American International Journal of Multidisciplinary Scientific Research
Vol. 1, No. 1; 2018
Published by Centre for Research on Islamic Banking & Finance and Business

Output Commercialization as Three-Way Traffic for Sugarcane Farming Households in Kwara State of Nigeria

Sadiq, M.S[1]; Singh, I.P[2] ; Lawal, M[3]; Yisa, P.B[4]

[1]Department of Agricultural Economics, FUT, Minna, Nigeria

[2]Department of Agricultural Economics, SKRAU, Bikaner, India

[3]Department of Pure and Applied Chemistry ,University of Science and Technology. Aliereo Kebbi State, Nigeria

[4]Department of Agricultural Education, Federal College of Education, Katsina, Nigeria

Correspondence: Sadiq, Mohammed Sanusi, Department of Agricultural Economics, SKRAU, Bikaner, India.

E-mail: sadiqsanusi30@gmail.com

Received: July 29, 2018 Accepted: August 8, 2018 Online Published: August 18, 2018

Abstract

The study empirically determined the factors that influenced household sugarcane output commercialization in Kwara State of Nigeria using undated data elicited *via* structured questionnaires complemented with interview schedule from 105 active sugarcane farmers chosen through multi-stage sampling design during the 2017 production season. The collected data were analyzed using both descriptive and inferential statistics. The empirical findings showed poor extension services, inadequate credit facilities, failure of the farmers to utilize their social capital, lack of scientific storage facilities and health-related issues to be the major factors that affected sugarcane output commercialization the studied area. Therefore, the study recommended that the farmers in the studied area should be advised to pool their social capital together in order to become economically viable thereby maximizing the pecuniary economic advantages of sugarcane value chain in the studied area.

Keywords: Commercialization; Sugarcane output; Farmers; Kwara State; Nigeria.

1. Introduction

Agriculture commercialization involves a transition from subsistence-oriented to increasingly market-oriented patterns of production and input use. The economists have long advocated cash crop production as part of a broader strategy of comparative advantage. According to Timmer (1997) and Pingali (1997) as reported by Egbetokun (2014), the underlying basis is that markets allow households to increase their income by producing goods which turn-in the highest returns to land and labour, and then use the cash to buy household consumption items, rather than be constrained to produce all the various goods that the household needs to consume.

Small-scale agriculture commercialization is an indispensable pathway towards economic growth and development for most developing countries depending on the agrarian sector. Therefore, output commercialization, especially for the smallholder farmers is three-way traffic as it minimizes poverty, double farmers' income and enhances the growth of the economy. However, having a glance from a larger perspective, smallholder commercialization could be seen as the strength of the linkage between farm households and markets at a given point in time. Without the ability to sell, irregular bumper harvests dampen farm prices, undermining the income of small farmers who manage to produce the surplus, thus leading to convergent cobweb cycle of low-price due to glut followed by scarcity.

It is obvious that subsistence agriculture in the long-run may not be a viable activity to ensure sustainable household food security and welfare. Kurosaki (2003) reported that smallholder commercialization typically leads to an

increased diversity of marketed commodities at a national level and increased specialization at regional and farm levels.

Moreover, commercialization has a linking power between input and output sides of a market. Demand for modern technologies promotes the input side of production and facilitates the development and advancement of technological innovations. In turn, the use of modern technologies can result in increased output due to high yield entering the markets.

Smallholder agriculture remains the major engine of rural growth and livelihood improvement in the studied area. Meeting the challenges of eliminating food insecurity and improving rural incomes in the studied area will require transformation and transition out of the semi-subsistence, low-input, low-productivity farming systems that currently characterized most of the rural economies in the studied area.

Lacunas in the literature still exist particularly on the comprehensive and concurrent conceptualization of the drivers of output commercialization at the household level. Therefore, this research intends to close these gaps particularly by the comprehensive conceptualization of the drivers of output commercialization at household level in the wake of promotion of collective action initiatives targeted towards poverty alleviation especially in the rural areas were agriculture is the driver of the economy. The specific objectives of this study were to describe the socio-economic profile of the farmers in the studied area; determine the factors influencing output commercialization in the studied area; and, determine the constraints affecting sugarcane production in the studied area.

2. Research Methodology

The Kwara State of Nigeria lies between longitudes 4^0 20' and 4^0 25' East of the Greenwich meridian and latitudes 8^0 30' and 8^0 50' North of the equator. The population of the state is approximately 2.3 million and has a landmass of approximately 36,825 square kilometres with varying physical features like hills, lowland, rivers etc. Its vegetation is derived savannah with two distinct wet and dry seasons, with mean annual precipitation and monthly temperature of 1000-1500mm and 25^0C-34^0C, respectively (Anonymous, 2010). The major occupation of the inhabitants is agricultural activities complemented by trade, artisanal, *Ayurvedic* medicine etc. The present research used undated data elicited through structured questionnaire complemented with interview schedule from 105 active sugarcane farmers during the 2017 production selected *via* multi-stage sampling design. In the first stage, one agricultural zone, namely zone B was purposively selected due to its comparative advantage in the production of sugarcane. In the second stage, the two LGAs *viz.* Edu and Patigi which made-up the selected agricultural zone were automatically selected as both have the comparative advantage in the production of sugarcane. Because of the limited number of villages producing sugarcane in the selected LGAs all the villages were considered. Therefore, a total of seven villages: five (5) villages from Edu LGA and two (2) from Patigi LGA were the areas of coverage. In the last stage, fifteen sugarcane farmers from each of the selected villages were randomly selected: seventy-five (75) and Thirty (30) active farmers from Edu and Patigi LGAs respectively. Thus, a total of 105 active farmers made-up the sample size for the study.

