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ANALYSIS OF MARKETING AND PROFIT EFFICIENCY OF BITTER KOLA (Garcinia kola) IN KADUNA STATE, NIGERIA: APPLICATION OF NORMALIZED STOCHASTIC PROFIT FRONTIER MODEL

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ABSTRACT

Inspite of the importance of bitter kola, there has been a dearth of information on the marketing and marketing efficiency of bitter kola in Kaduna State. This study evaluated socio-economic factors influencing marketing efficiency of bitter kola in Kaduna State, Nigeria; applications of normalized stochastic profit frontier model. The study was designed to; determine the socio-economic characteristics of bitter kola marketers, evaluate socio-economic factors influencing marketing efficiency of bitter kola, analyze the costs and return of marketing bitter kola, evaluate factors influencing productivity of bitter kola marketing and determine the constraints influencing bitter kola marketing in the study area.The study used primary data from bitter kola marketers, obtained with well-structured questionnaires. Multi-stage sampling method was used to select a total sample size of 120 bitter kola marketers for this study. The following analytical tools were used to achieve the stated objectives; descriptive statistics, financial analysis, gross margin model, normalized stochastic frontier model, and principal component analysis. The results showed that an average bitter kola marketer was aged 32 years. Majority (62.15%) were male with less than 5 years of marketing experience and household size of 7 people. An estimated values of ₦167,000 and₦164,000 were obtained as gross margin and net income of bitter kola marketing respectively. The elasticity coefficient of purchase price was – 1.064. The major constraints influencing bitter kola marketers include, high transportation cost, storage problems, lack of credit facilities, and bad road infrastructures. We recommend the provisions of feeder roads for easy evacuation of bitter kola from producing area to market centers, provision of adequate research, funds and establishment of medicinal or pharmaceutical outfit for product processing and usage.

Keywords: Socio-economics, Costs and returns, Gross-margin, Stochastl, Marketing Efficiency.

Introduction

Bitter kola is a non-timber forest product (NTFP) that has many ethno-botanical uses to the general populace. The seeds have brown seed coat having yellow pulp with elliptically smooth shaped. The trees can be found in areas with densely populated natural and secondary forest, rain forests where the land is used predominantly for tree-crop plantations (Babalola and Agbeja, 2010).

Bitter kola can generate income both for people living in urban and rural areas in sub-Saharan Africa. The seeds can be used medicinally to treat hypertension and cough (Adebisi, 2004). It is used as a snake repellant and an antidote for poison, overdose and snake bite (Unaeze *et al.*, 2013). Bitter kola is an important and well recognized forestry product in traditional medicine for treating chest cold (Okojie *et al.*, 2009). Adefule-Ositelu, *et al.*, (2010) reported that eye drop contains 0.5% extract of bitter kola seeds for reducing eye pressure. The seeds are medicinal and edible, widely consumed in developing countries. When the seeds are chewed is stringent and bitter in taste. The chewing sticks are medicinal and the plant parts and seeds are used for medicinal preparations (Adedokun, *et al.*,2018). The stem, plant bark and seeds are used traditionally in the treatments of acute fever, throat infections and inflammations arising from respiratory tracts (Chinyere *et al.*, 2013). In terms of socio-cultural lives in Africa, the seeds bitter kolaare of economic values. Bitter kola is beneficial and a good source of rural livelihoods to people of sub-Saharan Africa. The seeds are forestry products that are traded among marketers in Africa. The seeds are eaten as stimulants, snacks, and it has high content of caffeine. The potentials of bitter kola in brewing industry have been widely reported (Eleyinmi, *et al.*,2006). Due to the presence of other bioactive compounds and their flavonoids, it has been observed to have potential therapeutic benefits (Eleyinmi, *et al.*, 2006). According to Icheku, *et al.*,(2020) bitter kola is used in African ethno-medicinal purposes because of anti-parasitic, anti-microbial and purgative properties.

