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COSTING POSTHARVEST LOSSES IN SELECTED LEAFY VEGETABLE MARKETING IN LAGELU LOCAL GOVERNMENT AREA OF OYO STATE, NIGERIA

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Abstract

Global efforts at improving food and nutrition security should tackle the menace of crop losses. This study assessed postharvest losses in selected leafy vegetables marketing in Lagelu Local Government Area, Oyo State Nigeria. Multistage sampling procedure was utilized to select one hundred and ten (110) leafy vegetable marketers as study sample while structured interview schedule was used to gather relevant data on marketing costs and returns, cost of post-harvest losses to marketing as well as constraints to vegetable marketing in the study area. Data collected were analyzed with appropriate descriptive and inferential statistical tools. Results show that the sampled leafy vegetable marketers were female (100.0%) and married (80.9%) having average household size of 7±1.60 members. Age, years of formal education and marketing experience averaged 44.6±10.23, 3.35±1.52 and 14±3.2years, respectively. The average amount invested in leafy vegetable marketing per month was ₦52,932.73±16,698.78 while the average monthly income from leafy vegetable marketing was ₦72,354.91±25,599.35 leaving a marketing margin of ₦19,422.18. The monetary values for the monthly estimated postharvest losses incurred on marketing of Corchorus olitorus, Celosia argentea, Telfeira occidentalis, Solanum macrocarpon and Amaranthus spinosus were ₦898.19±206.14, ₦685.45±157.25, ₦810.90±186.03, ₦674.18±154.67 and ₦567.27±130.14, respectively.
Perishable nature of vegetables (1.53) and inadequate storage and processing facilities (1.44) were reported as the most severe constraints to leafy vegetable marketing in the study area. Age (t=3.785), years of formal education (t=-2.072), marketing experience (t=-5.226), amount invested in vegetable marketing (t=-22.637) and monthly income (t=21.36) all at p≤0.05, significantly determined postharvest losses in leafy vegetable marketing in the study area. In conclusion, the study established an appreciable level of postharvest losses to leafy vegetables marketing and recommended that marketers should be adequately trained in the areas of postharvest handling, processing and storage of leafy vegetables.

***Key words*:** *food and nutrition security, leafy vegetables, postharvest losses, Oyo State Nigeria*

INTRODUCTION

Post-harvest losses (PHL) describe losses that occur along the food supply chain basically from the farm gate to the table of the final consumer. Losses are encountered in handling, storage, transportation and processing thus resulting in the reduction of quantity, quality and market value of agricultural commodities [1]. Food losses and waste are a global problem, with an estimated 1.3 billion tons lost annually [5]. Over the past few decades, researchers have developed many different methods for measuring postharvest losses for fruit and vegetable crops, each focusing on different aspects of the value chain and on varying types of food losses [11].

Mechanical damage coupled with physiological and biological deterioration to insect pest and postharvest diseases are the main causes of postharvest losses [7]. Also, rodents and birds cause significant postharvest losses in fruits and vegetables. Losses caused by rodents and birds tend to be relatively small for vegetables when compared with damages incurred to rough handling, poor packaging and loss of quality to temperature stress. Postharvest losses of vegetables are

sometimes attributed to socioeconomic and institutional factors like inappropriate transportation facilities, inadequate marketing information and support systems, unfavourable government policies, inability to implement regulations and legislations, lack of appropriate tools and equipment and poor maintenance culture for available facilities and infrastructure among others [14].

