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Marketing of African Breadfruit Seeds (*Treculia africana*) in Anambra State, Nigeria

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Abstract: The need to develop a sound knowledge of the current situation regarding marketing of African breadfruit seeds, reduce demand-supply gap and improve the marketer's income in Anambra State, Nigeria trigged this study. The study established the socio-economic characteristics of the marketers, marketing margin, profitability, spatial price spread and determinants of profit. Multistage, purposive and random sampling techniques were used to select 120 respondents. Data were collected using pre-tested questionnaire and analyzed using descriptive and inferential statistics. Findings indicated mean age, educational level and marketing experience of 45.3 years, 8 years and 10 years respectively. 100% female dominance; 100% personal savings as source to fund and 55% membership of market association. Peak and lean season inter price difference realized by the wholesalers and retailers were highest in Eke Awka market and lowest at Ochanja and Oye Achalla market. The retailers realized higher percentage marketing margin (30.4%) than the wholesalers (16.7%). The enterprise proved profitable with monthly net marketing income of ₦ 37,569 for wholesalers and ₦ 75,754 for retailers. Household size and membership of market association significantly determined wholesalers profit while education, marketing cost, membership of market association and price of product significantly influenced retailers' profit. Policy measures towards reduction of market taxes and marketing costs the through provision of infrastructural facilities, dissemination of market information and formation of thrift and cooperative societies should be encouraged by the government and allied institutions to mitigate marketing problems and increase the benefits accruing to players in the African breadfruit seeds marketing business.
Keywords: Marketing margin, profitability, determinants, African breadfruit seeds, Nigeria

INTRODUCTION

In Nigeria, 65% of the households had difficulties meeting their food requirements mainly because of low income, abject poverty and high prices of nutritious food crops [1]. Some nutritious crops which are rich in protein are neglected in cultivation thereby culminating to their low output and protein deficient diets of people [1, 2]. Addressing the challenges, identification and promotion of widespread planting and consumption of those crops is expedient. This is because some of the crop species have great potentials for integrated contribution to solving the aforesaid multiple challenges. One of such crop species is breadfruit (*Treculia African*). African bread fruit *(Treculia africana)* is a multipurpose tree belonging to the family, *Moraceae*. It commonly grows in the forest zone, particularly the coastal swamp zone [3]. It is one of the four members of the genera, *Treculia* and native to many tropical countries like West Indies, Ghana, Sierra Leone, Nigeria and Jamaica [4]. African breadfruit seeds, according to Ojinnaka, Anyanwu and Ihemeje (2013), is an important food tree crop that bears seeds widely eaten in southern Nigeria and it is eaten as main dish in Nigeria [5], the consumption is culturally accepted and is gradually being changed from food for the poor to food for the affluent in the area and in all Igbo ethnic communities where it is popularly Known as ''Ukwa''

The seeds are highly nutritious and constitute a cheap source of vitamins, minerals, proteins, carbohydrates and fats to the rural poor who cannot afford the luxury of buying meat or other sources of animal protein [6]. The seeds are used in preparing pudding and as a thickener in weaning food for children and the flour has high potential usage for pastries [7]. African breadfruits hasten and stimulate skin and hair growth, regulate metabolism, promote reproduction and stimulate bone growth and health. It also has various medicinal uses including its use as cure for malaria, cough, rheumatism and diabetic [8].

The American Marketing Association (AMA) [9] defined marketing as the activity, sets of institutions, and process for creating, communication, delivering, and exchanging offerings that have value for customers,

clients, partners and society at large. It is a management process responsible for the identification, anticipation and satisfaction of consumer requirement [10]. Marketing can also be described as a machine that directs production along the line most suited to consumer requirement, thus production is limited by the extent of marketing [11]. The function of marketing in economic system is to ensure that consumers get the product they desire at the right form (form utility), made available at the right place (place utility), at the right price (possession utility) and at the right time (time utility) to fully satisfy the consumer [12].

Breadfruit marketing activities include all postharvest activities involved in the flow of breadfruits and seeds from the field to consumers through marketing channels. These activities, according to Burt and Wolfley [13], include gathering, processing, storage and packaging, transportation, marketing and administration.