Bitter kola protects the oxidation of lipoprotein through scavenging activities and anti-oxidants activities of flavonoids (Icheku, *et al.*, 2020). Bitter kola can be stored in fresh and dried forms; it is highly amenable to storage. Bitter contributed immensely to domestic and international markets and hereby raises the living standard of those people engaged in its trading activities in both urban and rural areas. Considering its importance, there are research gaps in terms of data, and information of bitter kola regarding its marketing activities and profitability measures. Marketing can be explained in terms of all full range activities involved in moving the non-timber forest products, bitter kolafrom producers to end consumers. Marketing activities happen from farm gate to the end consumers. The utilities involved in marketing bitter kolaare those of time, place and form. If a market is functioning properly it will lead to efficient production. Efficiency is very important determining factor in any enterprises because it is an act of achieving profits with little waste (Chowdhury, 2010, Musa *etal.*, 2011). Economists and policy makers' also observed that efficiency and agricultural production are important issues in developing countries (Chowdhury, 2010, Musa *etal.*, 2011).

In sub-Saharan Africa where resources are meager, efficiency can be said to be a factors of productivity growth and there are declining opportunities in developing and adopting improved technologies in developing countries (Dziwornu and Sarpong, 2014). In developing countries with low technology adoption facing the growth of agriculture, improving efficiency of resources used is a good measure to enhance agricultural productivity (Dziwornu and Sarpong, 2014).Analyzing marketing efficiency using stochastic profit frontier approachis not common in existing literatures. The most recent known literatures who applied stochastic profit frontier approach to measure

marketing efficiency are those used by Rahman and Awerije (2014);Hamidi (2016); Hassan, *et al*.,(2012).The main underline assumption of using a profit function to examine marketing efficiency is that marketers of bitter kola are involved in activities of marketing the non-timber forest products to maximize profit or marketing margin (Rahman and Awerije, 2014). Profit is define as the difference between total revenue obtained from selling the non-timber forest products bitter kola minus total variable costs incurred in the marketing process. A marketer of bitter kola can be said to be allocative inefficient if the marketers do not allocate the marketing inputs optimally, the marketing inputs include; storage, marketing space, transportation, labour for loading, and utilities. Marketers of bitter kola a non-timber forest products can be scale in-efficient if the marketers does not sell the forest products at a selling price which is equal to the marginal cost of marketing.

The broad objective of the study was an analysis of marketing and profit efficiency of bitter kola in Kaduna state, Nigeria: application of normalized stochastic profit frontier model. And the specific objectives are to; determine the socio-economic characteristics of bitter kola marketers; analyze the costs and returns of bitter kola marketing; evaluate factors influencing marketing margin of bitter kola marketing; evaluate factors influencing marketing efficiency of bitter kola and to determine the constraints facing bitter kola marketers in the study area.

Methodology

The research study was conducted in Kaduna State, Nigeria. The State lies within Latitudes 10º 20ºNand Longitudes 7º 4|E. The total land mass area of the state is 46, 053 Km^2.The soil type is loamy mostly to sandy type with substantial amount of clay soil. The vegetation cover is Sudan savannah type with shrubs, grasses and short trees. The main occupation and major source of rural livelihoods of people is agriculture. They are involved in producing maize, millet, cowpea, sorghum, pepper, ginger, also, they involve in animal production such as poultry farming, fish farming, and marketing of many forestry products such as bitter kola, African walnut, African pear, and date palm. The population of the State is 8.9 million people (KSBS, 2020).

Sampling procedure and sample size

Purposive sampling method was used in selection of Kaduna State because of the predominant marketers of bitter kola in the area and due to the proximity of the area to the base of the researcher. Multi-stage sampling method was adopted and used in selecting the target marketers. First stage involves random selection of Kaduna North Local Government Area using well-shuffled cards method. Second stage, involves the random selection using well-shuffled cards method to select 6 markets within the Local Government Area. A preliminary and reconnaissance survey was adopted to obtain a comprehensive list of bitter kola marketers, the compiled comprehensive list of bitter kola marketers become the sampling frame of respondents for this study. A total sample frame of 300 bitter kola marketers was listed and used (Table 1). Following Yamane (1967) formula of calculating sample size was adopted and used:

$$n = \frac{N}{1+N\,(e^2)} = 177 \ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

where,

n= Sample Size (Units)
N= Sample Frame (Units)

e= Level of Precision (5%)

The third and final stage, a proportionate-random sampling method was used to select a total sample size of 177 bitter kola marketers. Primary data using cross – sectional sources were used. A well-structured and well-designed questionnaire was used to collect information from the bitter kola marketers. The questionnaire was designed to collect information on socio-economic profiles such as age, marital status, experience in marketing, level of education, also information on income, cost of transportation, loading and offloading cost, and constraints facing bitter kola marketers. The questionnaire was subjected to validation and reliability test. The corrections encountered in the reliability and validity test carried out were incorporated in the design of the questionnaire.