For reliability test of the questionnaire, the questionnaire was pre-tested in a pilot survey made up of 15 farmers from the sampling population and the estimated Cronbach Alpha value was 0.86, indicating high reliability and consistency of the questionnaire. With the aid of trained enumerators, ex-post data of 2017 sugarcane cropping season were collected in the year 2018. The collected data were analyzed using both descriptive and inferential statistics. Objective I was achieved using descriptive statistic; objective II was achieved using Gini coefficient index in conjunction with Lorenz curve; objective III was achieved using censored regression (Tobit regression); and, Kendal coefficient of concordance (KCC) and Exploratory factor analysis were used to achieve objective IV.

2.1 Model Specification

2.1.1 Gini coefficient index: The Gini index is defined as a ratio of the areas on the Lorenz curve. As shown by Sadiq *et al.* (2017a), the formula is specified as follows:

G = A/0.5 = 2A=1-2B …………………........................…….. (1)

2.1.2 Censored model: Following Sadiq *et al.* (2018), the original Tobit model developed by James Tobin a Nobel laureate economist (Tobin, 1958) is given below:

$Y_i{*} = \alpha + X\beta + \varepsilon_i$ .... (2)

Where $Y_i{*}$ is an observable variable. Now $Y_i = 0$ if $Y_i{*} \leq 0$

$= Y_i{*}$ if $Y_i{*} > 0$

$Yi{*}=\alpha+X_1\beta_1+X_2\beta_2+X_3\beta_3+X_4\beta_4+X_5\beta_5+X_6\beta_6 + \ldots\ldots + X_n\beta_n+\varepsilon_i$ .... (3)

Where:

$Y_i{*}$ = censored latent observation (HCI) for i^{th} household

HCI_i = Household commercial index for i^{th} household

X_1 = Age (Year)
X_2 = Marital status (Married =1, Otherwise = 0)
X_3 = Educational level (Formal = 1, Otherwise = 0)
X_4 = Household size (Number)
X_5 = Land ownership (Yes =1, Otherwise = 0)
X_6 = Farming Experience (Year)
X_7 = Farm size (Hectare)
X_8 = Non-farm activity (Yes =1, No = 0)
X_9 = Co-operative membership (Yes =1, No = 0)
X_{10} = Access to credit (Yes =1, No = 0)
X_{11} = Extension contact (Yes = 1, No = 0)
X_{12} = Sickness (Number)
X_{13} = Security threat (Yes = 1, Otherwise = 0)
X_{14} = Income (₦)
X_{15} = Unit price of output (kg)
X_{16} = Yield (kg)
α = Intercept
$B_{1\text{-}n}$ = Coefficients
ε_i = Error term

The most common approach used in measuring the degree of commercialization at the household level has been the proportion of sales from the total value of agricultural production (Von Braun, 1994). This is actually the revealed marketing decision of a household, particularly for commodities that are potentially used for sale and home consumption (Randolph, 1992). The HCI is conceptualized in this study as a ratio of the gross value of marketed sugarcane output to the gross value of produced sugarcane per household per cropping season and it is given as:

$$\boldsymbol{HCI_i} = \left[\frac{Gross\ value\ of\ marketed\ sugarcane\ output}{Gross\ value\ of\ produced\ sugarcane}\right] \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

2.1.3 Kendall's Coefficient of Concordance (W): Kendall's coefficient of concordance (*W*) uses the χ^2 statistic for testing. If the test statistic *W* is 1, then all the survey respondents have been unanimous and each respondent has assigned the same order to the list of subjects or situations. If *W* is 0, then there is no overall trend of agreement between the respondents and their responses may be regarded as essentially random. Intermediate values of *W* indicate a greater or lesser degree of agreement among the various respondents. Following Sadiq *et al*.(2017b), Kendall's coefficient of concordance developed by Kendall and Smith (1939) and Wallis (1939) is given below:

$$W = \frac{12S}{k2n\,(n2-1) - kT} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where;

S = Sum over all subjects
k = Number of respondents ranking the attributes or objects
n = Number of attributes or objects that are evaluated by respondents
T = Tie-correction factor

$$T = \sum (t_k^3 - t_k) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

't_k' is the number of tied ranks in each (k) of g groups of ties. The sum is computed over all groups of ties found in all m variables of the data table. T is 0 when there are no tied values.

