

Non Parametric Analysis of Post-harvest Loses Among Tomatoes (*Solanum Lycopersicum*) Marketers In Bodija Market Ibadan, Oyo State, Nigeria

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Abstract: Tomato marketer suffers economics loss due to non-standardise handling of the produce. The study was conducted to examine the problems associated with postharvest loses among tomatoes marketers in Bodija market, a major tomatoes market hub in Ibadan, Oyo State, Nigeria. Data were collected with the aid of structured questionnaire from sixty respondents using simple random sampling technique and analysed with descriptive statistics. 55.0% of the respondents were within the ages of 40-49years and were mostly female (76.7%) with over 10 years of marketing experience. Wooden basket (62.0%) was mostly used for packaging of tomato and transported by car (38.3%) to the market. It was found that both engineering and non-engineering nature among which high cost of transportation scored high($x = 2.70$). Engineering approach tomato at post-harvest should be intensified so as to increase its availability among consumers.

Keywords: Tomato, Handling, Storage, Marketing.

1. Introduction

Tomato (*Solanum lycopersicum*) is a fruit vegetable universally known, widely consumed and grown staple food in the world. Tomato is botanically referred to as fruit but when used for cooking it is classified as vegetable [1]. It a source of mineral and essential vitamins in human diet [2], [3]. Tomato is a major vegetable crop that has achieved tremendous popularity over the last century. World Tomato production in 2001 was about 105 million tons of fresh fruit from an estimated 3.9 million hectare [4]. Because of high demand for this fruit, Tomatoes are cultivated in almost every country of the world as cash and industrial crop due to its versatility. It is available as fresh tomatoes or process as purees, juice or ketchup. The quality and nutritional value of fresh tomato is affected by pre-harvest, harvest, post-harvest handling and storage practices [5], [6].

Fresh and processed produce are sold on the farm, at the farm gate, locally or regionally via wholesale or retail operations, or through exports to other countries. However, [7] identifies six basic marketing alternatives available to the tomato grower: wholesale markets, cooperatives, local retailers, roadside stands, pick-your-own operations, and processing firms. When deciding how to market your fresh

and processed produce, each postharvest handling step taken provides an opportunity to make additional profits [8], [9]. The high moisture of vegetable makes their handling, transportation and marketing a special problem. The deterioration of the product starts during the harvesting operations, because fresh tomatoes are inherently perishable. The causes of tomato losses included physical damage during handling, and transport, physiological decay, water loss, or sometimes simply because there is a surplus or glut in the market. Improper postharvest sanitation, poor storage and packaging practices and mechanical damage during harvesting, handling and transportation resulting from vibration by undulation and irregularities of the bad road network can enhance wastages ([10], [11], [12]). Owing to the dearth of information on the appropriate postharvest technology for prolonging the shelf life of tomatoes, this survey, therefore, was conducted in order to source for information on the post-harvest challenges faced annually and possible engineering design of postharvest handling machine for the commodity. This survey was carried out to scrutinize post-harvest loses in tomato among marketers in Ibadan North Local Government Area of Oyo State.

2. Materials and Methods.

The study was conducted in Bodija Market, a popular

open-air market located in Bodija, a district in Ibadan North local government of Oyo State, South Western Nigeria. The market is strategically located close to interstate road network that allows produce farmers from Northern Nigeria and from Northern Oyo state easier access to transport their produce to the market. The design of the market is such that each produce such as pepper, beans, rice and yam has its own rows of stalls. The market is a mixture of open space trading, concrete and wooden stalls. The study population comprises of tomato sellers in Bodija Market in Ibadan North Local Government Area in Oyo State. Data were collected by means of well-structured questionnaires, which were administered to correspondents in the study area. To ensure that information gathered were true representation of what should be obtained; unstructured question(s) were used where possible to allow the respondents view on certain issue(s). Two hundred and twenty tomato sellers were interviewed using simple random sampling technique. Some of the issues addressed by the questionnaires include: (1) socio-economic characteristics of the respondents. (2) The problem associated with packaging, transportation and storage of tomato. (3) constraints experienced by the seller. Out of these 220 respondents, only 200 respondents completely filled the questions or returned the questionnaire. This represents 0.91 of the distributed questionnaire were available for analysis.