Table 1: Sampling Matrix and Sample Size of Bitter Kola Marketers

LGAs	Markets	Sample Frame	Proportion	Sample Size
Kaduna North	Kaduna-Central	120	0.40	70
	Kawo	80	0.27	48
	Badarawa	30	0.10	18
	A/Sarki	28	0.09	16
	A/ Shanu	30	0.10	18
	Tundun-Wada	12	0.04	07
Total	6	300	1.00	177

Source: Field Survey (2019).

The statistical and econometric tools used to achieve the stated objectives were;

Descriptive Statistics: This involves the use of mean, frequency- distributions and percentages. Descriptive statistics is used to have a summary statistics of data collected. This was used to describe the socio-demographic characteristics of the respondents.

Financial Analysis: Gross Margin Ratio (GMR) following Ben-Chendo (2015) was used to determine the profitability of marketing bitter kola.

$$Gross\ Margin\ Ratio = \frac{Gross\ Margin}{Total\ Revenue} \ldots\ldots\ldots\ldots (2)$$

In order to evaluate the strength and financial positions of bitter kola marketing enterprises, operating ratio and rate of return per naira invested were considered. An operating ratio (OR) according to Olukosi and Erhabor (2005) is stated thus:

$$OR = \frac{TVC}{GI} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

where,

OR = Operating Ratio (Units),
TVC= Total Variable Cost (Naira),
GI= Gross Income (Naira).

An Operating Ratio (OR) that is less than one (1) implies that the total revenue obtained from bitter kola marketing was able to pay for

the cost of variable inputs used in the enterprise (Olukosi and Erhabor, 2005). The rate of return per naira invested (RORI) in bitter kola marketing is stated thus:

$$RORI = \frac{NI}{TC} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where,

RORI = Rate of Return per Naira Invested (Units),
NI = Net Income from bitter kola Marketing (Naira),
TC = Total Cost (Naira).

The financial analysis was used to analyze the costs and returns of bitter kola marketing.

Gross Margin Analysis: Gross Margin Analysis is defined as the difference between the observed gross farm income (GFI) and total variable cost (TVC) (Olukosi and Erhabor, 2005).

It was used to determine the potentials profitability of marketing bitter kola.Gross margin model (GM) is expressed as follows:

$$GM = TR - TVC \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where,

GM = Gross Margin (₦),
TR = Total Value of Output or Total Revenue from the Marketing bitter kola (₦),
TVC = Total Variable Cost (₦), and
TR = P.Q (₦).

Where: P = Price of bitter kola Marketed in Naira per Kilogram, Q = Output ofbitter kola Marketed in Kilogram.

Net Farm Income (NFI) is stated thus:

$$NFI = \sum_{i=1}^{n} P_1 Y_i - \sum_{j=i}^{m} P_j X_j - \sum_{k=1}^{k} GK \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

NFI = Net Farm Income (₦ Per annum)
P_i = Unit Price of Product (₦/Unit)
P_j= Price per Unit Variable Input (₦/Unit)
GK = Cost of all Fixed Inputs (where k = 1,2,3, ……. k fixed input)
∑ = Summation or Addition signs.
This was used to analyze the costs and returns of bitter kola marketing.

Marketing Efficiency: Marketing Efficiency was estimated thus:

$$\mathrm{ME} = \frac{\mathrm{TR} - \mathrm{TC}}{\mathrm{TC}} \times 100 \quad \ldots\ldots\ldots\ldots\ldots (7)$$

where,

ME = Marketing Efficiency
TR = Total Revenue from bitter kola marketing (₦)
TC = Total Cost from bitter kola marketing (₦)
This was used to evaluate the factors influencing marketing efficiency of bitter kola.