African breadfruit is increasingly becoming commercially important in southern Nigeria; hence, Baiyeri and Mbah [14] described it as an important natural resource which contributes significantly to the income and dietary intake of the poor. In Anambra State, the rate of consumption of African breadfruit is on the increase for health and economic reasons and this has led to increasing demand and decrease in supply for African breadfruit seeds, thus widening demand-supply gap. More so, in local markets in the state, market price of African breadfruit seeds are rising probably due to rising population; increasing demand and decreasing supply. The widening demand-supply gap can also be attributed to the existence of inefficiencies in the marketing system due to inadequate market infrastructural facilities, transports and pricing system, inefficient floating capital and poor sales [15].

Breadfruit according to Chukwuone *et al.;* [1], yields high income and plays useful roles in the livelihoods of rural dwellers, yet the marketers seem not to be reaping the full benefits of the product as majority of them still remain in abject poverty and unable to expand their business frontier. This could signify inefficiency in the marketing system in the study area and thus the need for this study; to ascertain the marketing income of African breadfruit seeds and the variables that influence income realized by the marketers.

MATERIALS AND METHODS

The study area was Anambra State of Nigeria. It has 21 local government areas (LGAs), consisting of 177 communities and four Agricultural Zones. Anambra state is located at longitude 7^0 00' 00" East and latitude of 6^0 20' 00" North. The 2006 estimated population of over 4 million for Anambra state (National Population Commission (N.P.C), 2006) [16] makes it one of the most populous states in the Southern Eastern geo-political zone. The State occupies an area of 4,887 sq.km, 70% is arable land. The State has great potential for agricultural development and the climate is favourable for crop production, livestock farming, fishery and agro-forestry (ASMARD, 2008) [17]. One of the crops being produced in the State is African breadfruit. The tree grows freely in the many natural and secondary forests of Anambra State where the land use system is predominantly tree-crop alley farming. Off-farm activities like agricultural processing and marketing are also vital components [18].

All the African breadfruit seeds marketers in the study area constituted the study's population. Purposive sampling method was used to select five daily markets from each of Onitsha Agricultural zone and Awka Agricultural zone to arrive at 10 daily markets for the study. The markets were identified by a reconnaissance survey on the size, strategic location, daily nature and number of intermediaries selling seeds in the area. Subsequently, simple random sampling method was used to select six wholesalers and six retailers from each of the selected markets to arrive at a sample frame of 120 respondents. The selection was facilitated by lists complied by the market masters overseeing each of the markets as well as the African breadfruit seeds marketers' association leaders.

A set of structured and pretested questionnaires were fully utilized in the study. Data were collected on socio-economic characteristics of the marketers such as gender, age, educational level, marketing experience, membership of market association and access to credit. Additional data were collected on marketing margin, revenue and cost variables, spatial price spread as well as the effects of socio-economic factors on profit/ net marketing income. Descriptive statistics such as frequencies, tables, means and percentages were used to achieve objective i socio-economic characteristics of African breadfruit seeds' marketers and objective iii spatial (inter market) price spread of African breadfruit seeds marketers, Objective ii market margins and profitability were achieved using marketing margin and Budgetary method respectively, Finally, objective iv, determinants of net marketing income was achieved by means of Ordinary Least Squares (O.L.S) regression.

The model used for marketing margin is given as:

$$MM = P_r - P_f$$

Percentage marketing margin was determined with Onyemauma (2010) stated as

$$\% MM = \frac{P_r - P_f}{P_f} \times 100 \quad 1$$

Where: % MM= Percentage Marketing Margin,
P_r = Retail/ Consumer price (₦),
P_f = Farm gate price (₦)

The budgetary technique model deployed for profitability assessment for the marketers is given as:-
GM = TR – TVC
NMI =TR –TC

Where,
GM = Gross margin,
TR =Total Revenue, (Price per kg X quantity) (₦),
TC = Total Cost,
NMI = Net marketing income,
TVC = Total Variable Costs

The multiple regression models employed to examine the influence of socio-economic factors of African breadfruit seeds marketers' on net marketing income is implicitly defined as:
NMI = f(GEN+AGE+MAS+EDU+HOS+MKC+MKE+PPD+MKA+ACC+MKI+e)

Where;
NMI = Net marketing income (₦),
GEN= Marketer's gender (Dummy: male = 1, female = 0),
AGE = Marketer's age (years),
MAS = Marketer's marital status (dummy: married= 1, otherwise =0),
EDU= Marketer's educational level (years),
HOS= Marketer's household size (number of persons in the household),
MKC= Marketing cost (₦),
MKE =Marketing experience (years already spent in the business),
PPD = Price of produce (₦)
MKA = Membership of market association (dummy: member = 1, non-member =0)
ACC = Access to credit (dummy: accessed = 1, otherwise =0)
MKI = Marketing information (dummy: obtained information = 1, otherwise =0)
e = Stochastic error term.