The data collected were analyzed with the aid of the descriptive statistics (frequency count, percentages, mean) and inferential statistics (Chi-square) were used to test the study hypothesis.

3. Result and Discussion

Socioeconomic Features of the Respondents.

Analysis of the socioeconomic feature of the respondents (Table 1) revealed that 76.7 % of the respondent were female while males constitute 33.3%. This translates to the ratio 2:1 (female : male) respondents indicating that marketing of tomato in the study area was female dominated. This is consistent with the fact that Production activities in farming is labour intensive and are male dominated, while female mostly engaged in processing and marketing activities. The age distribution of respondents showed that 55.0% of the respondents were between the age bracket of 40 – 49 years, and very few were between 49 years and above. This implied that tomato marketers were in their active age and were very agile. Further analysis of socioeconomic features showed that 45.0% of the respondent had no formal education, those with secondary education were 25% and 20 % had primary education while tertiary education were 10% respondents. The findings show that more than half of the respondents had formal education. Sixty-three (63.3%) of the respondents were married, 13.3 % were widow/widower and 18.3 % were single while 5.0 % were divorced (Table 1). The business size of the respondents were of both small holding size (78.7 %) and medium sizes (21.3 %). The distribution of tomato sellers by number of years of experience showed that 46.4 % of the tomatoes sellers have over 10 years of marketing experience while 34.6 % have 6 – 10 years experience in selling tomato.

Tomato Post harvest/Storage Handling and Problems

Sixty-two percent 62% of the tomato sellers uses woven basket to package their tomatoes, 20.00 % uses plastic bowl

while 15.00 % of the respondents uses carton for packaging (Table 2). Metal bowl was not a common packaging material for tomatoes in the study area though it was the least material (3.33 %) used for packaging. Woven baskets of various sizes are commonly used for packing tomatoes in Nigeria because they are cheap, allow aeration, reusable and provide good protection from mechanical damage [13]. Tomato are usually transported to the market by mainly cars (38.3%), some (20%) used pickup van while 23.3% and 15.00% of the respondents use trucks and motorcycle respectively (Figure 1). Only 3.3% of the respondents always use their head to convey tomatoes to market in the study area. This result supports the assertion of [14] that transportation of tomatoes should be done in well ventilated vehicle, which should be covered to prevent direct sunlight.

Majority (41.7%) of the tomato sellers spread tomato in the room as a method of storage, many (31.7%) store tomatoes on the counter while few (8.3%) of respondent used refrigerator as method of tomato storage. Other storage methods employed were wooden box and paper carton (Figure 2). Post-harvest handling of tomato have been constrained by 3 categories of problems (high, medium and low constraints - Table 3). Strenuous process of converting tomato into paste (123.3), high cost of transportation (136.7) and lack of modern processing facilities (106.7) were the high constraints to tomato post-harvest handling. Similarly, the medium constraints to tomato post-harvest handling include, inadequate financial support (110), low demand for dried tomato (96.7) and lack of technical know-how on post-harvest of tomato (96.7 - Table 3). Inadequate market information on tomato constitutes the only low constraint (133.3) to tomato post-harvest handling (Table 3).

