a friend / a close and that through a relative. "These patterns could have a positive or negative effect on the financial performance of the production.

Sup: The area planted is a continuous variable that can influence the profit of the producer. Thus, cashew producers who planted large area will have a higher net income than those who sow a small area. The effect of the area down on the net income of the producer can only be positive. The increase in planted area requires significant demand for labor and inputs in order to increase the level of production. A positive sign of the coefficient for this variable would be expected.

Mont: This variable refers to the amount of the loan taken by the producer. Over this amount, the higher the cashew producers have the capacity to invest in their planting. A positive sign is expectedthis variable.

CV and ***CF***: The variable loads and fixed charges represent production costs. Over these expenses were less producers take advantage of their planting cashew. These variables will thus have a negative effect on the net income of producers. Table (1) presents a summary of all the variables included in the model with their expected sign.

Results and Discussion

A. Characteristics of the surveyed producers and appreciation of agricultural contracts

In the North East of Benin, precisely in the communes of Tchaourou and N'Dali the cashew producers have an average age of respondents was 43 years with an average of 47 years for contractors and 39 years for no-contractors. Also, note that in the study area average household has 09 people and 05 agricultural assets shows that the size and the number of farm household assets are more important for the participating producers to agricultural contracts. On average households Contracting producers represent 10 with 06 active farmers while among non-contracting producers there are 08 people per household with 06 agricultural assets. Education levels and literacy of respondents are very small producers in the municipalities of Tchaourou and N'Dali, and this according to the two groups of producers. Overall, the average number of school years is 2.88 years (±5.15). This means that producers have managed mostly spent the Preparatory Course (CP) successfully. However, we note that the producers not participating in agricultural contracts (4.69) are more educated than the contracting producers (2.5 years). In the study area, producers of cashew cultivated averaged 4.26 ha (± 3.23). However, the contracting producers operate on average 0.53 hectares more than the non-contracting. This can be explained by the need for them to fulfill the commitment under contract. Moreover, in the maintenance of their plantation, contracting producers face significant burdens productions. There are charges for this so-called " variables " and the " fixed ". Note that there is no significant difference between these two categories of producers from the perspective of load variable, unlike the fixed load. Cashew trees are demanding in terms of maintenance, so we can deduce that the credit obtained by contractors producers allows them to invest in farm equipment. Thus allowing them to better maintain their plantation with a view to get good performance.

Table (2) shows the variables characterizing statistical respondents and appreciation of agricultural contracts.

B.Importance of cashew production under contract

To assess the economic importance of cashew production under contract, a comparative analysis of the operating accounts of the two groups of producers was made.

Comparative analysis of the operating accounts

Table (3) below presents the farms accounts ha of cashew producers contractors but also non-contracting.

Analysis of the results reported in Table (3) shows that the participation of cashew producers to agricultural contracts induced an improvement in Gross Product Value. This gap between the two categories of producers is mainly due to the sale price of nuts per kilogram. Indeed, the average sales price of nuts kilogram contract is significantly higher than the selling price without a contract. The results also indicate that the contracting producers have higher production costs than non-contractors. The contract growers receive technical support and credit says " maintenance " through which they get to perform all the operations necessary to obtain a good yield. Paradoxically, we note that these same producers net income per hectare of the contracting producers (192,355 FCFA) is higher than that of non-contracting producers (139,976 FCFA) with a difference of 52,379 FCFA per hectare. The income of the contracting producers is about 1.3 times that of non-contracting parties.

Table 2 : Statistics variables characterizing respondents and appreciation of agricultural contracts.