The regression model was fitted with the data and tried in four functional forms (linear, exponential, semi-log, and double-log) and output of the form with the best result in terms of economic, statistical and econometric criteria was chosen as the lead equation. The explicit versions of the functional forms are given as:

Linear: $NMI = a_0 + a_1GEN + a_2AGE + a_3MAS + a_4EDU + a_5HOS + a_6MKC + a_7EXP + a_8PDP + a_9MKA + a_{10}ACC + a_{11}MKI + e_i$

Exponential: $InNMI = a_0 + a_1GEN + a_2AGE + a_3MAS + a_4EDU + a_5HOS + a_6MKC + a_7EXP + a_8PDP + a_9MKA + a_{10}ACC + a_{11}MKI + e_i$

Semi-log: $NMI = a_0 + a_1lnGEN + a_2lnAGE + a_3lnMAS + a_4lnEDU + a_5lnHOS + a_6lnMKC + a_7lnEXP + a_8lnPDP + a_9lnMKA + a_{10}lnACC + a_{11}lnMKI + e_i$

Double-log: $lnNMI = a_0 + a_1lnGEN + a_2lnAGE + a_3lnMAS + a_4lnEDU + a_5lnHOS + a_6lnMKC + a_7lnEXP + a_8lnPDP + a_9lnMKA + a_{10}lnACC + a_{11}lnMKI + e_i$

RESULTS AND DISCUSSION

Socio-economic factors of the marketers

The socio-economic factors of the marketers, as summarized in Table 1, showed that African breadfruit seeds' marketing was dominated by women (100%) both at the wholesale and retail levels. A mean age of 45 years with minimum of 21 years and maximum of 60 years were recorded. A maximum formal educational attainment of 18years, minimum of zero year and mean of 8years were also computed for the marketers. On the average, the marketers acquired marketing experience of 10 years with the least and most experienced marketers gaining years of experience of 2 years and 30 years respectively. Majority (55%) of the marketers do not subscribed to membership of marketing association. All (100%) the marketers used personal savings to fund their business. The result implied that most of the marketers were young, fairly educated and experienced women who depended mainly on their personal savings to fund the business. The result corroborates Ogbonna, Anyiro, Osondu, Nwachukwu and Chukwu (2013) [19]; Ofoedu (2014) [20]; Ugwumba *et al.;* (2014) [21]; and Gyang and Ojoko (2012) [22], that marketing of African breadfruit seeds and other crops' products were dominated by young, energetic, educated, experienced and self-sponsored female marketers who mostly do not belong to any market association.

Monthly income of African breadfruit seeds marketers;

Percentage MM for the wholesalers during the peak period =

$$\% MM = \frac{2345 - 2010}{2010} \times 100 = \frac{33500}{2010} = 16.7\%$$

Percentage MM for the retailers during the peak period =

$$\% MM = \frac{3060 - 2345}{2345} \times 100 = \frac{71500}{2345} = 30.4\%$$

Thus, the result indicates high profit earned by the marketers and implies that an average African breadfruit seeds marketers (wholesalers and retailers) in the study area earned a farm to retail price spread of 0.16Naira and 0.30 Naira for every one naira retail price paid by the final consumer in the marketing process.

The estimated monthly profitability of African breadfruit seeds' marketers is shown in Table 4. The result showed that the total variable cost incurred by the intermediaries (wholesaler and retailers) was ₦ 28,575,305 and constituted 98.0% of the total cost.