Postharvest losses vary greatly with commodities, seasons, production areas and the level of infrastructural and technology development for postharvest management and market system [8] [10]. Huge knowledge gap exists in postharvest handling and management in spite of the existing rich knowledge of postharvest losses in vegetable production and marketing around the world [6]. Vegetables are severely damaged, with the exception of intensive treatment during harvesting, handling and transport. In African countries, vegetable losses are estimated to account for over 50% of total food production. Therefore, minimising these losses between yield and consumption of already produced food is generally more sustainable than higher production [9]. Most vegetables are naturally low in fat and calories. Therefore, they help to maintain healthy blood pressure. Dietary fibre from vegetables as part of an overall healthy diet helps to reduce blood cholesterol level and may lower the risk of heart diseases. Folate (folic acid) in vegetables helps the body form red blood cells. Vitamin A in vegetables keeps eyes and skin healthy and helps to protect against infections. In Nigeria, marketers suffer a lot because of the marketing techniques they employ. Transportation of the vegetables during different phases of marketing is mainly by the use of motor vehicles, cart, bicycles and farm animals while the transportation around urban centres is mainly by open, non-refrigerated trucks with capacities within the range of 10t to 30t [2]. Postharvest losses are as high as 30% in cereals, 50% in root and tubers and up to 70% in fruits and vegetables [7]. This can be attributed to the highly perishable nature of fruits and vegetables. In Nigeria like most developing countries, storage and packaging system are still very intolerable and so also is transportation which is very undependable. Market infrastructure in the traditional system is also poorly established. All these lead to post harvest losses which could be attributed to mechanical, physiological and pathological stress. Consultations on nutrition and chronic disease prevention recommended adequate consumption of fruits and vegetables [8]. Therefore, it is important not only to increase production, but also to minimize post-harvest losses in order to bridge the gap between the recommendations.

Against this background, this research sought to evaluate the cost of postharvest losses to leafy vegetable marketing in Lagelu Local Government Area, Ibadan, Oyo State, Nigeria. Specifically, the study described socioeconomic and enterprise characteristics of vegetable marketers; examined marketing margins of selected vegetables, estimated the cost of post-harvest losses to leafy vegetable marketing and identified major constraints to vegetable marketing in the study area. The study also tested relationship between selected socioeconomic and enterprise characteristics and cost of post-harvest losses to vegetable marketing in the study area.

MATERIALS AND METHODS

This study was carried out in Lagelu Local Government Area of Oyo State, Nigeria. The headquarters of Lagelu LGA is located in Iyana Offa area in Ibadan. Lagelu has a total land area of about 338km^2 and a population of 147,957 as given by census (2006). Farming is the main occupation of the people of Lagelu L.G.A. This includes large production and marketing of leafy vegetables, oil palm and black soap; thus traditional palm oil and soap making industries also thrive well in the study area. The population of the study consisted of all leafy vegetables marketers in Lagelu local Government Area of Oyo State.

The study utilized multistage sampling procedure to select the sampled respondents. At the first stage, 30% (5) of the 17 wards in the study area were purposively selected. The selected wards were Oyedeji, Monatan, Lalupon, Ejioku and Kuffi being the wards with the highest concentration of markets.

Second stage involved proportionate random sampling of 50% of the total number of markets having preponderance of leafy vegetable marketers from the selected wards resulting to 3 markets in Oyedeji, 2 markets in Monatan, 2 markets in each of Lalupon and Ejioku and lastly, 1 market from kuffi ward making up 10 markets in all.

Third stage involved proportionate random sampling of 50% of the total number of leafy vegetable marketers from each of the ten selected markets summing up to a total of one hundred and ten (110) leafy vegetable marketers as the study sample.

Primary data were collected from the selected leafy vegetable marketers selling five (5) selected leafy vegetable species, using structured interview schedule. Relevant information were collected on socioeconomic and enterprise characteristics, marketing margin, worth of vegetables loss to marketing and constraints to leafy vegetable marketing in the study area.

Descriptive and inferential statistics were utilized to analyze data collected. These include frequencies, percentages, mean and standard deviation, marketing margin analysis, weighted mean score, ranking and multiple regression analysis at $p \leq 0.05$.

Table 1. Selected leafy vegetables (LVs) considered in the study

No.	Scientific name	Common name	Local name
1.	*Celosia argentea*	Celocia	Efo-Soko
2.	*Amaranthus spinosus*	Amaranthus	Efo-Tete
3.	*Solanum macrocarpon*	Solanum	Efo-Gbagba
4.	*Telfeira occidentalis*	Telfeira	Efo-Ugwu
5.	*Chochorus olitorius*	Jute mallow	Ewedu

Source: Compiled by Authors, 2021,

Marketing margins of leafy vegetable marketing was determined using marketing margin analysis which is widely used in agricultural marketing researches e.g. [4]. Marketing margin amongst vegetable marketers refers to the difference between the selling price (SP) and purchase price (PP) by the vegetable marketers including cost of vegetables, transportation and other logistics:

$$MM = SP - PP \quad (1)$$

where:

