Analysis of apple fruits profitability in selected markets in Abuja Metropolis, Nigeria.

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ABSTRACT

This study analysed profitability of apple fruits in some selected markets in Abuja metropolis, Nigeria. A purposive sampling technique was used to select 120 apple fruit marketers. The data obtained was analysed using descriptive analysis, gross margin analysis, multiple regression analysis and factor analysis. The results reveal that most (76.67%) of the apple fruit marketers were male. Gross margin of N4,240.19 per carton (45kg) was recorded, while the benefit cost ratio was 1.20. The study also revealed that the profit made by apple fruit marketers were premise on their level of education and marketing experience. Poor pricing (0.5260), perishability (0.6106), inadequate extension services (0.9395) were the constraints experienced by apple fruit marketers in the study area. Therefore, more women should be encouraged to join the business and those already in the business should collaborate to generate fund to purchase storage and transport facilities. In addition, apple fruit marketers should visit extension agents to learn modern ways of preserving and prolonging apple fruit shelf life.

Keywords: Factor analysis, Profitability, Constraints, Marketers, Apple fruit

INTRODUCTION

Apple fruits (*Malus domestica*) is a nutritious fruit which offers multiple health benefits to humans. It is rich in dietary phytochemicals such as flavonoids which are necessary for optimal health (Ferretti *et al.,* 2014). The antioxidants in apple have much health promoting and disease prevention properties. Over hundred (100) varieties of apples are grown in North America and there are different varieties which are a bit bigger than the size of a cherry to as big as the size of a grapefruit. Dietary fibres are found in the skin and core apple. It is consumed by humans and it is rich in nutrients with significant bioactive compounds (Bastein *et al*., 2022). There are many who delight in apple fruit consumption (Abdullahi *et al*., (2017). In Nigeria, apple hardly grows because it requires cold weather for optimal growth and production, but cold region in Nigeria, such as Jos, Mambila and Obudu Plateau support it growth. According to Kughur *et al.* (2015), fruits and vegetable production are cultivated in some specific locations in Nigeria and are prominent in Plateau and Kaduna States from where supply are made to local markets and neighboring states of the country such as Lagos , Oyo, Abuja and others. Apple, strawberries, grapes and others are the temperate fruits whose demand are on the increase as postulated by Osadebamwen *et al.* (2022). However, to an average Nigerian, apple fruit is highly expensive and this actually restricts its consumption coupled with poor attitude of many Nigerians toward fruit consumption Abdullahi *et al* (2017). The health benefit and change in orientation of many, especially among the elites is making apple fruit a prominent business among fruit sellers.

The land area where apple was cultivated globally was 4,904,305 ha with total production output of 86,142,197 tonnes in 2018 (FAO, 2020). FAO (2020), also stated that China is the greatest apple producer in the world with over 39.2 million tonnes production volume. According to Shah (2020), apple farmers sell their products directly to middlemen (assemblers, wholesalers and retailers) who eventually sell apple fruits to the ultimate consumers. Agricultural commodities marketers usually operate within and without their geographical areas. Apple fruit are among fruit crops that are exported and imported across nations of the world.

Natalia and Harvey (2021) stated that the awareness of consumption of healthy food, increased income and population growth, especially in urban area resulting into global demand for fruits, where the second position goes to apple, necessitate efficient and profitable marketing. In Nigeria, the efficiency of fruits and vegetables marketing has been a great concern as observed by Kughur *et al.* (2015).

However, agricultural marketing helps in sustaining produce/ product in the market due to the prevalence of open competition both in the present global and liberal world (Ibeawuchi *et al.,* 2015). Apple fruit production is beneficial in agriculture and food markets due to its health benefits aside its social and economic benefits (Senchi and Malami 2015). Profitability is an important terms with respect to business and it determines the business long term success. It's primary goal of a business which is pivotal to business growth. Studies on profitability of apple fruit marketing is expedient considering the health benefit derived by teeming population of its

consumers. Many studies have been conducted on apple fruit by several authors (Abdullahi *et al* (2017), 2015; Muraki *et al.,* 2013) and few others like Abdullahi *et al*. (2017) and Omotesho *et al*. (2013) in other parts of Nigeria. Other authors (Ojo *et al*, 2016 and Ajibade *et al*, 2021) have conducted studies on tomato fruit. However, the focus of this study is on analysis of apple fruits profitability in selected markets in Abuja Metropolis, Nigeria. The specific objectives of the study were meant to describe the socio-economic characteristics of apple fruit marketers, estimate apple fruit marketers' costs and returns, identify factors that determine apple fruit profitability and identify constraints faced by apple fruit marketers in the study area.

