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Income and revenue analysis of garden egg leaf (*Solanum aubergine)* marketing among smallholder farmers in Onitsha and Awka agricultural zones, Anambra state

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Abstract

The study examined income and revenue analysis of garden egg leaf (*solanum aubergine)* marketing among smallholder farmers in Onitsha and Awka agricultural zones, Anambra State, Nigeria. Specifically, it described describe the socioeconomic characteristics, estimate the socioeconomic factors that determine the net marketing income, determines the profitability, the economic efficiency, and examines the constraints to garden egg leaf marketing. A multistage and random sampling procedure was used to select 160 respondents for the study. Data were collected from primary sources and were analyzed using descriptive statistics, enterprise budgeting, multiple regression, and relative importance index. Findings from the result show that the majority of the marketers are within the age limit of 25-35 years (56.25%), presence of female dominance, and a high percentage of marketers who sell both in the market, hawk in the street, events, and offices. Out of 12 independent variables included in the model, age, branding of product, education, household size and mode of delivery statistically and significantly influenced the net marketing income earned by the marketers. Profitability indicators such as net marketing income, return on investment, net return on investment, and coefficient of marketing efficiency of ₦441, 336.63, 1.3, 0.28, and 77% proved the enterprise profitable. The implication of the net return on investment figure is that the marketers return 28 kobo for every 1 Naira invested in the enterprise. The findings show that the perishable nature of garden egg leaf, inadequate price control, and hazards associated with hawking were perceived as the most serious constraints. Underage children should be encouraged to desist from street hawking especially during school hours also there is a need to address the activities of middlemen by relevant stakeholders to combat the price fluctuation in the marketing of garden egg leaves.

Keywords: Income and revenue; Garden egg leaf; Marketing; Smallholder farmers; Awka

1 Introduction

Agriculture plays a crucial role in society, contributing to poverty alleviation, food security, and economic growth. It serves as the foundation of many African economies and serves as a vital source of livelihood for numerous individuals [1]. In Africa, agriculture holds significant economic importance, with more than 60% of sub-Saharan Africa consisting of smallholder farmers, and approximately 23% of the region's Gross Domestic Product (GDP) being derived from agriculture [2]. Nigeria, specifically, has an agrarian economy, with agriculture serving as its primary economic pillar. The sector provides employment to over 90% of rural dwellers, who constitute about 70% of the total population, through agricultural output, processing, packaging, and marketing [3].

Nigeria heavily relies on agriculture as a major source of food, contributing approximately 35% to the country's Gross Domestic Product (GDP), 37% to merchandise exports, 75% to rural household income, and employing around 70% of the workforce [2]. The agricultural sector acts as an engine for sustaining Nigeria's economic growth, serving as the

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backbone of the economy by providing food for the growing population, generating employment opportunities, creating wealth, supplying raw materials to the industrial sector, and earning foreign exchange. Prior to the oil boom of the 1970s, Nigeria, like many other sub-Saharan African countries, relied heavily on agriculture as the mainstay of its economy [4].

Garden egg, scientifically known as *Solanum melongena* and belonging to the subgenus *leptostemanum melongena* [5-6], is a vegetable originating from tropical Africa. It is gaining increasing popularity worldwide. As a member of the family Solanaceae, which primarily consists of herbaceous plants, garden egg holds economic importance. In Southeastern Nigeria, it is one of the oldest vegetables cultivated for its nutritional, medicinal, and economic values, with various economically important varieties [7]. The nutritional composition of garden egg includes minerals, vitamins, carbohydrates, and water, which are crucial for maintaining health and preventing diseases. The fruit can have different shapes such as pear-shaped, round, long, or cylindrical, depending on the variety. The Solanum genus comprises over 1000 species, with about 100 indigenous African species, making it nearly cosmopolitan. Among these, the Gilo, Kumba, Shum, and Aculeatum cultivar groups are important in Africa, with Shum being highly cultivated for its leaves [6].