MM = Marketing margin
SP = Selling price
PP = Purchase price

RESULTS AND DISCUSSIONS

Socioeconomic Characteristics of Leafy Vegetable Marketers in the Study Area

Results in Table 2 reveal that all the sampled leafy vegetable marketers were female most (80.9%) of who were in the age range of 30 to 59 years. Mean age was 44.6±10.23 years. Most (81.8%) of the respondents were married with an average household size of 7.0±1.60 persons. Agricultural production is dominated with male in Nigeria and sub-Saharan Africa as a whole while female dominates the agricultural products marketing terrain along the value chain. In the same vein, 90.0% of South African leafy vegetable marketers were female who were mainly above 60 years of age having average household size of 6 members [12]. Conversely, 35.0% of carrot and cucumber marketers in Enugu State, Nigeria were male [13]. Corroborating this, male involvement in fruit vegetable marketing is very common in the literature, unlike leafy vegetables.

Table 2 further shows that few (18.2%) of the respondents never attended school while the average years of formal education was 3.35±1.52 years. Level of formal education should impact vegetable marketers' postharvest handling knowledge thereby reducing losses to the barest minimum. Contrarily, more than half of carrot and cucumber marketers in Enugu State, Nigeria had secondary education [13] while over forty percent of South African leafy vegetable marketers had primary education [12]. Over a quarter (26.4%) of the respondents had leafy vegetable marketing experience of 6-10 years with mean of 14.0±3.2years. Respondents' vast experience is expected to help reduce post-harvest losses to marketing meaningfully. Fruit vegetables marketers had about 6 years of marketing experience in Enugu State, Nigeria [13]. Majority (67.3%) of the respondents had no secondary occupation which implies that their livelihood

is mainly earned from leafy vegetable marketing.

Table 2. Socioeconomic characteristics of leafy vegetable marketers in the study area

Variables	Freq.	%	Mean
Age (years)			
20-29	09	8.2	**44.6±10.23**
30-39	26	23.6	
40-49	37	33.6	
50-59	27	24.5	
60 & above	11	10.0	
Gender			
Female	110	100.0	
Marital status			
Single	04	3.6	
Married	89	80.9	
Widowed	17	15.5	
Household size			
1-5	30	27.3	**7±1.60**
6-10	73	66.4	
11-15	07	6.4	
Years of Formal Education			
No formal education	20	18.2	**3.35±1.52**
1-6	52	47.3	
7-12	38	34.5	
Veg. Marketing Experience (years)			
1-5	24	21.8	**14±3.2**
6-10	29	26.4	
11-15	16	14.5	
16-20	19	17.3	
21-25	22	20.0	
Secondary Occupation			
Artisanal engagements	30	27.3	
Trading	06	5.5	
None	74	67.3	
Membership of Veg. marketing association			
Members	87	79.1	
Non-members	23	20.9	
Marketing channels			
Directly to consumers only	93	84.5	
To both consumers & retailers	17	15.5	

Source: Field survey, 2021.

Most (81.8%) of the leafy vegetable marketers belonged to vegetable marketing associations which suggests ready availability of social capital base among the vegetable marketers which can readily avail them the opportunity to access business loan and high value bulk sales outlets among other benefits. Contrarily, none of the fruit vegetables farmers in Enugu State Nigeria belonged to any cooperative or marketing association [13].

Furthermore, 84.5% of the respondents (Table 2) market their leafy vegetables directly to the consumers, while 15.5% market their vegetables to both consumers and retailers. This indicates that the marketers strived to explore alternative marketing channels in order to minimize postharvest losses incurred.

Enterprise characteristics, marketing margin and benefit cost ratio of leafy vegetable marketing in the study area.

Table 3 shows that more than half (51.8%) of the sampled leafy vegetable marketers invested ₦44,000 - ₦63,000 on leafy vegetable marketing per month, while the average amount invested in leafy vegetable marketing per month was ₦52,932.73±16,698.78.