METHODOLOGY

The study was conducted in Abuja, Nigeria. It has an estimated population of 2.5 million. Abuja is the 4th biggest metropolitan population after Lagos, Kano and Ibadan. It consists of six area councils with total land area of approximately 7.290 km^2. The climate is tropical with mostly warm weather coupled with normal bright sunny days. Abuja being the Federal Capital Territory of Nigeria is blessed with markets where various commodities are sold. Due to its urbanisation fruits marketing especially apple fruit and others are common in some of the markets within Abuja metropolis which many elites preferred to junks consumption.

Purposive sampling technique was used to select three main markets (Zuba Market, Wuse market, and Deidei market) in Abuja, based on high level of involvement in fruits and vegetables in these markets. One hundred and twenty (120) respondents were randomly selected across the three markets with respect to the lists of apple fruit marketers obtained from their associations. Thirty percent of the registered apple fruit marketers were selected from Wuse (50), Zuba (40) and Deidei (30) from sample frame of 401.

The study used structured questionnaire as an instrument for collection of primary data from the respondents. The analytical tools employed in the study were descriptive statistics, gross margin analysis, multiple regression and factor analysis.

Gross margin shows the difference between total revenue (TR) and the total variable cost (TVC). Gross margin analysis was used as proxy for apple fruit profitability. Gross margin analysis helps in measuring business efficiencies and setting selling prices of agricultural products. It exposes the financial health of business venture. It reveals whether the business is running profitably or otherwise. The study followed Gosa *et al*. (2023), Gambo (2015) and a host of others in using gross margin analysis to ascertain apple fruit profitability

$$GM = TR - TVC \dots\dots (i)$$
$$Profit (\pi) = TR - TC \dots\dots (ii)$$
$$TC = TFC + TVC \dots\dots (iii)$$

The following Profitability ratios were calculated:
Benefit Cost Ratio (BCR) = $\underline{TR}$ …… (iv)
 TC

Where;
GM = Gross Margin (N / 45kg)
TR = Total Revenue (N / 45kg)
TVC = Total Variable Costs (N / 45kg)
TC = Total Costs (N / 45kg)

Multiple regression analysis

It is a statistical tool used for estimating the relationship among variables with reasons and results for relationship. Multiple regression model has one dependent and many independent variables. This study determined the factors affecting profitability of apple fruit marketers following empirical studies of Nguyen and Nguyen (2020) and others. The model was specified as follows:

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + e_t \dots\dots\dots (v)$$

Where;

Y = Average Return (N)
X_1 = Age of marketers (years)
X_2 = Household size (numbers)
X_3 = Education level (number of schooling years)
X_4 = Marketing experience (years)
X_5 = Transportation cost (N)
X_6 = Access to credit (1 = Yes; 0 = otherwise)
X_7 = Co-operative society (1 = member, 0 = non-member)
a = constant intercept
b_1 = the coefficient corresponding to X_1… X_9
e_t = error term

Factor analysis

The possible constraints confronting marketing of apple fruit was analysed using factor analysis.

Factor analysis is a method for investigating whether a number of interests C_1, C_2, C_3, C_4 are linearly related to a smaller number of unobservable factors F_1, F_2, F_3, F_4 Equamax with Kaiser Normalization was the rotation method used to examine constraints confronting marketing of apple fruits following the study of Ali *et al* (2013). It is mathematically represented as;

$$C_1 = \beta_{10} + \beta_{11}F_1 + \beta_{12}F_2 + e_1 \text{ vi}$$
$$C_2 = \beta_{20} + \beta_{21}F_1 + \beta_{22}F_2 + e_2 \text{ vii}$$
$$C_3 = \beta_{30} + \beta_{31}F_1 + \beta_{32}F_2 + e_3 \text{ viii}$$