Stochastic Profit Frontier Model

A Stochastic Frontier Profit Function was used to evaluate factors influencing market efficiency and productivity of bitter kola marketing. According to Coelli (1996), Ifeanyi and Onyenweaku (2007), Ngangaet *al.*, (2010) Sadiq and Singh (2015), Rahman and Awerije (2014), Hamidi (2016), the Stochastic Profit Frontier Model is specified as:

$$Ln\pi^* = \beta_0 + \sum_{j=1}^{6} \beta_j \, LnX^*{}_{ij} + \beta_k LnX_k + V_i - \mu_i \quad \ldots\ldots\ldots (8)$$

where

Ln =Natural Log
Lnπ =Natural Log of profit function
X_k = Vector of Variable Input Cost Paid by i[th]Marketers
X_1^* =Purchase Price of Bitter Kola(₦).
X_2^* =Transportation Cost (₦/Kg)
X_3^* = Loading and Off-loading Cost (₦/Kg)
X_4^* = Rent (Market Stall Space) (₦)
X_5^* = Fees (Commission, Fees for Agents, Associations and Councils)(₦)
X_6^* = Utilities (Storage, Security, Electricity, Water) (₦)
β_1-β_6 = Parameters to be estimated
β_0 = Constant Term
V_i= Two sided random error
μ_i = One sided random error
$e_i = V_i - \mu_i$= Error Term
The inefficiency model (μ_i) is specified as:

$$\mu_i = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \alpha_4 Z_4 + \alpha_5 Z_5 + \alpha_6 Z_6 + \alpha_7 Z_7 \ldots\ldots\ldots (9)$$

where,
Z_1 = Age (Years)
Z_2 = Household Size (Units)
Z_3 = Gender (1, Male; 0, Otherwise)
Z_4 = Years of Marketing Experience
Z_5 = Membership of Marketing Association (1, Membership, 0, Otherwise)
Z_6 = Access to Credit (1, Access, 0, Otherwise)
Z_7 = Level of Education (Years)
α_0 - α_7 = Parameters to be estimated

Principal Component Analysis (PCA)

The perceived constraints or problems faced by bitter kola marketers were analyzed using principal component analysis (PCA). The Model of Principal Component (PCA) is stated thus:

$$x = x_1, x_2, x_3, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$$\propto_k = \propto_{1k1}, \propto_2 K, \propto_3 k, \ldots, \propto pk \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

$$\propto_K^T x = \sum_{j=1}^{p} \propto_{KjXj} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

$$Var = [\propto_K^T X] \; is \; Maximum \ldots\ldots\ldots\ldots\ldots\ldots (13)$$

Subject to;

$$\propto_K^T \propto_K = 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (14);$$

and $Cov. = [\propto_1^T \propto - \propto_2^T \propto] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (15)$

The Variance of each of the Principal Component are: $Var[\propto_k X] = \lambda_k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (16)$

$$S = \frac{1}{n-1}(X - \bar{X}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (17)$$

$$S_i = \frac{1}{n-1}\sum_{i=1}^{n}(X_i - \bar{X}_i)(X_I - \bar{X}_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots (18)$$

where,
X = vector of 'P' Random Variables
$\propto_k$ = Vector of 'P' Constraints
λ_k= Eigen Value
T = Transpose
S = Sample Covariance Matrix
This was used to determine the constraints facing bitter kola marketers in the study area.

Results and Discussion

Socio-Economic Profiles or Characteristics of Bitter Kola Marketers

Results indicated in Table 2 shows the frequency distributions of socio-economic profiles of bitter kola marketers. The results show that 92.08% of the bitter kola marketers were less than 50 years of age. This means that the bitter kola marketers were young, energetic, resourceful, and in their youthful age. They are active and will be able to adopt improved technologies, research findings and innovations. The mean age of bitter kola marketers was 33 years. About 62.15% of bitter kola marketers were male, and 36.72%