Table 3. Enterprise characteristics of leafy vegetable marketers in the study area

Variables	Freq.	%	Mean
Amt. invested in Veg. Marketing/Month			
₦24,000 - ₦43,000	27	24.6	₦52932.73 ±16,698.78
₦44,000 - ₦63,000	57	51.8	
₦64000 - ₦83000	22	20.0	
₦84000 - ₦103000	04	3.6	
Income from Veg. Marketing/Month			
₦31,600-₦56,900	24	21.8	₦72,354.91 ±25,599.35
₦57,000-₦82,200	52	47.3	
₦82,300-₦107,500	27	24.5	
₦107,600-₦132,800	07	6.4	
Total	**110**	**100.0**	
SP = Ave. Income from veg. marketing/month			₦72, 354.91
PP = Ave. Amt. invested in veg. marketing/month			₦52, 932.73
Marketing margin = SP - PP	₦72,354.91-₦52932.73		₦19, 422.18
BCR = TR/TC	₦72,354.91/₦52932.73		1.36

Source: Field survey, 2021.

This suggests that respondents were small scale marketers and the amount they invest in leafy vegetable marketing tends to limit their profit accordingly. However, 47.3% of the respondents earned between ₦57,000-₦82,200 as their monthly income from leafy vegetable marketing, while the mean monthly income from leafy vegetable marketing stood at ₦72,354.91±25,599.35. Respondents

realized an average marketing margin of ₦19,422.18 while the benefit cost ratio of their enterprise was 1.36. This implies that the respondents realized 36% return on investment. That is, for every ₦1 invested in leafy vegetable marketing, they realized 36 kobo profit. The enterprise is profitable and marketers tend to make higher profits during the dry season when vegetables command better value.

Cost of post-harvest losses to leafy vegetable marketing in the study area

Table 4 shows that more than half (54.5%) of the respondents incurred losses range of ₦200 – ₦599 per month on Celosia argentea marketing. Mean of postharvest losses in Celosia argentea marketing is ₦685.45±157.25. Table 4 further reveals that 74.5% of the respondents incurred losses between ₦200 - ₦399 to marketing of Amaranthus spinosus, while mean of monetary loss was found as ₦567.27±130.14. This may indicate a higher rate of Amaranthus spinosus consumption or reduced perishability compared to celocia. Over sixty eight percent (68.2%) of respondents incurred loss of ₦200 - ₦2,199 to Solanum macrocarpon marketing per month with an average postharvest loss of ₦674.18±154.67 monthly (Table 4). This portends low rate of Solanum consumption in the study area. Table 4 also shows that 36.4% of the respondents incurred loss of ₦400 - ₦649 per month with a mean loss of ₦810.9±183.1 to Telfaria occidentalis marketing per month. Though Telfeira has longer shelf life due to lower moisture content compared to other vegetables which should reduce the quantity lost to marketing but it commands higher premium also which would expectedly affect the cost of its postharvest losses compared to other leafy vegetables marketed in the study area. The estimated losses varied among marketers as a result of respective amount invested in vegetable marketing. Lastly, Table 4 shows 61.8% of the respondents incurred losses of ₦600 – ₦999 to Corchorus olitorius marketing per month, while the mean monetary loss was ₦898.19±206.14. This loss can be reduced if marketers could gain access to marketing outlets of better value. However, the proportion of marketing margin that is lost to postharvest marketing is highest in Corchorus (4.62) and least in Amaranthus marketing (2.92).

Table 4. Cost of post-harvest losses incurred by leafy vegetable marketers

Cost of estimated vegetable losses to marketing	**Freq.**	**%**	**% of MM lost to PHL in leafy vegetable marketing**
			Marketing margin for all vegetables =₦19, 422.18
Celosia argentea			
₦200 – ₦599	60	54.5	3.53
₦600 – ₦999	23	20.9	
₦1000 – ₦1399	25	22.7	
₦1400 – ₦1799	02	1.8	
Mean = ₦685.45±157.25			
Amaranthus spinosus			
₦200 - ₦399	82	74.5	2.92
₦400 - ₦599	22	20.0	
₦600 - ₦799	06	5.5	
Mean = ₦567.27±130.14			
Solanum macrocarpon			
₦200 - ₦2199	75	68.2	3.47
₦2200 - ₦4199	24	21.8	
₦4200 - ₦6199	08	7.3	
₦7200 - ₦9199	03	2.7	
Mean = ₦674.18±154.67			
Telfeira occidentalis			
₦400 - ₦649	40	36.4	4.18
₦650 -₦ 899	22	20.0	
₦900 - ₦1149	32	29.1	
₦1150 - ₦1400	16	14.5	
Mean = ₦810.90±186.03			
Corchorus olitorius			
₦200 - ₦599	17	15.5	4.62
₦600 - ₦999	68	61.8	
₦1400 - ₦1799	25	22.7	
Mean = ₦898.19±206.14			
Total	**110**	**100.0**	

Source: Field survey, 2021.