$C_4= \beta_{40}+ \beta_{41}F_1 + \beta_{42}F_2+ e_4$ ix

Where:

C_1 to C_4 are unknown factors or component

β_{10} to β_{42}-Factor loadings

e_1 to e_4 - error variance

RESULTS AND DISCUSSION

The results in Table 1, show the socio-economic characteristics of respondents. The majority (76.67%). of the respondents who engaged in apple fruit marketing were male. The implication is that the apple fruit marketing was a business majorly embraced by men, who can on-load and off-load apple fruits especially in carton. Also, apple fruit could be a business mostly engaged in by men because it does not entails further processing apart from cleaning and little or no packaging before marketing, which can easily be done by men (Chidiebere-Mark, 2016). The mean age of respondents was 39 years, which shows that the majority (63.3%) of the respondents were still active and could carry out every activities associated with apple fruit marketing. The results is in-line with the findings of Osadebamwen *et al* (2022) who reported 32 years as the mean age of respondents in their study on apple fruit in Plateau State, Nigeria. This study also revealed that most (83.3%) of the apple fruit marketers were married, while others were either single, separated and widow. The implication of the findings is that the apple fruit marketing could be a good source of income for their livelihood and family upkeep. The findings of Omotesho *et al.* (2013) also affirmed high percentage of married respondents among apple fruit sellers in their study. Pavlović *et al.* (2020) findings also discovered more (90%) married respondents. The results, further show also that over 86% of the apple fruit marketers were formally educated. The level of education attained by the respondents could aid their ability in packaging and learning better method of preservation of their products. This could be an added advantage in reaching out and communicating effectively with their consumers who were mostly elites. The results indicated that the respondents were well informed and were fully informed on the health benefit of apple fruits and are ready to engage in such enterprise that would enhance wellness of their customers profitably. Also, their exposure educationally would help them to adapt and adopt new marketing strategies that will enhance their efficiency in their business. In addition, the educational composition of the respondents is a clear indication that they were knowledgeable enough to provide reasonable answers to issues related to apple fruits

marketing. The study agrees with the findings of Pavlović *et al.* (2020), where they asserted high level of respondents' education in their study. The mean household size in this study is 6 persons. This implies that members of the household who were within the reach of the marketers could be of help in apple fruit marketing related activities. Thus, the respondents' household is not too big but moderate and the marketers may have less distraction from family tie. The study is almost similar to the findings of Reshi *et al.* (2010) in which they reported a household size of not more than 5 members. This study discovered that apple fruit marketers in the study area have been in the business for an average of eleven (11) years. The implication is that the apple fruit marketers are highly experienced and this made them to remain in the business, probably due to the benefit derived from the business, since no one will continue investing in an unprofitable venture and the more years they spent in the business the better their performance and more market entry opportunities could be discovered. Majority (70.8%) of the respondents sourced fund or capital from their personal savings and re-invested their profit from precious sales to their business, while others borrowed from cooperatives and less than 5% got loan from bank. This implies that the respondents may not be able to expand the size and scope of their business beyond their means, since they probably lack collateral security for bank loan or probably they didn't desire operating beyond small to medium scale. The results is in line with the findings of Ajani (2007), who asserted that personal savings, cooperative societies and friends were the sources of capital for the start-up of fruit and vegetable business, which have the tendencies to impede their business expansion. Majority (94.17%) of the respondents had no access to extension services, no wonder they recorded high perishability of their products, since they have little or no knowledge on modern way of apple fruit preservation and other necessary marketing information on their venture. The results further indicate that majority (92.50%) of the respondnets were members of cooperative which could mean there is a derivable benefits in being member of apple fruit marketers. Thus, large number of apple fruits marketers being a member of cooperative society could be attributed to the benefit enjoyed such as access to credits facilities, access to first-hand information among others. The provision of credits by the cooperatives could drive development among farmers (Kehinde and Ogundeji, 2022). Thus, membership of cooperative could enhance better performance than non-membership due to economies of scale.