Variables		Contracting		No contractors		Together		StatisticsTests
		Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	
Quantitative variables								
Age (years)		38.96	13.18	38.96	13.18	42.86	14.40	-3.367 **
Size of households		10.28	4.94	8.51	4.67	9.40	4.87	-2.200 **
Number of agricultural workers		5.67	2.83	4.26	2.49	4.97	2.75	-3.150 ***
Number of years of schooling		2.50	3.26	4.69	5.58	2.88	5.15	0.888
Area planted (Ha)		4.53	3.42	4.00	3.02	4.26	3.23	-0.999
Variable expenses (CFA)		11771.73	10565.98	8925.061	11852.40	10348.40	11279.10	-1.521
fixedcosts (CFA)		12913.41	6974.81	1912.58	1584.27	7412.99	7474.37	0.000 ***
Qualitatives variables								
Literacy (%)	Read or write	51.38		56.94		54.16		0.782
	Read only	6.95		6.95		6.95		
	Read and write	41.67		36.11		38.89		
Education Level (%)	No	69.45		69.45		69.45		0.106
	Primary	19.45		8.33		13.88		
	Secondary	9.75		20.84		15,29		
	University	1.38		1.38		1.38		

*** = significant 1%; ** = significant at 5% and * = significant at 10%.

source:*Results of investigation (2017)*

Table 3: Profitability indicators calculated

Parameter (FCFA / ha)	Average producer groups	
	Contracting	**No contractors**
Gross Product Value	**217781**	**150978**
Intermediate consumption (herbicides, insecticides, jute bags)	3.139	1765
value Added	**214642**	**149213**
Cost of labor	8487	7,066
Other financial expenses (storage, subscription, loan interest more)	11837	277
Gross operating income	**194318**	**141870**
Technical amortization	1963	1894
Net operating income	**192355**	**139976**

Source: Results of investigation (2017)

Table 4: Variance homogeneity test

		Levene's test of equality of variances	
		F	Meaning
Results of Net Operating (FCFA / ha)	The variances are equal	1,607	0,207
	The variances are not equal	-	-

source: Levene test results equal variances

Table 5: Comparison Test average of Net Operating Results

T-test for equality of means						
T	Ddl	Significance (bilateral)	Average difference	Difference standard deviation	95% confidence interval of the difference	
					lower	superior
-3.158	142	0,002	-52,378.225	16584.043	-85,161.745	-19,594.704
-3.158	138	0,002	-52,378.225	16584.043	-85,169.898	-19,586.551

source: Test results mean comparison t

Table 6: Regression Model estimation multiple linear

Net operating income	**coefficients**	**Standard error**	**t**	**prob**
Demographicsproducers				
Constant	351,122.1 ***	88659.1	3.96	0,000
Age	-1,539.841 *	910.7143	-1.69	0.096
Household size	-5,291.703 *	3079.601	-1.72	0.091
Number of agricultural household assets	19517.8 ***	5183.486	3.77	0,000
Literacylevel	5472.759	8546.827	0.64	0.524
Level of education	-121,249.8 **	53341.73	-2.27	0,027
Number of years of schooling	19335.24 **	8125.375	2.38	0,021
Membership Mode to agricultural contracts	-15,792.99	28198.84	-0.55	0,585
areasown	-6,312.453	5848.406	-1.08	0.285
Capitalinvestment				
Amount of loantaken	2.607483 **	1.251575	2.08	0.041
Production costs				
Variable expenses	-1.434878	1.144933	-1.25	0.215
Fixed charges	-4.096002 *	2.366121	-1.73	0.089
Linearregression	Number of observation = 72 F (11, 60) = 2.73 Prob> chi2 = 0.0062 *** R-squared = 0.3340 Adj R-squared = 0.2118			

*** = significant at 1%; ** = significant at 5%; * = Significant at 10%
source: *Estimation Results*

This result is mainly explained by two factors: the high selling price of the kilogram and good yield obtained under contract. It notifies that the average return achieved by contracting producers (320kg) is higher than for non-adopters producers (252Kg). It is the same for the average selling price of nuts per kilogram is 620 FCFA to 470 FCFA against the contractors for not contracting. 355 FCFA) is higher than that of non-contracting producers (139,976 FCFA) with a difference of 52,379 FCFA per hectare. The income of the contracting producers is about 1.3 times that of non-contracting parties. This result is mainly explained by two factors: the high selling price of the kilogram and good yield obtained under contract. It notifies that the average return achieved by contracting producers (320kg) is higher than for non-adopters producers (252Kg). It is the same for the

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Comparison of the average of Nets Operating Results

The average comparison test was preceded by Levene's test of equality of variances to verify whether there is an average difference within each category of producers. Table (4) presents the results of Levene's test of equality of variances.