of them were married. They have considerable experiences in bitter kola marketing with an average of 5 years experiences in marketing. In addition, about 70.62% of bitter kola marketers had less than 5 years experiences in marketing bitter kola. The bitter kola marketers were literate and about 87.56% had formal education. The household sizes were large with an average of 7 people per household. Furthermore, 76.27% of bitter kola marketers had less than 11 people in the household. The results are in line with findings of Famuyide, *et al.*,(2012) shows that the factors which were observed to have positive influence on price per unit for bitter kola marketing are age of the respondent, educational qualification, years of experience of the seller in the trade. This implies that when the older sellers, who apparently are more experienced in the trade, have an additional year of education,older sellers, who apparently are more experienced in the trade,themarginal effect on price per unit of measurement of bitter kola in the study area increases by 0.268.Also with amarginal effect on price per unit of measurement of bitter kola in the study area increases by 0.2additional naira to the cost price of bitter kola from where sellers buy to resell and the marginal effect on selling price per unit increases by 0.631

Table 2:Socio-Economic Profiles of Bitter kolaMarketers

Variable	Frequency	Percentage	Mean
Age (Years)			32.56
10 -20	41	23.16	
21 -30	33	18.64	
31- 40	52	29.38	
41 – 50	37	20.90	
51 – 60	14	07.90	
Marital Status			
Married	65	36.72	
Single	76	42.94	
Divorced	25	14.12	
Widow	11	06.21	
Sex			
Male	110	62.15	
Female	67	37.85	
Marketing Experience (Years)			
1 – 5	125	70.62	4.46
6 – 10	52	29.38	
Education Level			
Primary	45	25.42	
Secondary	67	37.85	
Tertiary	43	24.29	
Non-Formal	22	12.43	

Household Size (Units)			
1 – 10	135	76.27	7.87
11 – 20	42	23.73	
Total	177	100.00	

Source: Field Survey (2019), Computed Using STATA Version14

Cost and Returns Analysis of Bitter kola Marketing

Results as shown in Table 3 presented the various costs and associated returns of bitter kola marketing. The costs and returns were evaluated based on the prevailing market price. The total variable costs accounted for 83.87% of the total costs. The total variable costs include: transportation costs (32.26%), cost of storage (12.90%), cost of labour (22.58%) loading and offloading costs (16.13%). The fixed cost involved in bitter kola marketing was ₦2,500.00 this accounted for 16.13% of total cost. The gross return, gross margin and net income were ₦180,000.00,₦167,000.00 and ₦164,500.00 Naira respectively. The gross margin ratio was 0.93. This means that for every one Naira invested in bitter kola marketing, 92 kobo covered taxes, interest, profits, and depreciation. The estimated values for marketing margin and marketing efficiency of bitter kola marketing were 86.45 and 1061.2% respectively. The findings are in line with the results of Alabi, *et al.*,(2020) estimated the profitability analysis and marketing efficiency of soyabean estimated marketing margin and marketing efficiency were 20.13 and 338.66 in Abuja.

Table 3: Costs and Returns Analysis of Bitter kola Marketing per Marketer.

Item	Value (₦)	Percentage (%)
(a) Variable Cost		
(i) Cost of Transportation	5	32.26
(ii)Cost of Storage	2	12.90
(iii)Cost of Labour	3	22.58
(iv)Cost of Load/Offload	2	16.13
Total Variable Cost	13,000	83.87
Fixed Cost (Interest, Depreciation, Taxes, Expenses)	2,500	16.13
Total Cost	15,500	100.00
(a) Returns		
(i) Quantity (Kg)	2,000	
(ii) Price (₦/50Kg)	45,000	
(iii)Gross Returns (₦)	180,000	
(iv)Gross Margin (₦)	167,000	

(v) Net Income (₦)	164,500
(vi) Marketing Cost (₦)	13,000
(vii) Marketing Margin (%)	86.45
(viii) Marketing Efficiency (%)	10.61
(ix) GMR	0.927
(x) OR	0.072
(xi) RORI	10.61

Source: Field Survey (2019), Computed Using STATA Version 14

Socio-Economic Factors Influencing Marketing Efficiency of Bitter kola Marketing

Table 4 presented the maximum likelihood estimates or results of stochastic profit frontier analysis of socio-factors influencing marketing efficiency of bitter kola marketing. The stochastic profit frontier model was normalized using the price of output of bitter kola. Also, in the inefficiency model, the socio-economic factors included in the stochastic profit frontier model were age, household size, gender, years of marketing experience, member of cooperative associations, access to credit and level of education. In the inefficiency model, all negative coefficients increase marketing efficiency of bitter kola marketing, while positive coefficients reduce marketing efficiency of bitter kola marketing.