Table 1: Distribution of respondents according to their socio-economic characteristics

Socio-economic characteristics	Frequency	Percentage	Mean
Sex			
Female	28	23.33	
Male	92	76.67	
Age (years)			
20-40	72	63.33	
41-60	42	35.00	39 years
61-80	2	1.67	
Marital status			
Single	10	8.33	
Married	100	83.33	
Separated	8	6.67	
Divorced	2	1.67	
Level of education			
No formal education	7	5.83	
Primary education	9	7.50	
Secondary education	68	56.67	
Tertiary education	36	30.00	
Household size			
1-5	50	41.67	
6-10	62	50.67	
11-15	8	6.66	6 persons
Marketing experience			
1-10	68	56.67	
11-20	41	34.17	
21-30	9	7.50	11 years
31-40	1	0.83	
41-50	1	0.83	
Monthly income (N)			
Less than 100, 000	61	50.8	
100,000-200,000	24	20.0	₦84,583.33k
Above 200,000	35	29.2	
Source of credit			
Bank loan	4	3.3	
Personal savings	70	58.3	
Cooperatives	31	25.8	
Profit investment	15	12.5	
Extension Service			
Access	7	5.83	
No access	113	94.17	
Cooperative society			
Non member	9	7.50	
Member	111	92.50	
Total	120	100	

Source: Field Survey, 2022

Costs and returns of apple fruits marketing

The results in Table 2 reveal the average return from apple fruit marketing as N24, 030.83 per carton. The average variable cost incurred by the apple fruit marketers was N19, 979.17 per carton. The Gross margin was N 4,240.19 per carton, while the profit was N4, 051.66 per carton. Apple fruit marketers were able to recover the variable costs invested into the business, thus, it is possible to continue the business in the short run (Senchi and Malami, 2015). The profitability ratio estimated reveals 1.20 as the benefit cost ratio (BCR), which implies that 20 kobo accrued to the apple fruit marketer on every one naira invested into the business. Omotesho *et al.* (2013) also found apple fruit marketing to be a profitable venture in their study.

Table 2: Average Costs and Returns of Apple Fruit Marketing per Carton (45kg)

Items	Value (N)
A. Return	24,030.83
Variables Costs	
Purchase	17,779.17
Transportation	822.59
Loading	82.76
Offloading	67.75
Levy	19.72
Polythene bag	161.37
Labour	857.28
B. Total Variable Costs, TVC	**19,790.64**
C. Gross Margin, GM = A – B	4,240.19
D. Depreciation on fixed items	188.53
E. Total Costs, TC = B + D	**19,979.17**
F. Profit = A – E	4,051.66
G. Benefit Costs Ratio, BCR = A/E	1.20

Source: Field Survey, 2022

Determinants of apple fruits profitability

The results in Table 3 show that the adjusted R^2 value of 0.6924 indicates that 69.24% of the variation in the average return accrued to apple fruit marketers were as a result of the effects of all the explanatory variables (transportation cost, household size, education, marketing experience, age and membership of cooperatives) while 30.76 % unexplained may be embedded in the error term. The results show that apple fruit marketers' level of education and experience in apple fruit marketing were the determinants of their average return which were significant at 1%. Thus, education would enhance better performance of the respondents in terms of getting new market information, quick discovery of the customers' apple fruit varieties preference, new entry to other markets, quick link to elites who could demand home/office delivery of apple fruits and many more. Also, years of experience in apple fruit marketing could increase marketers' skills with its multiplier effect on higher return. It is a common knowledge that no one will remain in an unprofitable venture for a long period of time (Ajani, 2007).

Table 3: Determinants of Apple Fruits Profitability

Variables	Coefficient	Standard error	T	P> | t |
Transportation cost	-0.000994	0.0022714	-0.44	0.663
Household size	0.000045	0.000117	0.38	0.701
Education	0.5744486	0.0516706	11.12	0.000[***]
Marketing experience	0.4630999	0.1491957	3.10	0.002[***]
Age	0.1010807	0.1056696	0.96	0.341
Cooperative	0.537225	0.5735535	0.09	0.926
Constant	-17.93092	3.609954	-4.97	0.000[***]
Number of obs	= 120			
F (7, 112)	= 39.27			
Prob > F	= 0.0000			
R^2	= 0.7105			
Adjusted R^2	= 0.6924			
Root ME	= 4.4973			