According to Akunneh *et al.*, Solanum species are commonly referred to as garden eggplants [8], comprising leaves, fruits, stems, and roots. Various tribes and ethnic groups have different names for garden egg plants. For instance, in Igbo, it is called "Aghara" (Anara) or "Afufa," "guata" in Hausa, "Anyara" in Efik, "Nya" in Ibibo, and "Igbaaja" in Yoruba. The leaves of garden egg plants are extensively utilized in managing diabetes mellitus. Additionally, they can be used by patients with raised intraocular pressure (glaucoma) and convergence insufficiency. Garden egg plants also offer cardioprotective effects, act as a good source of dietary fiber for promoting regular bowel movements, contribute to healthy skin and hair, and are useful in managing heart diseases.

In addition, Omovbude and Ikenwa noted that garden egg leaves have traditionally been used to address various ailments [9], including boils, stomach pains, and throat pains. The vegetables encompass a diverse range of plants whose leaves, fruits, or roots are commonly consumed and recognized as food by both urban and rural communities, guided by customs, habits, and traditions. They possess significant nutritional value, as they are rich in minerals, vitamins, proteins, carbohydrates, and dietary fibers. Consequently, they form a vital component of the human diet [10].

Garden egg leaves specifically belong to a particular species of the garden egg (aubergine) plant. They are considered natural "blood-pumping" vegetables, particularly when consumed raw. Garden egg leaves are regarded as curative and nutritious due to their composition, serving as remedies for specific ailments and alternatives to medical supplements. They contain essential nutrients such as Vitamin B, C, potassium, and calcium, which contribute to human health in various ways.

The leaves are known to possess detoxifying properties for the kidneys. Consuming garden egg leaves naturally aids in kidney cleansing by filtering the blood and preventing unwanted substances from entering the organ. The minerals present also assist in blood filtration. Additionally, the leaves promote healthy development, average weight, and help prevent congenital disabilities in unborn babies. Their anti-inflammatory properties make them suitable for reducing swelling and preventing inflammation-related diseases such as cancer. Garden egg leaves play a role in preventing cancer formation due to the presence of phytochemicals that combat free radicals known to cause inflammation leading to cancerous conditions in the body. The micronutrients in the leaves also aid in managing obesity and lowering cholesterol levels in the blood. By reducing cholesterol levels, weight reduction can be achieved while maintaining healthy, vibrant skin when consumed regularly in appropriate quantities. Regular consumption of garden egg leaves improves heart health, acts as a blood tonic for individuals with anemia, helps maintain heart condition and regulate blood pressure due to its potassium content, regulates heartbeat, lowers sugar levels due to the presence of magnesium, aids in proper digestion, reduces constipation, and helps prevent stomach ulcers [11].

According to Matsane and Oyekale [1], the involvement of small-scale farmers is crucial for agricultural development, as they represent the majority of participants in this sector. Profitable agriculture entails maximizing returns from resources invested, as well as engaging in formal markets. Marketing, which involves the flow of goods and services from producers to consumers, plays a vital role in the agricultural sector. The process begins on the farm with production planning to meet specific demand and market prospects [12]. Marketing information and market prices guide stakeholders in making informed decisions, aiding farmers in planning during the pre-planting stage and enabling the sale of surplus produce. Marketing plays a critical role in achieving overall economic development, food security, poverty alleviation, and sustainable agriculture, particularly for smallholder farmers in developing countries. Constraints in marketing arise from factors such as limited knowledge and utilization of market information, lack of

access to reliable high-value markets, inadequate storage facilities, and insufficient financial support, among others [1, 13].