The Chi^2 (χ^2) statistic is given as follow:

$$\chi^2 = k\,(n-1)\,W \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where;

k = Number of respondents
n = Number of objects or attributes being ranked
W = Kendall's coefficient of concordance (KCC)

2.1.4 Friedman's Chi-square Statistic

The Friedman's Chi-square statistic proposed by Friedman (1937) was developed primarily to test the hypothesis that the ratings assigned to subjects under investigation come from the same statistical population. This is an indirect way of evaluating the extent of agreement among raters. Due to its close mathematical relationship with Kendall's

coefficient of concordance (*W*) it is used in studies of inter-judge reliability. The Friedman's Chi-square statistic is given below:

$\chi^2_r = k\,(n\text{-}1)\,W$ …… (8)

Where;

χ^2_r = Friedman's chi^2 statistic
k = Number of respondents
n = Number of objects or attributes being ranked
W = Kendall's coefficient of concordance (KCC)

3. Results and Discussion

3.1 Socio-Economic Profile of the Farming Population

Presented in Table 1 are the socio-economic profiles of the sugarcane farming population in the studied area. The results showed the sugarcane farming population to have an effective labour force which will enhance production as indicated by the mean and standard deviation values of 44.09 years and 8.63 respectively. The mean and standard deviation values of 13 persons and 4.47 respectively, depict a large household under the control of the farming household head. The implication is that large household mostly composed of able-bodied people is an asset as the farmer will have access to free farm labour supply which if properly utilized would increase the farm production. In addition, a large farm family will have access to a stream of income, thus boosting the aggregate income base of the farming household. However, large household mostly made-up of weak people or dependants such as children and old people would drain farmers income due to high expenditure on food and non-food items which is required for keeping the body and soul together. The results showed sugarcane farming to be mainly male affairs in the studied which may be due to tedious nature associated with the cultivation of the crop. The non-participation of women at the primary production level may be attributed to cultural and religious beliefs in the studied area which limits women to domestic house choir and agricultural marketing. The results depicted a responsible social setting in the studied area as the majority of the respondents were married. Marriage is an asset as married farmers stand the chance of benefiting from the twin advantage of economic and social capitals. Furthermore, the findings showed a literate farming population as majority possessed one form of formal education or the other. Though, farmers who exceeded secondary educational level dominated sugarcane farming in the study area. The ability of a farmer to read and write will encourage him to source for innovative information on production and potential market for input demand and output supply, thus enhancing production of sugarcane in the studied area. The results showed sugarcane cultivation in the studied to be carried-out mostly on small-scale (1.76 ± 0.81) which may be attributed to pressure on the use of land for various agricultural purposes coupled with capital paucity, thus limiting farmers from exploring the commercial potential of sugarcane production owing to the establishment of BUA Sugar Company in the studied area. The results showed the majority of the farmers to have adequate years of experience in sugarcane production in the studied area (5.58 ± 3.39, thus making them to be efficient managers in the allocation of their farm resources. The low productivity level of sugarcane production observed in the studied area is attributed to the sole cultivation of local variety which may be due to poor extension contact, the poor relative advantage of improved and hybrid varieties during the studied period. Also observed was that majority of the farmers were not into enterprise diversification, thus making them liable to food insecurity in any situation when risk or uncertainty arises. Most of the respondents had no extension contact during the studied period, thus indicating that most of the farmers had no access to any innovative technologies on sugarcane production during the last cropping season. A similar scenario of abysmal extension contact in the same studied area was observed for rice production (Sadiq *et al*., 2018). The findings showed that majority of the sugarcane farmers were not members of social organization and have no access to credit facilities during the studied period, thus indicating inability of the farmers to benefit from pecuniary advantages such as bulk discount for input purchase and bargaining power for co-operative marketing; and inability to procure adequate inputs for sugarcane production during the studied period respectively. Most of the farmers reported a moderate number of family members been sick during the last production season, thus affecting their income base as they have to contend with the expenditure of securing medication for the sick family members. In addition, they firmly stated that their farm labour efficiency and their attention towards farming have been distorted during the illness period/moment. However, the farming environment during the production period had relative peace devoid of crises such as herdsmen/farmers and communal conflicts. Though, a pocket of minor communal conflict occurred during the production period in the studied area. The results showed that most of the farmers possessed title of ownership i.e. owned the land which they used for sugarcane cultivation, with the land been acquired by inheritance. The implication is that lands acquired by this means mostly do not permit commercial

production being subject to fragmentation and dispute, as any member of the household who attained adulthood would ask for his own share or piece of land.

Table 1b: Socio-economic profile of sugarcane farmers

Variables	Frequency	Percentage
Inheritance	67	63.8
Borrow	8	7.6
Communal	27	25.7
Rent	3	2.9
Total	105	**100** [**140.67*****]

Source: Field survey, 2018

3.2 Income Distribution of Sugarcane Farmers in the Studied Area

The estimated Gini coefficient value indicated a fair equality in the distribution of sugarcane farmers in the studied area (Table 2). In addition, the graphical representation of the income distribution showed the Lorenz curve not to be farther from the line of equality (Figure 1). Therefore, it can be inferred that the sugarcane farmers in the studied area belong to the low-income category as earlier revealed that majority of the farmers were smallholder farmers.