Constraints to leafy vegetable marketing in the study area

Respondents pointed out the major constraints to leafy vegetable marketing in the study area as presented in Table 5. Perishable nature of vegetable was ranked first as the most severe constraint to leafy vegetable marketing. Inadequate storage and processing facilities ranked second, while high cost of transportation was ranked third. However, insufficient capital availability and instability of vegetable prices were the least severe constraints faced by respondents in leafy vegetable marketing.

Table 5. Constraints to leafy vegetable marketing in the study area

Constraints	WMS	Rank
Perishable nature of vegetables	1.53	1st
Inadequate storage and processing facilities	1.44	2nd
High cost of transportation	1.32	3rd
High postharvest losses	1.15	4th
Poor demand for vegetable by consumers	0.65	5th
Insufficient capital/poor credit availability	0.6	6th
Instability of vegetable prices	0.34	7th

Source: Field survey, 2021.

Test of relationship between selected socioeconomic characteristics and postharvest losses to leafy vegetable marketing among respondents

Result of regression analysis is presented in Table 6. The coefficient of R^2 and Adjusted R^2 indicates that the model is well fitted. The number of significant variables is shown by t-value and their corresponding level of significant is shown by the p-value at ($p \leq 0.05$). Age (t=3.785), average amount invested in leafy vegetable marketing (t=22.637) and average monthly income realized from leafy vegetable marketing (t=21.36) were positively significantly related to postharvest losses to marketing. This suggests that aged marketers experience higher postharvest losses due to reduced agility that limit marketing activities among other reasons. Also, the higher the amount of money invested in leafy vegetable marketing, the higher the postharvest losses incurred by marketers and the same narrative goes for the average monthly income realized from leafy vegetable marketing. However, years of formal education (t= -2.072) and marketing experience (t= -5.226) were negatively related to postharvest losses of leafy vegetable marketing in the study area. This implies that educated marketers have access to high value markets like grocery stores and co thus minimizing postharvest losses. Also, as the vegetable marketers spend more years in leafy vegetable marketing, their experience increases and they tend to understand marketing dynamics better thereby lowering the post-harvest losses incurred to marketing. Negative relationships were found between years of education, household size, cooperative membership as well as extension support services and post-harvest losses of crops [3]. Similarly among other variables tested, significant relationship existed between educational status as well as selling price and postharvest losses of horticultural crops [15].

Table 6. Result of Multiple Regression Analysis

Variable	Coefficient	t-value	Probability
Constant	0.000	80.247	0.000
Age	0.02**	3.785	0.000
Family size	0.002	0.178	0.859
Years of formal education	-0.046**	-2.072	0.041
Vegetable marketing experience	-0.03**	-5.226	0.000
Ave. income from veg. marketing/Month	0.001**	21.36	0.000
Ave. amount invested in veg. marketing/Month	0.000**	22.637	0.000
R^2	0.847		
Adjusted R^2	0.836		
F (6,101)	92.862		
Prob>F	0.000		

Source: Field survey, 2021.

CONCLUSIONS

Based on the findings of this study, it was concluded that most of the leafy vegetable marketers are middle aged married women with little or no formal education. The cost of postharvest losses in leafy vegetables marketing was relatively appreciable. The most severe constraints to marketing faced by the marketers included perishable nature of vegetable, inadequate storage and processing facilities and high cost of transportation while the least severe constraint was capital/poor credit availability and instability of vegetable prices, these accounted for the high post-harvest losses in leafy vegetable marketing. Significant variables related to the level of postharvest losses included age, years of formal education, vegetable marketing experience, average monthly income from vegetable marketing and average amount invested in vegetable marketing per month. Based on major findings of this study, it is recommended that leafy vegetable marketers should be encouraged to explore training opportunities on improved postharvest

handling and better marketing strategies through their cooperative societies. Specialised distinct markets should be organized for the leafy vegetable marketers by the government as it is done in developed countries to attract consumers and gain better marketing values. Government and other private investors should invest in postharvest processing technologies and establish processing industries to reduce postharvest losses while leafy vegetable marketers are adequately trained in the areas of vegetable handling, storage and transportation.

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