2 Material and methods

The study was conducted in the Onitsha and Awka Agricultural zones. The Onitsha agricultural zone is situated in the southern part of Anambra State, with coordinates at approximately 60°05'80-21'N latitude and 60°44'7.41'E longitude. The zone is estimated to have a population of around 2 million people [11]. It consists of seven local government areas (LGAs): Ekwusigo, Idemili North, Idemili South, Ihiala, Ogbaru, Onitsha North, and Onitsha South. The landscape of the area is characterized as lowland, with an average temperature of 39 °C. The region experiences two distinct seasons, with the rainy season beginning at the end of March and lasting until the end of October, followed by the dry season from November to February. The presence of the city of Onitsha and its main market, which is the largest single market in the West Africa Sub-region, contributes to a high level of commercial activities. Additionally, several other markets in the zone facilitate the wholesale and retail marketing of various agricultural products.

The Awka agricultural zone comprises Anaocha, Awka North, Awka South, Dunukofia, and Njikoka local government areas (5). This zone serves as the seat of power, housing the state capital and important government establishments. It is located in a fertile tropical valley; however, much of the original rainforest has been cleared for farming and human settlements. The zone has a population of approximately 1,544,852 and a population density of 35,000/km^2, with coordinates at approximately 5.12680°N latitude and 7.36790°E longitude [11]. The presence of the seat of power in the area has led to the establishment of various markets that facilitate the sale of agricultural produce alongside other commercial activities. Similar to the Onitsha zone, the Awka zone experiences a rainy season from the end of March to the end of October, followed by a dry season from November to February.

2.1 Population and Sampling Technique

Table 1 Sampling of markets and respondents

Agricultural zone	LGAs selected	Markets selected	Intermediaries selected
Onitsha	Onitsha North	Ose market	10 marketers
		Ahia Nwanmega	10 marketers
	Onitsha South	Relief Market	10 marketers
		Ochnja Market	10 marketers
	Ekwusigo	Orie-Akpu Ozubulu	10 marketers
		Nkwo-Ozuluigbo	10 marketers
	Ihiala	Nkwo-Ogbe Ihiala	10 marketers
		Nkwo Okija	10 marketers
Awka	Awka North	Oye-Achalla	10 marketers
		Nkwo- Mgbakwu	10 marketers
	Awka South	Eke-Awka	10 marketers
		First Market Ifite	10 marketers
	Dunukofia	Afor-Umudioka	10 marketers
		Oye-Market Ukpo	10 marketers
	Njikoka	Oye-Nimo	10 marketers
		Nkwo-Enugwu-Ukwu	10 marketers
	8 LGAs	16 Markets	I60 Respondents

Source, Field Survey, 2023.

The study focused on garden egg leaf marketers operating in the Onitsha and Awka Agricultural zones of Anambra State, Nigeria. The sampling methods employed in the study included multistage, purposive, and random sampling. A total of eight local government areas (LGAs) were selected for the study, chosen randomly from the agricultural zones. Additionally, 16 daily markets that specialize in the sale of garden egg leaf (Agricultural Food) were purposively selected, considering factors such as the presence of a large number of intermediaries and consumers. This ensured representation from various market types.

In the final stage of sampling, ten garden egg leaf marketers were randomly selected from each of the 16 markets selected in the second stage. This resulted in a total of 160 respondents who participated in the study. The selection of respondents was based on the size and significance of the markets in the study area, ensuring a diverse and representative sample for the research.

2.2 Method of Data Collection

Data for the study were collected from primary source. Primary data were obtained using structured questionnaire to the respondents from the list of garden egg fruits marketers obtained that constituted the sampling frame for the study.

2.3 Method of Data Analysis

The study employed various analytical tools to analyze its objectives. Descriptive statistics, including tables, means, percentages, and frequency distributions, were used to examine the socioeconomic characteristics of the garden egg leaf marketers. Multiple regression analysis was utilized to determine the socioeconomic factors that influence net marketing income. The study also employed Enterprise Budgeting and Shepherd Futrell analysis to assess the profitability and economic efficiency of garden egg leaf marketing. Additionally, the Relative Importance Index was employed to identify the constraints faced in the marketing of garden egg fruits in the study area. These analytical tools provided valuable insights and allowed for a comprehensive exploration of the research objectives.