Effects of Socio-economic features on Postharvest Handling of Tomato

The contingent table analysis of the effects of socioeconomic features of the respondents on the usefulness of tomato as a result of prolonged storage indicated that more females found tomato useful after prolonged storage than males. This was supported by the proportional ratio (0.78:0.22) of females which is greater than that of male (0.76:0.24) and this result ($(\chi_{(2)}^2 = 0.086)$) was however not significant ($P < 0.1$ - Table 4). The married returned the highest proportionate ratio of 0.80:0.20 in favour of usefulness of prolonging tomato (Table 4). This was followed by the respondent singles (0.76:0.24) and the least proportionate ratio was that returned for the respondents who are divorced (0.69:0.31). This result ($(\chi_{(2)}^2 = 12.27)$) was significant ($p < 0.1$ Table). There exist no significant difference between the observed and the expected response on the beneficial status of prolonging tomato by occupation of the respondent because the test statistics ($\chi^2 = 6.152$) was not significant ($p < 0.1$). Highest proportional ratio (0.87:0.13) was obtained for the respondents who were farmers (Table 4) and was followed by that returned for those who were traders (0.84:0.16). The least proportionate ratio (0.70:0.30) was obtained for both the civil servant and the students (Table 4).

The categorical analysis of the effects of socioeconomic feature of the respondents on storage as a source of financial gain indicated that there exist relationship between their gender and financial increment (Table 5). More females were

beneficial from tomato storage than the male. The proportional ratio of female that benefit to those that do not benefit (0.87 : 0.13) was greater than that of male counterpart(0.76 : 0.24). This result ($\chi_{(2)}^2 = 3.729$) was significant ($p < 0.1$ - Table 5). Similarly the age group with the highest proportion of benefiting from tomato storage through financial increment was those above 49years (Table 5). This was followed by the age group 29 – 39 years with the proportional ratio of 0.88: 0.12 and the result ($\chi_{(2)}^2 =$

6.786) was significant ($p < 0.01$). More of the widow respondents make more financial gain from storage of tomato. This was followed by respondent who were married (0.86:0.14) and this result ($\chi_{(2)}^2 = 17.097$) was significant ($p < 0.01$ - Table 5). The contingency analysis of the effect of socioeconomic features by climate change on tomato storage indicated that more of the female respondent 71 were

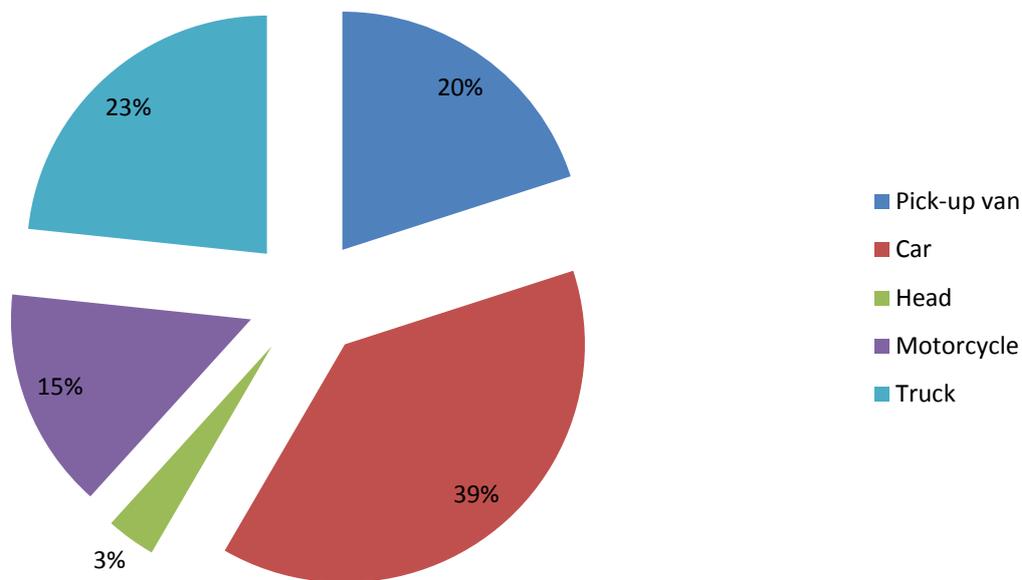


Figure 1: Mode of transportation employed by the respondent.