Table 2: Annual Income distribution of sugarcane farmers

Item	Coefficient
Gini coefficient index	0.301282
Estimate of population value	0.304179

Source: Field survey, 2018

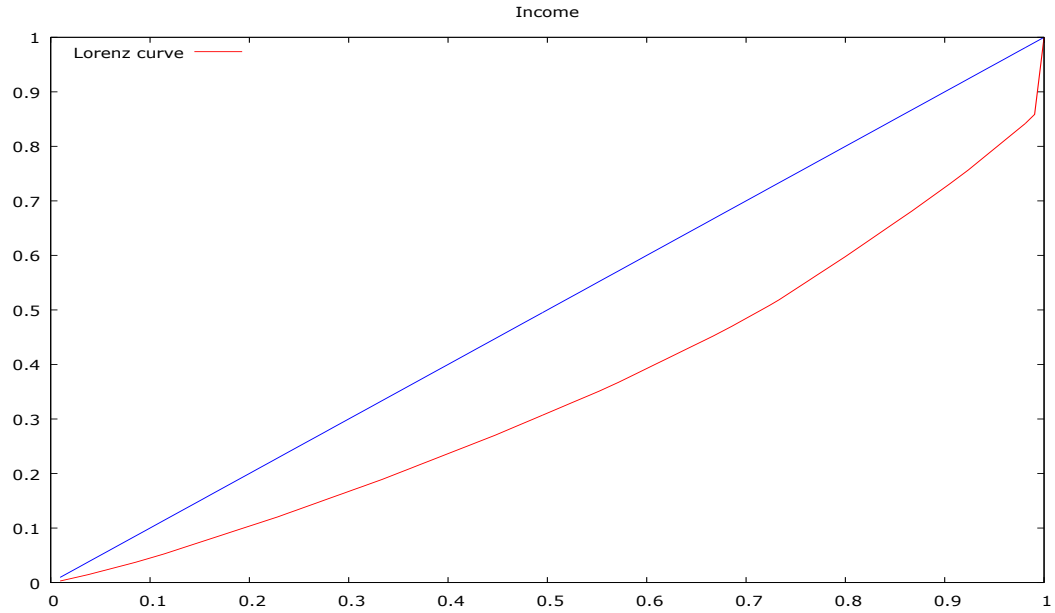

Figure 1: Income distribution of sugarcane farmers in Kwara State of Nigeria

3.3 Determinants of Sugarcane Output Commercialization Level

A perusal of Table 3 showed the censored regression to be the best fit for the specified equation and the predictor variables are different from zero as indicated by the significance of the Chi^2 value at 1% degree of freedom. In

addition, the multicollinearity test showed no presence of collinearity between the predictor variables as evidenced by the variance inflation factors (VIF) of the explanatory variables which were less than the benchmark of 10.0. However, the residual is not normally distributed as shown by the Chi^2 test statistic which is different from zero at 10% degree of freedom. Though, non-normality in the distribution of error term is not considered a serious problem as data in their natural form in most cases are not normally distributed. Thus, these results are valid for prediction.

The results showed that commercialization in the production of sugarcane in the studied area is been influenced by output unit price, farm size, yield, household size, farm experience, mode of farm ownership, extension contact, co-operative membership, access to credit and sickness as shown by the significance of their respective estimated parameter coefficients at less than 10% risk level. Furthermore, the decomposition detail showed output unit price, farm size, household size, mode of farm ownership and access to credit to increase output commercialization while the hosts of the remaining significant variables decrease output commercialization in the studied area.

The positive significance of the estimated coefficient of output unit price with commercialization means that an increase in the unit price would encourage the farmers to increase the commercialization of sugarcane production in the studied area. This result conforms with *a prior* expectation stipulated by the theory of supply which showed that price is directly related to output supply. Therefore, the marginal and elasticity implications of a unit increase in the output price would increase sugarcane commercialization by negligible marginal value and 0.03% respectively. The direct relationship of farm size with commercialization level implies that an increase in farm size would increase the commercialization level of sugarcane output in the studied area. The implication of an increase in the hectare allocated to sugarcane production would increase farmers' marketable surplus, thus increasing farmers' marketed output. However, an increase in marketable surplus can only guarantee an increase in output commercialization in the absence of glut as prices in the future time will likely be remunerative, thus increase in the output marketed. But in the situation of a downward fluctuation in the price of output, the large and average farmers' marketable surplus would be greater than marketed surplus i.e. they will retain most of their output till in the future time when the price become remunerative. It is worth to note that it is only small-scale farmers that mostly engaged in force sell due to pressing cash requirements as against the large and average farmers who resort to distress sale only in rare cases. The marginal and elasticity implication of an additional hectare would make farmers to increase sugarcane output commercialization level by 0.002 and 0.007% respectively.