Source: Field survey, 2022
Note: *** -Significant at 1%

Constraints to marketing of apple fruits

The results in Table 4 show the constraints to apple fruit marketing in the study area. These include inadequate extension services (0.9395) and inadequate technical-know-how (0.6222) were institutional factors constraining apple fruit marketing. Poor transportation system (0.8932) and lack of storage facilities (0.5112) were infrastructural factors that constrained apple fruit marketing. Perishability (0.6106) was a marketing factor, while credit facilities was an economic factor constraining apple fruit marketing in the area. The perishable nature of the product in most cases have forced respondents to offer their apple fruits to buyers at low prices. The study deduced that apple fruits marketers do not have

adequate access to capital to expand their business ventures. This affirms the findings of Kaka *et al.* (2020), which postulated access to credit as a constraint to marketers. Omotesho *et al* (2013) also discovered inadequate credit facilities as aconstraints in apple fruit marketing in their study within Ilorin metropolis, Kwara State, Nigeria. Poor transport facilities placed the respondents at a disadvantage while buying and selling apple fruits leading to increase transportation costs. The resultant effect will lead to increase marketing costs which will eventually lower marketers' total revenue and profit. Poor transport facilities could lead to produce losses as a result of perishable and bulky nature of apple especially if the commodity is going to be transported to distance places (Al-Dairi *et al.,* 2021; Okwuokenye and Onemolease, 2011). In addition, inadequate storage facilities were rated as serious constraint facing apple fruits marketing in the area. This may bring about considerable losses of apple fruits which invariably may reduce marketers' profit (Mohammed *et al,* 2021).

Table 4: Constraints Confronting Apple Fruits Marketers

Constraints	Mkt. 1	Inst. 2	Eco. 3	Infra. 4
Inadequate source of information	-0.0996	0.0217	0.1121	-0.0240
Lack of credit facilities	0.1337	0.3208	0.5400	0.1763
Poor marketing	-0.0591	0.2083	0.2896	-0.1981
High cost of Packaging materials	0.2132	0.3066	-0.6308	0.2368
Poor transportation system	0.2014	-0.2116	0.0107	0.8932
Lack of storage facilities	-0.0022	0.3321	-0.0438	0.5112
Lack of processing technology	0.0667	0.3032	0.1032	0.2092
Inadequate extension services	-0.2440	0.9395	0.0731	0.0643
Availability of many retailers	0.2789	0.3853	-0.6165	-0.1990
Labour shortage	0.1038	0.0676	-0.0527	-0.2514
Inadequate technical know-how on packaging and preservation	-0.0827	0.6222	0.1625	-0.0611
Poor Communication facilities	0.1604	0.0815	-0.0144	-0.0315
Poor pricing	0.5260	0.4215	0.3447	-0.1831
Seasonality	-0.0045	0.3531	-0.1384	0.4582
Bulky nature of fruits	0.0242	0.2618	-0.1695	0.3894
Theft and pilfering	0.1618	0.3173	0.1325	-0.4424
Perishability	0.6106	0.3946	0.2841	0.1574
Low patronage	0.0121	0.2614	-0.0241	-0.0685
Losses resulting from fruits spoilage	0.2027	0.1578	0.2841	-0.0116
The packaging material is not of standard quality	0.3042	0.2281	0.0752	-0.0640
Losses resulting from pests attack	0.0714	0.3589	0.3962	-0.0320

Source: Field survey, 2022
Note: Mkt.(1) = Marketing Factor, Inst.(2) = Institutional Factor, Econ.(3) = Economic Factor, Infra. (4)= Infrastructural Factor

CONCLUSION AND RECOMMENDATION

The study concludes that educated and married men dominated apple fruit markets in the area. The study further asserted that apple fruit marketing was a profitable venture. Furthermore, the level of education and marketing experience were the determinants of profitability, while poor pricing and perishability (marketing factors), inadequate technical-know-how on packaging and preservation (institutional factors), lack of credit facilities (economic factor), poor transportation system and lack of storage facilities (infrastructural factors) were the constraints to apple fruit marketing in Abuja metropolis. Therefore, apple fruit marketers should collaborate to purchase adequate transportation and cold storage facilities, visit the extension agents to learn modern ways of preserving and prolonging apple fruit shelf life. More women should also be encouraged to engage in the sales of apple fruits to create business opportunity without gender bias.

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