Analysis of Table (4) revealed that the Levene test of equality of variances was not statistically significant (p> 0.10). Therefore, the null hypothesis that the variances are significantly equal is accepted. The premise of equality is respected. Table (5) shows the test results mean t comparison Student.

The analysis in Table (5) reveal that the t test of Student equality of means is significant at 5% level (p <5%). The assumption that the net income per hectare of the contracting producers is equal to that of non-contracting is rejected.

It then concludes that agricultural contracts significantly improve the incomes of cashew producer's contractors. The results obtained in this study are consistent with those of [20] which concluded that producers (rice) improve their income by participating in agricultural contracts.

C. *Determinants of profitability cashew production under contract*

Table (6) shows the results of the model estimation made of multiple linear regression. The multiple linear regression model performed to investigate the determinants of the profitability of the production of cashew contract is generally significant at the 1% level (p = 0.0062 <1%). Variables such as age of the producer (***Age*** *), household size (***Mena*** *), the number of farm assets (***ActifM*** ***), educational level (***Inst*** **), the number years of schooling (***AnSco*** **), the amount of loan taken (Mount **) and fixed costs (***CF*** *) are those that determine the profitability of cashew production under contract. The model variables are not significant are: literacy, the mode of adherence to contract farming, the area sown and variable costs.

The age of the producer (Age)

Age has a negative and significant effect at the 10% threshold on the profitability of cashew production under contract. We therefore deduce that as the producer is aged less sometimes took advantage of its business. In addition, the aging of cashew plantations in time does not allow producers to achieve significant inputs.

Household size (Mena) and the number of farm assets (ActifM)

The variable "household size" has a negative and significant effect at the 10% threshold on the profitability of cashew production under contract. So the larger the household the household, the lower cashew production contract is profitable. In addition, the number of agricultural workers has a positive and significant influence on the threshold of 1% on the profitability of cashew production under contract in the North East of Benin. Thus the more the number of agricultural workers is high in the household, the more production is profitable. Indeed agricultural assets account for the producer a work force enabling it to increase its production.

The level of education (Inst) and the number of years of schooling (Ansco)

Education is a factor of crucial importance in that it enables producers to understand and establish the operating account. The level of education and

number of years of schooling determine the 5% threshold of profitability of cashew production under contract. These results are consistent with those of [22] which identifies education as adetermining the economic efficiency of resource allocation in soybean production in Benin.

The loanamount (Mount)

The funding received by cashew growers contract has a positive and significant effect at the 5% threshold on the profitability of their business. So the higher the loan amount, the higher the producer gets to benefit from his plantation. Agricultural credit is therefore of some importance for producers in that it allows them to improve their income. Notifies that [23] identified access to credit as a major annual income obtained from the sale of cashew nuts in Benin.

Fixedcosts (CF)

Fixed costs have a negative and significant effect at the 10% threshold on the profitability of cashew production under contract. Therefore, the more these expenses amounted minus the producer benefits from its plantation. These results are consistent with those of [19] that identify the fixed costs as determinants of the net profit of the cotton production in Benin.

Conclusion

Agricultural contracts by the benefits they provide participants improve producers' income. In other words, the income per hectare of the contracting producers is significantly higher than non-contracting producers. Several variables can explain the income earned by participating producers to agricultural contracts offered to them. This is the age of the producer, household size, the number of farm assets, education level, number of years of schooling, the amount of loan taken and all fixed charges. Improving the level of economic efficiency of the cashew production contract thus necessarily involves targeted action on these variables. Note also that the social importance of cashew production contract is felt in terms of health, in terms of education, on social relations between producers on their living conditions and in the acquisition of rolling stock.

Acknowledgement

Authors acknowledge to MSc Ghislain Boris AÏHOUNTON for reading and contribution of his expertise to this document.

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