The direct relationship of household size coefficient with output commercialization showed that farmers with large household size would increase their marketed output in order to meet its household consumption needs. In addition, a large household composed of able-bodied people will provide the farming household with free labour which will enable the farmer to produce more output/ marketable surplus, thus increase in the marketed output of the farming household. The marginal and elasticity implication of a unit increase in the family size of the farm family would increase output commercialization level by 0.0004 and 0.005% respectively. The positive significance of the credit coefficient implies that farmers with access to credit facility would engage in output commercialization, as credit being a catalyst will give them access to procure required quantity of farm inputs at the right time. In addition, it will enable them to carry out marketing function involved in sugarcane marketing without much hindrance. Therefore, the marginal and elasticity of farmers with access to credit would increase sugarcane output commercialization by 0.018 and 0.015% respectively.

The positive significance of the title of farm ownership showed that farmers who owned their farmland will participate more in commercial production. The farmers who owned their land can take to commercial sugarcane production with no restriction to the use of land, thereby increasing their output commercialization, as when compared to the lease or communal land which will limit full potential utilization of the land resource, thus affecting household output commercialization level. The marginal and elasticity implication of farmers who possessed the title of land ownership would increase sugarcane output commercialization by 0.004 and 0.0026% respectively.

The inverse relationship of yield with household sugarcane output commercialization level showed how apprehension of market glut as a result of excess supply which mostly dampens the market price would affect household sugarcane output commercialization level. Lack of scientific storage facilities and poor technical know-how on sugarcane processing at local farm level will make it difficult for the local farmers to defer the sales of this bulky crop, making them resort to force sale or distress sale during the bumper period, thus affecting output commercialization due to slim stream of income caused by downward price fluctuation. The marginal and elasticity implication of a unit increase in the yield level of sugarcane would decrease sugarcane output commercialization level by negligible value and 0.0076% respectively.

The negative relationship of experience with output commercialization showed how farmers' complacency and conservatism in price prediction in a dynamic market affect their efficiency in the marketing of sugarcane output commercialization in the studied area. Therefore, the marginal and elasticity implication of a unit increase in the farming experience will decrease farmers' output commercialization level by 0.001 and 0.00589% respectively. The

negative coefficient of extension contact implies that farmers with no extension contact would be less involved in output commercialization as when compared to their counterpart who stand to benefit from innovative production and marketing techniques introduced to them. Also, farmers who are not member of co-operative association will be less involve in output commercialization as they stand not to benefit from pecuniary economic advantages such as bargaining power in the marketing of their outputs as when compared to those who belong to social organization whereby bulk marketing is adopted in the sale of their products, thus having bargaining power in the sales of their output. Therefore, the marginal and elasticity implications of farmers with no extension contact and not a member of co-operative association would decrease their household output commercialization level by 0.008 and 0.0013%; and, 0.017 and 0.0015% respectively.

The negative significance of sickness implies that in the situation of any member of the family being sick would have an adverse effect on the production capital base of a farmer as much will be expended in seeking for medication, thus reducing household output commercialization level. The marginal and elasticity implication of a household member being sick will decrease output commercialization level by 0.003 and 0.0089% respectively.

The positive relationship of security threat coefficient though non-significant, showed that farming environment devoid of security threats such as farmers/herders clash and communal conflicts will encourage farmers to produce more sugarcane, thus increasing output commercialization level in the studied area. However, the non-significant of this variable indicate the presence of relative peace in the farming environment of the studied area. Furthermore, the inverse relationship of income despite non-significant indicates how an increase in income will increase farmers expenditure level by marrying more wives, purchase of materialistic asset i.e. capital consumption instead of re-investment in the farm production, thus affecting household output commercialization level. The educational level coefficient was non-significant owing to the effect of diffusion across the strata of the farming population in the studied area. The non-significant of the age coefficient is due to the fact that most of the farmers were in their youthful age which is economically viable with regard to labour force. However, the inverse relationship of the age coefficient showed that when farmer advance in age he will focus on farm family food security rather than having the temptation for a higher level of output commercialization in order to satisfy his materialistic needs. Also, the non-significant of marital status is as a result of the majority of the farmers been married in the studied area. Though, the positive sign of the marital status implies that married farmers will participate more in output commercialization in order to meet up with their family expenditure: food and non-food expenditure. The non-significant of the estimated coefficient of non-farm activity is an indication that much is not earned by the farmers from the non-farm activity. However, the positive effect of the estimated coefficient implies that the farmers with diversified income will participate more in output commercialization as they have better food security coping strategy.

Table 3: Output commercialization determinants

Variable	Coefficient	t-stat	Elasticity	VIF
Constant	0.9673(0.0126)	76.45***		
Age	−0.00014(0.00010)	1.327^{NS}	-0.00659	1.816
Marital status	0.00011(0.00347)	0.032^{NS}	0.00072	1.360
Education	0.00049(0.00168)	0.297^{NS}	0.00033	1.411
Household size	0.00039(0.00018)	2.215**	0.00506	1.479
Land ownership	0.004008(0.0015)	2.647***	0.00261	1.222
Farming Experience	−0.00104(0.00026)	3.851***	-0.00586	1.905
Farm size	0.0021(0.00056)	3.762***	0.007417	1.909
Non-farm activity	0.00166(0.0035)	0.483^{NS}	0.00022	2.750
Co-operative mem.	−0.01697(0.00596)	2.848***	-0.00154	6.646
Access to credit	0.01750(0.00561)	3.120***	0.00150	5.665
Extension contact	−0.00829(0.00228)	3.629***	-0.00129	2.153
Sickness	−0.00292(0.00071)	4.107***	-0.00888	1.344
Security threat	0.00197(0.00357)	0.554^{NS}	0.00015	1.821
Income	−8.55E-11(3.02E-10)	0.282^{NS}	-0.00013	1.149
Unit price of output	5.971E-5(2.349E-5)	2.542**	0.029468	1.064
Yield	−1.299E-6(7.268E-7)	1.787*	-0.007630	1.215
Chi^2 (χ^2)	**121.37 [2.9E-18]*** **			
Normality test (χ^2)	**35.76 [1.71E-8]*** **			