2.4 Model specification

The Budgetary Technique is expressed as:

$$NER=\sum PyxiYi-(\sum PxijXij + \sum Fij)$$

Where $\sum$ =sum
PyiYi= unit price × quantity of ith respondents' sales = Total revenue (TR) for ith respondent.
PxijXij = Prices X quantities of ith respondents' variable inputs= total variable cost (TVC) for jth respondent.
Fij = Depreciation values of equipment, annual rent for store, interest on loan, for jth respondents = Total fixed cost (TFC) for jth respondent.

TC = Total cost (TVC + TFC).

2.5 Marketing Efficiency

The marketing efficiency of marketers was achieved using the Sherpherd-Futrell technique which is considered as an accurate marketing efficiency. The coefficient of marketing efficiency is the total cost of marketing to total revenue expressed in percentage terms. It is specified as

The marketing efficiency

$$\text{ME} = \frac{TC}{TR} \times \frac{100}{100}$$

Where:
ME = coefficient of marketing efficiency
TC = Total marketing cost incurred
TR= Total value of product sold

The model was used to measure the influence of socio-economic characteristics on net marketing income of marketers (multiple regression model). Socioeconomic characteristics were as follows:

NMI=Net Marketing Income '
AGE= Age in years
GEN = Gender (dummy: male =0; female = 1)
MRS = Marital status
EDU = Educational level
SOF = Source of finance
HOS = Household size (number of persons living together)
MOD = Mode of delivery
EXP = Marketing experience
MKS = Marketing cost
PDP = Product price
OBT = Other business activity (dummy: member =0, non-member = 1)
BOP = Branding of product (dummy: member =0, non-member = 1)
e = Stochastic error term.

It is implicitly represented below as

NMI = β (AGE1, GEN2, MRS3, EDU4, SOF5, HOS6, TOU7, EXP8, MKS9, PDP10 ……e1)

Four functional forms of the regression models (linear, exponential, semi-log and double log) were used and the model that best fit was adopted as the lead model.

2.6 Acronyms

NMI= Net marketing income

The explicit versions of the functional forms are stated as:

Linear form:

NMI = β0 + β1AGE1 + β2GEN 2 + β3MRS3 +β4EDU4 +β5SOF5 +β6HOS6 + β7OBT7+β8BOP8 +β9EXP9 + β10MOD10+ β11 MKC11+ PDP12 +e1

Semi Log form

NMISN = β0 + β1logAGE1 + β2logGEN2 + β3logMAS3+β4EDU4 + β5SOF5 +β6HOS6 + β7OBT7+β8BOP8 +β9EXP9 +β10MOD10 +β11MKC11 + PDP12 + e1

Double Log form:

Log NMISN = β0 + β1log AGE1 +β2logGEN2+ β3logMAS3 + β4logEDU4 + β5logSOF5 + β6logHOS6+ β7logOBT7 + β 8logBOP8 +β 9logEXP9+ β 10logMOD10 + β11logMKC11 + PDP12 +e1

Exponential form:

Log NMISN = β0 + β1AGE1 +β2GEN2 + β3MRS3+ β4EDU4 + β5SOF5 + β6HOS6 + β7OBT7 +β8BOP8 +β9EXP9 + β10MOD10+ β11MKC11 + PDP12 +e1.

The Budgetary Technique is expressed as:

NER=∑PyxiYi-(∑PxijXij + ∑Fij)

Where ∑ =sum
PyiYi= unit price × quantity of ith respondents' sales = Total Revenue (TR) for ith respondent.
PxijXij = Prices X quantities of ith respondents' variable inputs= total variable cost (TVC) for jth respondent.
Fij = Depreciation values of equipment, the annual rent for store, interest on loan, for jth respondents = Total fixed cost (TFC) for jth respondent.

TC = Total cost (TVC + TFC).