Total revenue of ₦ 35,513,600 was realized by the intermediaries after spending ₦ 29,206,167 to make a profit of ₦ 6,307,433. Separately, the wholesalers and retailers realized net marketing incomes, return on investment and net return on investment figures of ₦ 37,569 & ₦ 75,754; 1.11 & 1.37 and 0.11 & 0.37 respectively. The net return on investment figures implies that the wholesalers and retailers realized 11 kobo and 37 kobo, respectively, on every 100 kobo expended on the enterprise in a month. Though this result proved the enterprise profitable, the return on investment seems low for either the wholesalers or the retailers. The finding is contrary to Ogbonna *et al.;* in 2013 [19] who reported that marketers realized high net return on investment of ₦18.20 in Ahiazu Mbaise LGA of Imo State, Nigeria.

Spatial price spread of African breadfruit seeds (₦/4.40kg plastic bucket)

Table 2 shows the peak season (February to September) inter market price different between wholesalers and retailers. The result showed wholesale's and retail's marketing margin highest in Eke Awka with ₦ 600.00 each and lowest in Ochanja market and Oye Achalla in Onitsha South and Awka North in the state, with ₦ 200.00 and ₦ 600.00 respectively.

Table 3 shows the lean season (October to January) inter market price different between wholesalers and retailers and their daily markets. Marketing margin per painter plastic bucket (4.40kg) realized by the wholesalers and retailers was highest in Eke Awka market with ₦ 1000.00 and ₦ 1700.00 respectively and least at Ochanja market with ₦ 450.00 and ₦ 850.00 respectively. The difference in the inter price variations by the wholesale and retail markets during the peak and lean period implies that marketing at the retail level was more profitable. The reason could be that retailers incurred little or no cost on security, transport, storage and other handling charges unlike the wholesalers.

Determinant of net marketing income for the wholesaler

Table 5 indicates the output of the four functional forms (linear, exponential, semi-log, and double-log) of the regression model on estimated determinants of net marketing income realized by the wholesalers from the marketing of African breadfruit seeds. The MINITAB Statistical software was used to run the regression. As shown in the table, the output of semi-log form produced the best result in terms of numbers, signs and sizes of the parameter estimates and was chosen as the lead equation. The R^2 value of 78.1% indicated that 78.1% of variations in net marketing income realized by the wholesalers were attributed to variations in the independent variables while the remaining 21.9% were due to random disturbance. The F-statistic value was statistically significant, an indication that the independent variables collectively exerted significant influence on the net marketing income and that the model was a good fit for the data.

Out of the eleven exogenous variables in the model, only two variables (household size and membership of market association) exerted significant influences on net marketing income. The coefficient of household size was negative and statistically significant at 5% level. This result is in agreement with the *apriori* expectations and implied that the respondents who had fewer persons in their household were able to consume less, sell more quantities of the product purchased and hence earned higher income. Marketing association had positive and significant relationship with net marketing income at 1.0% probability level in accordance with *apriori* expectations and follows that wholesalers who belong to an association tend to dictate market prices due to economies of scale.

Determinant of net marketing income realized by the retailers

Table 6 shows the output of the four functional forms (linear, exponential, semi-log, and double-log) of the regression model on estimated determinants of net marketing income realized by the retailers from the marketing of African breadfruit seeds. The MINITAB Statistical software was used to run the regression. As indicated in the table, the output of linear model produced the best result inconformity with *apriori* expectations ((i.e. signs and magnitudes of coefficients of the parameter estimates) and thus was chosen as the lead equation.

The R^2 value of 83.1% indicated that 83.1% of variations in net marketing income realized by the retailers were attributed to variations in the independent variables while the remaining 16. 9% was due to random disturbance. The F-statistic value was significant, an indication that all the exogenous variables exerted joint and significant effect on net marketing income and that the regression model was a good fit for the data.

Out of the eleven exogenous variables imputed in the model, four variables (education, marketing cost, marketing association and price of product) exerted statistical and significant influences on net marketing income earned by the respondents. The coefficient of educational level and market association were negative and statistically significant at 5% and 10% probability level respectively. This is contrary to *apriori* expectations. This implies that increase in educational level and involvement in market associations, brings about decrease in net marketing income. This is an indication that the higher one's education, the more he engages in lucrative businesses other than petty trading and that retailers who belong to associations are not better informed about market prices. Product price was positive and had statistically significant influence on net

marketing income at 1.0% probability level in accordance with *aprior* expectations. However, product price and marketing cost exerted positive and negative influence on net marketing income respectively. This meant that increase in product price and decrease in marketing cost would lead to increase in net marketing income earned by the retailers and vice versa.