Table 4: Maximum Likelihood Estimates of the Stochastic Frontier Function

Variable	Parameters	Coefficient	Standard Error	t-Value
Constant Term	β_0	0.9844***	0.1096	8.98
Purchase Price	β_1	-1.06478***	0.1842	-5.78
Transport Cost	β_2	-0.6321**	0.2518	-2.51
Loading/Offloading Cost	β_3	-2.1098*	1.0655	-1.98
Rent	β_4	-3.4209***	0.7156	-4.78
Fees	β_5	-5.8970**	2.0618	-2.86
Utilities	β_6	-4.3408**	1.5727	-2.76
Inefficiency Effects				
Age	α_1	0.7608**	0.2937	2.59
Household Size	α_2	0.03609*	0.0184	1.96
Gender	α_3	-0.6752*	0.3215	-2.10
Years of Marketing Experience	α_4	-0.2507**	0.0898	-2.79
Member of Cooperative Association	α_5	-4.5087**	1.5709	-2.87

Access to Credit	α_6	-0.8239**	0.3144	-2.62
Level of Education	α_7	-0.1382**	0.0550	-2.51
Diagnostic Statistics				
Sigma Squared	0.1047			
Wald Chi^2	33677.09			
Prob> Chi^2	0.0000			
Log-Likelihood	-1067.98			
F-Test Value	106.67***			

***-Significant at $P \leq 0.01$, **-Significant at $P \leq 0.05$, *-Significant at $P \leq 0.10$

Source: Field Survey (2019), Computed Using STATA Version 14

The statistical and significant socio-economic factors increasing market efficiency of bitter kola marketing were gender ($P < 0.10$), years of marketing experiences ($P < 0.05$), member of cooperative association ($P < 0.05$), access to credit ($P < 0.05$) and level of education ($P < 0.05$). The Log-Likelihood and Wald Chi square values were -1067.98 and 33677.09 respectively. The F-value was 106.67 and was significant at 1 % probability level. The statistical and significant socio-economic factors that reduce marketing efficiency of bitter kola marketing include age ($P < 0.05$) and household size ($P < 0.10$).

The Table shows that majority of marketers were within the mean age of 35 years, and this implies that most of the sampled bitter kola marketers were within the active and productive age, hence they could participate in many income generating ventures in order to maintain their families. This agrees with the findings of Oladejo and Oladiran (2014) in their research where they reported the mean age of tomato marketers in their study area were within the mean age of 43.3 years. However, because it's most perceived that adults are the most consumers of the bitter kola, the youthful marketers find it more effort in marketing the products to adult consumers than they will sell to their fellow youths. Also, the Table shows that the mean family size of bitter kola marketers was 11 members. This implies that the more of family abourwere employed in bitter kola marketing enterprise. Large household sizes could be beneficial to bitter kola marketers since family labour would be available to reduce labour costs for both wholesalers and retailers. However, it also highlights the likelihood of high poverty level among the marketing households. This agrees with the finding of Obayelu, *et al.*,(2014) whereby majority of tomato marketers in Kosofe Local Government in Lagos State have the average family size of 6 members. The result is in line with findings of Rahman and Awerije (2014), Hamidi (2016), Hassan, *et al.*, (2012), Balde, *et al.*,(2014).Table 5 shows the frequency distributions of efficiency scores of bitter kola marketing. About 76.83% of bitter kola marketers were between efficiency scores of 0.21 to 0.70 respectively. The mean marketing efficiency score was 0.42 leaving the inefficiency gap to 0.58 for improvement. The maximum efficiency score was 0.76

Table 5: Distributions of Marketing Efficiency Scores of Bitter kola Marketers

Efficiency Scores	Frequency	Percentages
≤ 0.10	10	05.65
0.11 – 0.20	12	06.78
0.21 – 0.30	22	12.43
0.31 – 0.40	33	18.65
0.41 – 0.50	44	24.86
0.51 – 0.60	23	12.99
0.61 – 0.70	14	07.90
0.71 – 0.80	19	10.73
Total	177	100.00
Mean	0.429	
Minimum	0.06	
Maximum	0.76	