2.7 Constraints to Garden egg-leaf marketing

The respondents were asked to rate the problems the face in garden egg marketing from a list of problems complied by the researcher. The relative importance index was used in determining the degree of importance of the problem as follows: Very important =4, Important =3, moderately important =2, Not important = 1. The responses on constraints to garden egg marketing were disaggregated as follows:

Where:
RII = $\sum$ W
RII = Relative importance index
W = Weighting given to each factor by the marketers (ranging from 1-4)
A = Is the highest weight
N = Is the total number of marketers.

To make an inferential statement, the mean score was compared with the critical mean, 2.5. If the calculated mean of a problem is greater than the standard critical value, then the problem is regarded as very serious.

3 Results and discussion

3.1 Socioeconomic characteristics of garden egg-leaf marketers

The socioeconomic characteristics of the marketers, as presented in Table 2, indicate that the majority of them fall within the age range of 25-35 years (56.25%). This suggests that they are relatively young and energetic. It was observed that some of these young marketers are children whose parents are involved in the enterprise, and they engage in hawking and selling in the market either for themselves or on behalf of their parents. Female marketers dominate the industry, and many of them are married. Notably, all the marketers in the study area possess basic literacy skills, contradicting the findings of Idris et al. [14], who reported a lack of formal education among 47.5% of onion marketers in Adamawa.

In terms of startup capital, the majority of marketers (75.63%) began their businesses with savings. This differs from the findings of Ekeke et al. [15], who emphasized the role of friends and relatives in providing financial resources for kick-starting agribusiness in Anambra State through social networks. Furthermore, a significant percentage (50.63%) of marketers reported that 5-8 individuals depend on the same income source for their livelihoods. To attract customers, the majority of marketers (91.87%) brand their products, giving them a competitive edge. Additionally, 47.5% of the marketers have 1-5 years of experience in the enterprise, with new entrants often being the children of existing marketers. A considerable proportion of marketers (54.37%) engage in both selling in the market and hawking in the street, events, and offices, surpassing those who solely sell in the market. Moreover, a significant percentage (76.87%) of marketers are involved in other business enterprises alongside their garden egg leaf marketing activities.

Table 2 Socioeconomic characteristics of garden egg-leaf marketers n=160

Variables	Frequency	Percentages
Age		
Less than 25	52	32.5
26-35	38	23.75
36-45	36	22.5
46-55	19	11.86
56 and above	15	9.37
Total	160	100
Gender		
Male	40	25
Female	120	135
Total	160	100

Marital Status		
Single	60	37.5
Married	79	49.37
Widow/Divorced	21	13.13
Total	160	100
Educational Status		
0-6	56	35.00
7-12	75	46.87
13-18	29	18.12
Total	160	100
Source of Finance		
Personal savings	121	75.63
Friends and relatives	39	24.37
Cooperatives/Isusu	-	-
Banks	-	-
Total	160	100
Household Size		
1-4	58	36.25
5-8	81	50.63
9 and above	21	13.12
Total	160	100
Branding of Product		
Branding	147	91.87
Non Branding	13	8.13
Total	160	100
Market Experience		
1-5	76	47.5
6-10	63	39.37
10 and above	21	13.13
Total	160	100
Mode of Delivery		
Selling in the market only	73	45.63
Selling and Hawking elsewhere	87	54.37
Total	160	100
Other biz Activities		
Yes	123	76.87
No	37	23.13
Total	160	100

Source, field survey, 2023.

3.2 Socio-economic characteristics that influence the net marketing income.

Table 3 presents the outcomes of four different functional forms used in the regression model to predict factors influencing garden egg marketing outcomes. The exponential form of the model yielded the most favorable results in terms of the number of significant predictors, the signs and magnitudes of the predictors, as well as the values of F-statistics, R^2, and adjusted R^2. Therefore, the exponential form was selected as the primary equation for analysis.

The coefficient of multiple determination (R^2) was calculated to be 75.0, indicating that 75% of the variation in the profit of actors involved in garden egg leaf marketing could be explained by the variations in the independent variables. The remaining 25% of the variation was attributed to error. The F-statistic value of 43.73 was found to be significant, affirming the overall significance of the regression analysis.