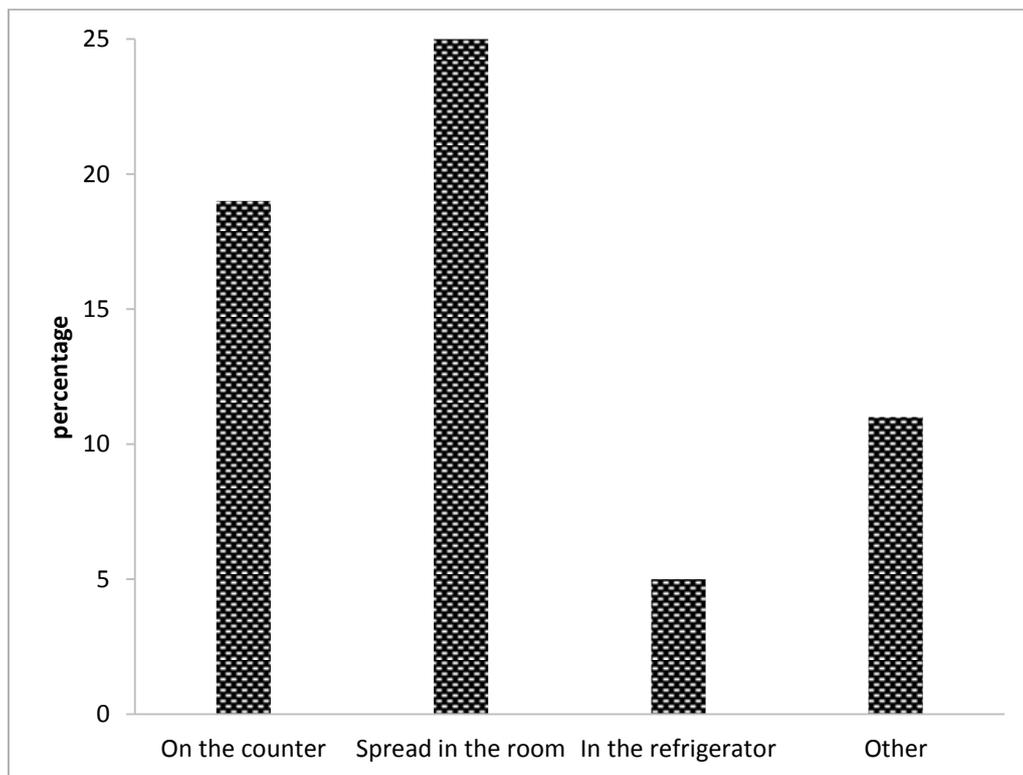


Figure 2: Method of tomato storage employed by the respondents

Table 1: Socio economic characteristics of the respondent (n = 200)

Variables		Frequency	Percentage (%)
Sex	Female	47	76.67
	Male	13	33.33
Age (Year)	15 – 29	11	18.33
	29 – 39	13	21.67
	40 – 49	33	55.00
	49 Above	3	5.00
Educational qualification	No formal education	27	45.00
	Primary	12	20.00
	Secondary	15	25.00
	Tertiary	6	10.00
Marital Status	Single	11	18.33
	Married	38	63.34
	Divorced	3	5.00
	Widowed	8	13.33
Religion	Islam	21	35.00
	Christian	32	53.33
	Traditional	7	11.67
Size of business	Small holding	47	78.33
	Medium size	13	21.67
	Large scale	0	0.00
Marketing Experience (Years)	Less than 5	21	19.09
	6 – 10	38	34.55
	Above 10	51	46.36

Table 2: Distribution according to packaging materials used for Tomatoes (n=60)

Materials used	Frequency	Percentage (%)
Woven basket	37	61.67
Plastic bowl	12	20.00
Metal bowl	2	3.33
Carton	9	15.00

Table 3: Constraints to Tomatoes Post-harvest Handling.