Table 1: Socio- economic factors of the marketers of African breadfruit seeds (N=110)

Variable	Wholesalers (n=53)		Retailers (n= 57)		Wholesalers & Retailers	
	%	Mean	%	Mean	%	Mean
Gender						
Male	-		-		-	
Female	100		100		100	
Age						
21-30	-		3.5		1.8	
31-40	11.3	**50.21**	56.1	**40.7**	34.5	**45.3**
41-50	30.2		24.6		27.3	
Above 50	58.5		15.8		36.4	
Educational Level						
Primary (1-6)	45.3		15.8		30	
Secondary (7-12)	54.7	**6.8**	73.7	**9.2**	64.5	**8.0**
Tertiary (13-18)	-		10.5		5.5	
Marketing Experience						
1-5	3.8		31.6		18.2	
6-10	37.7	**12.6**	45.6	**8.2**	41.8	**10.4**
11-15	20.8		10.5		15.5	
16 and above	37.7		12.3		24.5	
Marketing association						
Yes	67.9		22.8		44.5	
No	32.1		77.2		55.5	
Access to credit						
Accessed credit	-		-		-	
Otherwise	100		100		100	

N= Number of respondents. % = percentage.
Source: Field Survey, 2016

Table 2: Peak season inter market prices by wholesale and retail markets

LGA/State	Market	Wholesale market			Retail market		
		Purchase price	Selling price	Marketing margin	Purchase price	Selling price	Marketing margin
Awka South	Eke Awka	2300	2900	600	2900	3800	900
Awka North	Oye Achalla	1900	2100	200	2100	2700	600
Aguluizigbo	Oye Agulu	1900	2200	300	2200	3000	800
Dunukofia	Afor Igwe	2100	2500	400	2500	3250	750
Idemili South	Afor Nnobi	2200	2500	300	2500	3250	750
Idemili North	Eke Oba	2000	2500	500	2500	3250	750
Njikoka	Oye Agu	2200	2500	300	2500	3250	750
Ogbaru	Coca-cola	1900	2200	300	2200	2900	700
Onitsha South	Ochanja	1750	1950	200	1950	2550	600
Onitsha South	Ose	1850	2100	250	2000	2650	650
Anambra State (π)		2010	2345	335	2335	3060	725

Source: Field survey, 2016

Table 3: Lean season inter market prices by wholesale and retail markets

L. G. A.	Market	Wholesale market			Retail market		
		Purchase price	Selling price	Marketing margin	Purchase price	Selling price	Marketing margin
Awka South	Eke Awka	2800	3800	1000	3800	5500	1700
Awka North	Oye Achalla	2400	2900	500	2900	3850	950
Aguluizigbo	Oye Agulu	2400	3000	600	3000	4250	1250
Dunukofia	Afor Igwe	2600	3200	600	3200	4500	1300
Idemili South	Afor Nnobi	2600	3200	600	3200	4500	1300
Idemili North	Eke Oba	2600	3200	600	3200	4500	1300
Njikoka	Oye Agu	2600	3200	600	3200	4500	1300
Ogbaru	Coca-cola	2400	3000	600	3000	4000	1000
Onitsha South	Ochanja	2350	2800	450	2800	3650	850
Onitsha South	Ose	2350	2900	550	2900	3875	975
Anambra State (π)		2510	3120	610	3120	4312.5	1192.5

Source: Field survey, 2016

Table 4: Costs and returns for wholesaler and retailer per month

Variables	Wholesalers	Retailers	intermediaries
Total Revenue (TR)	19,446,950	16,066,650	35,513,600
Total Variable Cost (TVC)	17,168,655	11,406,650	28,575,305
Total Fixed Cost (TFC)	287,150	343,712	630,862
Total Cost (TC)	17,455,805	11,750,362	29,206,167
Gross Margin (GM)	2,278,295	4,660,000	6,938,295
Net Marketing Income (NMI)	1,991,145	4,316,288	6,307,433
Mean NMI = $^{NMI}/n$	37,568.8	75,754	113,322.8
Return on Investment (ROI = TR/TC)	1.11	1.37	
Net Return on Investment (NMI/TC)	0.11	0.37	

Source: Field survey, 2016.