The regression equation is given as:

NMI = 0.32AGE-0.1541GEN+0.05079MRS+0.05079HOS-0.00546EXP-0.01096EDU+0.88370MKS+0.024PDP-0.00564SOF-0.0076MOD+0.0000030BOP+0.047930BT

Among the 12 independent variables included in the model, age, branding of the product, education, household size, and mode of delivery were found to have a statistically significant influence on the net marketing income of the marketers. On the other hand, gender, marital status, marketing experience, marketing cost, product price, source of finance, and other business activities were not found to be significant.

Table 3 Socio-economic characteristics that influence the net marketing income

Predicator	**Linear**	**Exponential**	**Semi-log**	**Double-log**
Constants	3396 (1.55)	0.3562 (1.02)	-265487 (-12.69)	4.08098(51.67)
AGE	-50.48 (-1.20)	-0.1541 -(1.87)*	11634 (.94)	0.0023 (0.93)
GEN	-647.4 (-1.25)	-0.00312 (-0.03)	-781.8 _(-0.81)	0.00598 (0.17)*
MRS	164 (0.14)	0.05079 (1.71)	-8686 (-0.76)	0.01056 (0.50)
HOS	195.3 (1.70)*	0.05079 (1.71)***	-223 (-0.05)	0.001090 (0.45)*
EXP	-42.6 (-0.29)	-0.00546 (-0.15)	02197 (1.01)	0.000565 (0.101)
EDU	3.1 (0.03)	0.01096 (0.14)*	5586 (1.01)*	0.00234 (21.10)*
MKS	0.32423 (15.79)***	0.88370 (12.34)	55.834 (30.34)	0.00000623 (13.23)
PDP	57.49 (8.32)***	0.0243 (10.34)*	1324 (10.32)	394 (0.18)
SOF	0.01396	-0.00564 (-1.09)	4321 (1.08)	278 (11.43)
MOD	0.090769 (37.24)	0.0076 (14.31)**	0.2341 (1.98)*	2921 (1.33)***
BOP	224 (0.09)	0.0000030 (30.32) **	234 (1.59)	3776 (0.34)
OBT	600.2 (1.59)	0.04793 (1.80)	-14.7 (0.81)	-3242 (1.34)
R2	74.2	75.0	68.4	74.7
R2 Adjusted	72.5	73.3	66.2	73.0
F- statistic	41.98	43.73	31.49	43.00

Source, Field survey, 2023.

The coefficient of age, although significant, displayed a negative relationship with net marketing income at a 10% probability level. This was contrary to prior expectations and suggested that older marketers, despite their accumulated capital and experience, tended to be outperformed by younger generations due to their age. This finding contrasts with the results reported by Onuka et al. [7], who observed that the number of commodities marketed increased as African eggplant traders advanced in age. The coefficient of household size exhibited a positive relationship with net marketing income and was statistically significant at a 5% probability level. This indicates that an increase in the number of household members leads to higher net marketing income. This aligns with prior expectations, as the involvement of

household members in selling or hawking the produce contributes to increased sales and income. This finding is in agreement with the work of Nkamigbo and Isibor [1]. The coefficient of education demonstrated a positive and significant effect on net marketing income at a 10% probability level. This implies that higher levels of education serve as a tool for increasing income, likely due to enhanced enlightenment and adaptability to changes in the marketing system. This finding is consistent with Onuka et al. [7], who found that traders with higher levels of education marketed larger quantities of products.

The coefficient of the mode of delivery had a positive and statistically significant effect on net marketing income at a 1% probability level. This suggests that having multiple disposal outlets leads to higher sales and income. Similarly, the coefficient of branding of the product exhibited a positive and statistically significant effect at a 5% probability level. This implies that adding value to the product through activities like washing and other enhancements contributes to an increase in net marketing income.