Source: Field Survey (2019),

Factors Influencing Marketing Margin of Bitter kola Marketing

The estimates of the stochastic profit frontier model presented in Table 4 were basic features of the market structures which include the marketing margin or profit elasticities with respect to changes in the explanatory variables of fixed factors and input prices. The input price variable and the fixed factors are corrected using their mean values respectively. The coefficients of the terms in the first group can be read as elasticity of the market margin. Table 4 also clearly shows that the sign of the coefficients on the purchase price variable was negative, this is consistence with the theory. The purchase of bitter kola has a dominant factor on the marketing margin. The value of the coefficient on purchase price is – 1.065 which is also the elasticity value and is quite substantial. The explanations of this is that a 10% rise in purchase price of ₦ 4,500.00 (Table 3) of bitter kola will reduce marketing margin by 10.65% estimated at ₦ 8.645 (Table 3) per bitter marketer. This result is in line with findings of Rahman and Awerije (2014), and Hamidi (2016).

Principal Component Analysis of Constraints Facing Bitter kola Marketers.

Principal component analysis is a statistical and econometric tool that was used to reduce constraints influencing bitter kola marketers that were many and interrelated into smaller variables that are non-correlated. The variables that were retained have Eigen values greater than one. The variables that were retained include: high cost of transportation, storage problems, lack of credit facilities, and bad road infrastructures. The high cost of transportation with Eigen value of 3.2210 was ranked first (1st) based on the perceptions of the bitter kola marketers. The storage problems or lack of market stall was ranked second (2nd) with Eigen value of 2.9631 based on the perceptions of the bitter kola marketers. Lack of credit facilities and bad road infrastructures with Eigen values1.4762 and 1.0432 were ranked third (3rd) and fourth (4th) based on the perceptions of bitter kola marketers respectively.

Table 6: Results of the Principal Component Analysis of Constraints or Problems Facing Bitter kola Marketers

Constraints	Eigen Value	Difference	Proportion	Cumulative
High Cost of Transportation	3.2210	0.3424	0.3625	0.3625
Storage Problems/Lack of Market Stalls	2. 9631	1.3772	0.2372	0.5997
Lack of Credit Facilities	1.4762	0.2673	0.1067	0.7064
Bad Road Infrastructures	1.0432	0.2234	0.0608	0.7672
Bartlett Test of Sphericity				
KMO	0.660			
Chi-Square	2079.032***			
Rho	1.0000			

Source: Field survey, (2019). Using STATA Version 14

Conclusion

The following conclusions were drawn from the research results; bitter kola marketing is a profitable enterprise with a gross margin and net income of 167,000 Naira and 164,000 Naira per marketers. The gross margin ratio of 0.92 implies that for every one Naira invested in bitter kola marketing 92 kobo covered interest , taxes, expenses, profits and depreciation. The bitter kola marketers were active, young, energetic and resourceful with an average age of 32.56 years. The mean marketing efficiency was 0.42 leaving inefficiency gap of 0.58. Socio-economic factors influencing and increasing marketing efficiency bitter kola marketing were gender ($P < 0.10$), years of marketing experiences ($P < 0.05$), membership of cooperatives ($P < 0.05$), access to credit facilities, and ($P< 0.05$), level of education ($P < 0.05$). The purchase price also influences the marketing margin or profits of bitter kola marketing at 1 % probability level. The elasticity coefficient for purchase price was – 1.064. The constraints influencing bitter kola marketing were high costs of transportation, storage problems or lack of market stalls, lack of credit facilities and bad road infrastructures. The following policy recommendations were based on the results of this research including; the construction of feeder roads for easy movement of bitter kola non-timber forest product from farm gate to market centres. Market stalls in term of storage system should be provided for bitter kola marketers to store the bitter kola non-timber forest product; provisions of adequate funds should be made available to establish appropriate medicinal or pharmaceutical outfit, owing to the fact that the seeds are highly medicinal and hence as this will create job opportunities for unemployed youths;

credit facilities at no interest rate and no administrative procedures should be provided

for bitter kola marketers; and forest extension officers should be provided in the area for disseminating innovations and research findings to bitter kola marketers.

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