Source: Field survey, 2018

*, **, *** and ^{NS} means significance at 10%, 5%, 1% and non-significant respectively
Note: ( ): values in parenthesis are standard error; [ ] values in square brackets are probability levels

3.4 Factors Affecting Sugarcane Production in the Studied Area

A cursory review of the results revealed the major problems affecting sugarcane production in the studied area to be poor transportation network, high cost of agro-inputs, inadequate extension contact, land tenure problem and high cost of hired labour as indicated by their respective mean values which were greater than the mean benchmark of 3.50 (Table 4). However, the remaining identified problems were considered minor problems constraining sugarcane production in the studied area as their respective mean values were below the mean benchmark. Furthermore, the grand mean value of 3.43 been less than the likert scale benchmark mean value of 3.50 implies that the farmers have a negative perception about the identified constraints affecting sugarcane production in the studied area. In addition, the perception index showed that approximately 57.09% concurred that these were the problems affecting them in sugarcane production in the studied area.

The Kendall's coefficient of concordance value of 0.101 implies poor agreement among the sugarcane farmers with respect to the ranking. In addition, the significance of the Friedman's test value means that the attributes assigned to the constraints by the farmers come from the statistical population. Therefore, policymakers need not comply with this ranking in addressing the identified problems as they are at liberty to start with any of the pressing problems affecting sugarcane production in the studied area.

To reduce the number of research variables and find the common factors affecting sugarcane production in the studied area, 13 identified constraints were subjected to an exploratory factor analysis. The Kaiser-Meyer-Olkin (KMO) test which measures the degree of inter-correlation among the variables and the appropriateness of factor analysis (Hair *et al.*2010) has a calibration value of 0.712. Following Kaiser and Rice (1974), the calibrated MSA is "middling", implying that the variables are inter-correlated and appropriate for factor analysis. Mansourfar (2006) stated that for items to be suitable for factor analysis, the KMO value for sampling adequacy must be between 0.80 and 1. Therefore following Gindi *et al*.(2016) who reported KMO value of 0.735 which fall under "middling", the present study adjudged the KMO value of 0.712 for sampling adequacy to be satisfactory. Also, Bartlett's test rejected the hypothesis that the correlation matrix was an identity matrix (at the level of 0.01), indicating a significant relationship between the variables. The result of the latent criterion showed that the 13 variables subjected to the factor analysis should be extracted to form four dimensions. These four dimensions explained 53.07% of the variation in the data i.e. the factors that meet the cut-off criterion with Eigen-values greater than 1 and generally considered satisfactory in social sciences (Hair *et al.*1998; 2006 as reported by Sadiq *et al*., 2017b). According to Nunnaly (1978), for the reliability test, a Cronbach's Alpha score of 0.70 or above is considered to show proof of internal consistency. However, Churchill (1979) suggested a cut-off point of 0.60 or higher which is lower than what Nunnaly (1978) posited. Therefore, in line with Churchill (1979), the Cronbach's Alpha values for the four extracted factors were appropriate for the exploratory research as their respective values were above the suggested cut-off point.

The behaviour of individual items in relation to others within the same factor provides confirmation of content validity because the highest factor loading is central to the domains assessed by these factors (Francis *et al.*, 2000). The extracted factors and their respective factor loadings exclude those whose absolute loading value is less than 0.40. The four extracted factors which account for 55.68% of constraints variance were classified as social and biological constraint, institutional constraint, capital constraint and marketing constraint.

The first factor christened "social and biological constraint" with an Eigen-value of 3.53 and loaded with five items accounted for 27.12% of constraint variance. The items loaded on this factor showed farmers concern on social and biological factors affecting sugarcane production, thus the need for social capital and strategy for control ravaging effect of pest and diseases in order to enhance sugarcane production in the studied area. The second factor christened "institutional constraint" with an Eigen value of 1.37, loaded on three items, explained 10.58% of the constraint variance. The items on this factor showed farmers concern on ineffectiveness and poor implementation of existing government policies and call for harmonization, strengthening, monitoring and re-evaluation of policies to ensure efficiency in the sugarcane value chain in the studied area.