3.3 Profitability of garden egg leaf marketing

The enterprise budgeting analysis was conducted to estimate the monthly profitability of garden egg leaf marketing in the study area, as presented in Table 4. The analysis yielded various results, including total cost (TC), total revenue (TR), total variable cost (TVC), total fixed cost (TFC), gross margin (GM), net marketing income (NMI), and net return on investment (NROI), which are displayed in Table 3.

Table 4 Estimated monthly profitability of garden egg leaf marketing

Variable	**Parameters (₦)**	**Percentages (%)**
Total Revenue	1,986,500.00	
VARIABLE COST (VC)		
Purchases	1,315666.7	90.20
Transportation	33,850	2.32
Loading	51,133.4	3.51
Miscellaneous (Recharge car, water, food, nylon bag, small rope)	57,846.7	3.96
TOTAL VARIABLE COST (TVC)	1,458,496.7	99.99
FIXED COST (FC)		
Monthly shop rent	9,166.7	10.57
Ground levy	24,167.7	27.88
Depreciation on equipment (chair, table, wheelbarrow	9166.6	10.57
Local government charges	44,167.6	50.96
Interest on loan	-	-
TOTAL FIXED COST(TFC)	86,666.67	99.98
TOTAL COST TC=TVC+TFC	1,545,163.4	
Gross margin TR-TVC	528,003.30	
Net marketing income NMI=GM-TFC	441,336.63	
Return on investment TR/TC	1.3	
Net Return on Investment NMI/TC	0.28	
Gross Ratio TC/TR	0.77	
Marketing Efficiency TC/TRX100/1	77	

Source, Field survey, 2023.

From the results, it can be observed that out of the total cost of N1,545,163.40 incurred by the marketers, purchases accounted for 90.20%, while transportation expenses constituted the least at 2.32%. This finding aligns with the research by Isibor et al. [16], who highlighted that the purchase of stock is the most significant cost (97%) when analyzing the profitability of farmers involved in agribusiness through social networks. Many garden egg leaf marketers engage in bulk purchases, which are then transported to the markets where they operate. The availability of buses on these routes has reduced transportation costs associated with buying the product.

Regarding profitability, after incurring a total variable cost of N1,458,496.70 and a total cost of N1,545,163.40, the marketers generated total revenue of N1,986,500.00. This resulted in a gross margin of N528,003.30, a net marketing income of N441,336.63, and a net return on investment of 0.28. The net return on investment implies that for every 1 Naira invested in the business, the marketers earned a return of 28 kobo. Overall, the profitability indicators, including gross margin, net marketing income, and net return on investment, demonstrate that garden egg leaf marketing is a profitable venture in the study area. This finding is consistent with the research by Nkamigbo and Isibor [3], who reported that wholesalers and retailers achieved returns of 11 and 37 kobo, respectively, for every 1 Naira invested in the enterprise, further confirming its profitability.

3.4 Marketing efficiency of garden egg-leaf

The Sherpherd-Futrel method was used to determine the co-efficient of marketing efficiency. The method expresses marketing efficiency as the ratio of total revenue expressed as percentage. The lower the percentage, the better the marketing efficiency, since less proportion of the revenue will be expanded on total cost of marketing.

The model is stated as:

$$\text{ME} = \frac{TC}{TR} \times \frac{100}{1}$$

$$= \frac{18{,}541960.00}{20{,}238{,}000.00} \times \frac{100}{1}$$

$$= 91.6$$

Where:
ME = Marketing efficiency
TC = Total cost
TR = Total revenue

The result of the analysis revealed that marketers do not attain an efficiency of 100% in the marketing of garden egg leaf in the study area implying the existence of a good level of inefficiencies among the marketers.

Table 5 Constraints to Garden Egg Leaf Marketing

Constraints	Mean score	Rank
Seasonality of garden egg leaf	2.96	5th
Inadequate price control (Irregular prices)	3.15	2nd
Inappropriate storage facilities	2.49	6th
Perishable nature of garden egg leaf	3.58	1st
Low patronage	3.01	4th
Hazards associated with hawking	3.06	3rd
Temporal selling point	2.40	7th

Source, field survey, 2023.