Table 5: Determinants of net marketing income realized by the wholesalers

Predictor	Linear	Double-log	Semi-log	Exponential
Constant	2880	-1.514	–1165860	4.2073
	(0.04)	(-0.91)	(-3.64)	(6.19)
GEN	NA	NA	NA	NA
AGE	250	0.6465	189600	-0.00144
	(0.21)	(0.79)	(1.20)	(-0.12)
MAS	221	0.0511	28139	-0.04442
	(0.04)	(0.32)	(0.92)	(-0.80)
EDU	-1171	-0.0042	21145	- 0.00819
	(-0.54)	(-0.01)	(0.28)	(-0.38)
HOS	-1694	-0.2811	-98635	0.01433
	(-0.84)	(-1.46)	(-2.66)**	(0.71)
MKC	-0.2232	-1.631	505527	0.00000204
	(-0.38)	(-0.77)	(1.23)	(0.34)
EXP	-1297	-0.1678	-27586	-0.00447
	(-1.10)	(-1.10)	(-0.94)	(-0.38)
PDP	0.6087	2.680	-321083	-0.00000006
	(1.01)	(1.30)	(-0.81)	(-0.01)
MKA	12672	0.6006	136638	0.1465
	(0.92)	(1.65) ***	(1.94) ***	(1.06)
ACC	NA	NA	NA	NA
MKI	NA	NA	NA	NA
R^2	88.7%	85.3%	78.1%	71.4%
R^2 (Adjusted)	86.8%	82.9%	74.5%	66.6%
F-statistics	47.15	34.89	21.42	14.98
Durbin-Watson Stat.	1.86	1.80	2.05	1.77

Note: *** and ** indicate significant at 1.0% and 5.0% alpha levels, NA= Not Available

Source: Computed from survey data, 2016.

Table 6: Determinants of net marketing income realized by the retailers

Predictor	Linear	Semi-log	Exponential	Double-log
Constant	89916	5.3234	–186985	1.830
	(1.91)	(9.16)	(-1.07)	(1.35)
GEN	NA	NA	NA	NA
AGE	-43.0	-0.002643	-56	-0.1871
	(-0.06)	(-0.30)	(-0.00)	(-0.23)
MAS	5670	0.03766	-3421	0.1039
	(1.21)	(0.65)	(-0.13)	(0.50)
EDU	-2048.3	-0.01827	-24296	-0.07168
	(-2.05)**	(-1.45)	(-3.99) ***	(-1.52)
HOS	-1468	-0.01033	20988	0.1431
	(-0.66)	(-0.36)	(0.46)	(0.40)
MKC	-1.4621	-0.00001470	-905405	-18.010
	(-6.47)***	(-5.14) ***	(-2.30) **	(-5.91) ***
EXP	-73.6	0.005476	-8496	0.0654
	(-0.12)	(0.70)	(-0.30)	(0.30)
PDP	1.6264	0.00001633	957770	18.671
	(7.00)***	(5.56) ***	(2.46) **	(6.21) ***
MKA	-30302	-0.5472	-77235	-1.7005
	(-1.97)*	(-2.83) ***	(-1.07)	(-3.06) ***
ACC	NA	NA	NA	NA
MKI	NA	NA	NA	NA
R^2	83.1%	76.3%	66.4%	82.3%
R^2 (Adjusted)	80.0%	72.0%	60.3%	79.1%
F-statistics	26.97	17.69	10.99	25.59
Durbin-Watson Stat.	1.79	1.89	1.83	1.22

Note: ***, ** and * indicate significant at 1.0%, 5% and 10% probability levels respectively. NA= Not Available
Source: Computed from survey data, 2016.

CONCLUSION AND RECOMMENDATIONS

African breadfruit seeds marketing in Anambra State, Nigeria, are a profitable enterprise dominated by female marketers both at the wholesale and retail levels. The retailers made more profit in the business than the wholesalers. Profitability would improve if adequate measures are taken to ameliorate the constraints identified by this study to have limited the net marketing incomes realized by the marketers.

Rehabilitation and construction of access and feeder roads within the study area and encouraging local production to improve local supply and reduce huge transportation costs incurred by the wholesalers who source the product from distant states by Federal and State governments and formation of cooperative groups by the marketers in order to eliminate the exploitative activities of the middlemen and improve access to government and other non-governmental credit facilities will sustainably enhance the marketers profit and livelihood.

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