The third factor christened "capital constraint' with an Eigen value of 1.21, loaded with four items, explained 9.34% of the constraint variance. The items on this factor indicate farmers concern about poor infrastructural facilities and call for adequate provision of good road network, sufficient and appropriate marketing facilities in order to enhance market efficiency in the studied area. The fourth factor labeled "market constraint" with an Eigen-value of 1.12, loaded with one item, explained 8.64% of constraint variance. The item loaded on this factor showed farmers concern on poor market outlet for their products, and thus, the need for an efficient market which will yield remunerative price.

4. Conclusion and Recommendation

From the empirical finding, it can be concluded that sugarcane production in the studied area is gender bias; extension services and credit facilities during the study period were very poor, thus resulting in a low yield in the studied area. In addition, farmers in the studied area failed to utilize their social capital to ease themselves from the vicious cycle of poverty. Furthermore, it was observed that household sugarcane output commercialization is been affected by farmer's conservatism attitude, poor extension contact, failure to take advantage of their social capital strength, lack of scientific storage facilities and ill-health of the member of the farming household. The major constraints militating against sugarcane production in the studied area were the poor road network, inadequate extension services, the high cost of operating capital and problem of land acquisition. Therefore, the followings interventions were recommended to ensure the balance between domestic supply and demand for sugarcane products in the studied area:

- Farmers should be enjoined to put their social capital together in order to empower themselves *via* pecuniary advantages since most of them have no economic power.
- Government and non-governmental organizations should wax stronger by ensuring that credit facilities reached the target group by relaxing some unnecessary bureaucracy or administrative procedures associated with agricultural credit. In addition, credit administrators should devise another credit security measures other than the collateral requirement as most of these farmers have no economic power.
- The farmers in the studied area should be advised to adopt farmer to farmer extension approach since there is no sign for now in the provision of adequate government extension personals in the studied area.
- There is the need for gender sensitization as women in Africa are the most affected by poverty as they are left to meet up with most of the family needs especially in the polygamous home.
- Since health is wealth, the farmers need to be given proper orientation on how to put in place the basic precautions to maintain a healthy household.

References

Churchill, G.A.(1979).A Paradigm for Developing Better Measures of Marketing Constructs. *Journal of Marketing Research*, 16(1):64-73

Egbetokun, O.A., Bolarin, T.O., Sulaiman, A.Y., Omobowale, A.O.(2014).Determinants of output commercialization among crop farming households in South Western Nigeria. *American Journal of Food Science and Nutrition Research,* 1(4):23-27

Francis, L., Katz, Y. and Jones, S.(2000).The reliability and validity of the Hebrew version of the computer attitude scale. *Computer Education,* 35(2)**:**149-59.

Friedman, M.(1937).The use of ranks to avoid the assumption of normality implicit in the analysis of variance. *Journal of American Statistical Association,* 32(200):675

Gindi, A.A., Abdullah, A.M., Ismail, M.M. and Nawi, N.M.(2016).Factors influencing consumer's retail formats choice for fresh fruits purchase in Klang Valley Malaysia. *International Journal of Agricultural Research, Sustainability, and Food Sufficiency (IJARSFS),* 3(3):52-61

Hair J.F. Bush, R.P. and Ortinau, D.J.(2006).*Marketing Research: Within A Changing Information Environment (3rd Ed.)*. New York, USA: McGraw-Hill/Irwin

Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C.(1998).*Multivariate Data Analysis*. 5th Edition, Prentice Hall, Upper Saddle River, NJ.

Hair,J.F., Black, W.C., Babin, B.J. and Anderson, R.E.(2010).*Multivariate Data Analysis*. Upper Saddle River, NJ: Pearson Prentice Hall

Kaiser, H.R. and Rice, J.(1974).Little Jiffy Mark IV. *Educational and Psychological Measurement*, 34(1): 111-117

Kendall, M.G. and Smith, B.B.(1939).On the method of paired comparisons. *Biometrica*, 31(3:4):324-345

Kendall, M.G. and Smith, B.B.(1939).The problem of m ranking. *The Annals of Mathematical Statistics*, 10(3):275-287

Kurosaki, T.(2003).Specialization and diversification in agricultural transformation: The case of West Punjab, 1903-92. *American Journal of Agricultural Economics,* 85(2):372-386.

Mansourfar, K.(2006).*Advanced Statistical Methods: Using Applied Software*. University of Tehran Press.

Nunnaly, J.C.(1978).*Psychometric Theory*, 2nd ed., McGraw Hill, New York.

Pingali, P.(1997).From subsistence to commercial production system: The Transformation of Asian Agriculture. *American Journal of Agricultural Economics,* 79(2):628-634

Randolph, T.F.(1992).The impact of agricultural commercialization on child nutrition. A case study of smallholder household in Malawi. Been *Ph.D Dissertation* submitted to Cornell University, Ithaca, New York, USA.