The constraints associated with garden egg leaf marketing in the study area are summarized in Table 5. The findings reveal that the perishable nature of garden egg leaf is perceived as the most significant constraint in its marketing. This contrasts with the findings of Alawode et al. [17] and Chiekezi et al. [18] who reported that perishability is not a major factor in the marketing of pepper and fresh tomato in their respective study areas. Inadequate price control, leading to irregular prices, is another major constraint identified, which is consistent with the findings of Alawode et al., Onyia et al., and Isibor and Nkamigbo in their studies on fresh vegetables such as pepper, leafy vegetables, and tomato [17, 19-20].

Many garden egg leaf marketers engage in street vending, selling in offices, and at events in addition to the market. This practice exposes them to hazards such as accidents during transportation and interaction with inappropriate individuals, especially when minors are involved in hawking for their parents' economic support. Low patronage ranks fourth among the perceived constraints in garden egg leaf marketing. Situations such as unperceived sit-at-home orders due to calls for freedom in the South East region can adversely affect the product, causing it to decay after an extended period of unplanned closure.

Other constraints identified in the marketing of garden egg leaf, although not considered the most significant challenges, include seasonality of supply, inadequate storage facilities, and temporary selling points utilized by the marketers.

4 Conclusion

The findings on the socioeconomic characteristics revealed that a majority of the garden egg leaf marketers (56.25%) were within the age range of 25-35 years. There was also a notable presence of female marketers and married individuals. The results of the multiple regression analysis demonstrated that out of the 12 independent variables included in the model, age, branding of the product, education, household size, and mode of delivery had statistically significant influences on the net marketing income earned by the marketers. On the other hand, gender, marital status, marketing experience, marketing cost, product price, source of finance, and other business activities were not found to be significant predictors of net marketing income.

In terms of profitability, the study revealed that the garden egg leaf marketers, after incurring a total variable cost of N1,458,496.70 and a total cost of N1,545,163.40, realized a total revenue of N1,986,500.00. This generated a gross margin of N528,003.30, a net marketing income of N441,336.63, and a net return on investment of 0.28. The net return on investment implies that for every 1 Naira invested in the business, the marketers obtained a return of 28 kobo. Overall, the profitability indicators, including gross margin, net marketing income, and net return on investment, indicated that garden egg leaf marketing is a profitable venture in the study area.

The results of the economic efficiency analysis revealed that the marketers did not achieve 100% efficiency in the marketing of garden egg leaf, indicating the existence of significant inefficiencies among them.

The findings on the constraints affecting garden egg leaf marketing identified the perishable nature of the product, inadequate price control (resulting in irregular prices), hazards associated with hawking, and low patronage as the most significant constraints faced by marketers. However, factors such as the seasonality of garden egg leaves, inappropriate storage facilities, and temporary selling points were not found to be significant constraints.

Reiteratively, garden egg-leaf marketing in Awka and Onitsha Agricultural zones has been found to be a profitable venture, as evidenced by the positive values of gross margin, net marketing income, and return on investment. However, there are still existing inefficiencies among the actors in the market, primarily due to various marketing constraints. It is crucial for stakeholders to address these constraints in order to improve overall profitability. By addressing the necessary market challenges, it is expected that the profitability of garden egg-leaf marketing can be further enhanced.

Recommendation

Based on the findings of this study the following recommendations were made:

- There is a need for the government and stakeholders to provide a functional storage facility to reduce the level of losses associated with the product.
- There is a need to address the activities of middlemen by relevant stakeholders to combat the price fluctuation in the marketing of garden egg leaves.
- Underage children should be encouraged to desist from street hawking most especially during school hours.

Compliance with ethical standards

Disclosure of conflict of interest

The authors have declared no conflict of interest. All the authors have read through and accepted that the paper be published

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