Sadiq, M S., Singh, I.P., Grema, I.J., Usman, B.I. and Yusuf, A.O.(2017).Modelling Profit Efficiency of Small Scale Groundnut Farms in Niger State, Nigeria: Stochastic Profit Frontier Approach. *Journal of Agriculture and Agricultural Technology*, Vol. 7(1):14- 23

Sadiq, M.S., Singh, I.P., Isah, M.A., Greima, I.J. and Umar, S.M.(2017b).Strategy of minimizing the cost of cultivation *vis-à-vis* boosting farm income of small-holder maize farmers in Niger State of Nigeria using Efficiency Measurement System (EMS). *Indian Journal of Economics and Development*, 17(2a):722-728

Sadiq, M.S., Singh, I.P., Singh, N.K. and Yakubu, G.M.(2018).Improving economic efficiency and TFP of lowland paddy rice farmers in Kwara State of Nigeria. *Journal of Agricultural Sciences*, 13(2):110-129

Timmer, C.P.(1997).Farmers and Markets: The Political Economy of New Paradigms. *American Journal of Agricultural Economics*, 79(2):621-627.

Tobin, J.(1958).Estimation relationship for limited dependent variables. *Econometrica*, 26:24-36

Von Braun, J.(1995).Agricultural commercialization: Impacts on income and nutrition and implication for policy. *Food Policy*, 20(3):187-202

Wallis, W.A.(1939).The correlation ratio for ranked data. *Journal of the American Statistical Association*, 3(207):533-538

Appendices

Table 1a: Socio-economic profile of the sugarcane farmers

Variables	Frequency	Percentage	Variables	Frequency	Percentage
Age			Marginal	7	6.7
20-29	5	4.8	Small	53	50.5
30-39	24	22.9	Medium	42	40.0
40-49	44	41.9	Large	3	2.9
50-59	28	26.7	**Total**	**105**	**100** $[\mathbf{34.51}^{***}]$
≥ 60	4	3.8	**Seed variety**		
Total	**105** $(\mathbf{44.09 \pm 8.6})$	**100** $[\mathbf{53.91}^{***}]$	Local variety	105	100
Household size			Improved variety	-	
4-6	2	1.9	**Total**	**105**	**100**
7-9	13	12.4	**Extension contact**		
≥ 10	90	85.7	Yes	14	13.3
Total	**105** $(\mathbf{13.53 \pm 4.48})$	**100** $[\mathbf{131.37}^{***}]$	No	91	86.7
Experience			**Total**	**105**	**100** $[\mathbf{56.46}^{***}]$
≤ 3	28	26.7	**Social participation**		
4-6	41	39.0	Yes	9	8.6
7-9	26	24.8	No	96	91.4
≥ 10	10	9.5	**Total**	**105**	**100** $[\mathbf{72.08}^{***}]$
Total	**105** $(\mathbf{5.58 \pm 3.39})$	**100** $[\mathbf{18.54}^{***}]$	**Credit access**		
Gender			Yes	9	8.6
Male	105	100	No	96	91.4
Female	-	-	**Total**	**105**	**100** $[\mathbf{72.08}^{***}]$
Total	**105**	**100** $[\mathbf{51.97}^{***}]$	**Non-farm activity**		
Marital status			Yes	12	11.4

Married	100	4.8	No	93	88.6
Single	5	95.2	**Total**	**105**	**100** [**62.48*****]
Total	**105**	**100** [**85.95*****]	**Sickness**		
Education			1-2	38	36.2
Illiterate	21	20.0	3-4	60	57.1
Quranic	14	13.3	≥ 5	7	6.7
Primary	7	6.7	**Total**	**105**	**100** [**40.51*****]
36	34.3	25.7	**Security threat**		
Tertiary	36	34.3	Yes	7	6.7
Total	**105**	**100** [**24.09*****]	No	98	93.3
Farm size			**Total**	**105**	**100** [**78.86*****]

Source: Field survey, 2018 Note: *** NS; are 1% risk level and Non-significant; while values in ( ); [ ] are mean and standard error; and, Chi^2 respectively

Table 4: Constraints affecting sugarcane farmers in the studied area

Constraints	**Mean**	**Social & Biological constraint**	**Institutional constraint**	**Capital constraint**	**Market constraint**
Communal/herdsmen conflict	2.63 (4.88)	0.716			
Weak co-operative support	3.26 (6.78)	0.658			
Land tenure problem	3.68 (7.79)	0.607			
Pest and diseases	3.35 (6.49)	0.525			
Inadequate credit facility	3.30 (6.22)	0.523			
Price fluctuation	3.10 (6.13)		0.747		
Poor implantation of Govt. policy	2.74 (5.45)		0.698		
Inadequate extension services	3.76 (8.26)		0.550		
Poor road network	4.33 (8.65)			0.801	
High transportation cost	3.37 (6.60)			0.567	
High cost of hired labour	3.67 (7.60)			0.482	
High cost of agro-input	3.86 (8.28)			0.476	
Poor output market	3.48 (6.86)				0.867
Kendall's coefficient (KCC)	0.101				
KCC Chi^2 (χ^2)	126.83***				
Friedman's Chi^2 (χ^2)	126.83***				
Eigen-value		3.526	1.375	1.214	1.123
% of variance		27.123	10.580	9.338	8.641
Cronbach's Alpha		0.666	0.658	0.675	-
Kaiser-Meyer-Olkin test	0.712				
Bartlett's Test of Sphericity (χ^2)	263.637***				

Source: Field survey, 2018
Value in parenthesis is mean rank