Variables	High Constraint	Medium Constraint	Low Constraint	Mean	Rank
Inadequate financial support	70.0	110.0	20.0	2.25	4
Processing of tomato into paste is strenuous	123.3	56.7	20.0	2.51	2
Low demand of dried tomato	10.0	96.7	93.3	1.58	6
Inadequate market information in tomato	30.0	36.7	133.3	1.48	7
High cost of transportation	136.7	46.7	16.7	2.70	1
Lack of technical know-how on post-harvest	43.3	96.7	60.0	2	5
Lack of modern processing facilities	106.7	60.0	33.3	2.37	3

Grand mean = 14.89, Constraint level = 2.0

Table 4: Effects of Socio -Economic Features On Tomatoes Usefulness Because of Prolongation

	Options	NO	YES	Total	P _(No)	P _(Yes)	CHI-SQUARE VALUE
Sex	Female	18	64	82	0.22	0.78	0.086
	Male	28	90	118	0.24	0.76	
Marital status	Divorced	4	9	13	0.31	0.69	12.27***
	Married	19	77	96	0.20	0.80	
	Separated	3	0	3	1.00	0.00	
	Single	20	64	84	0.24	0.76	
	Widowed	0	4	4	0.00	1.00	
Occupation	Civil servant	15	35	50	0.30	0.70	6.152
	Farming	4	26	30	0.13	0.87	
	Student	16	37	53	0.30	0.70	
	Trading	11	56	67	0.16	0.84	

Table 5: Effects of socio- Economic characteristics on Tomato Storage and Financial increment

	Options	NO	YES	CHI-SQUARE VALUE
Sex	Female	11	71	3.279*
	Male	28	90	
AGE	15-29	19	54	6.786*
	29-39	9	65	
	40-49	11	35	
	49 Above	0	7	
Marital status	Divorced	4	9	17.097***
	Married	13	83	
	Separated	3	0	
	Single	19	64	
	Widowed	0	4	

benefited by the climate change and the tomato storage than men (98). This was because the proportionate ratio of female benefiting from climate change and tomato storage (87:13) was higher than those of the male counterpart which was (87:17). This result ($\chi_{(2)}^2 = 0.461$) was not significant ($p < 0.1$ - Table 6). Also, no significant trend was obtained for the effect of age as affected by climate change on tomato storage because all the age group affirmed that they were positively

affected by climate change hence tomato storage became a beneficial venture for them (Table 6). The age group 29 – 39 years returned the highest respondent (62) in favor of beneficial effects of climate change on storability of tomato (Table 6). The age group returned a proportionate ratio of 0.84:0.16 in affirmation of the positive effects of climate change on storability of tomato (Table 6). This was followed by result ($\chi_{(2)}^2 = 14.762$) was significant ($p < 0.01$ - Table 6).

Table 6. Effects of Socio Economic Features on climate change

	Options	NO	YES	Total	P _(No)	P _(Yes)	$\chi_{(2)}^2$
sex	Female	11	71	82	0.13	0.87	0.461
	Male	20	98	118	0.17	0.83	
AGE	15-29	16	57	73	0.22	0.78	14.762
	29-39	12	62	74	0.16	0.84	
	40-49	0	46	46	0.00	1.00	
	49 Above	3	4	7	0.43	0.57	
Marital status	Divorced	0	13	13	0.00	1.00	4.477
	Married	15	87	102	0.15	0.85	
	Separated	0	3	3	0.00	1.00	
	Single	16	68	84	0.19	0.81	
	Widowed	0	4	4	0.00	1.00	
Occupation	Civil servant	11	39	50	0.22	0.78	20.492
	Farming	0	30	30	0.00	1.00	
	Student	16	37	53	0.30	0.70	
	Trading	4	63	67	0.06	0.94	

4. Discussion and Conclusion

The prime requirement of any new technology is for it to be demand-driven and this forms a basic factor for its successful adoption. This study was conducted to assess the postharvest handling activities of tomato with a view to establishing the basis for suitable postharvest handling machine. It had earlier been established that postharvest losses were experienced in tomato farming [14]. Our study in addition established the associated problems with postharvest handling of tomatoes in Ibadan. The postharvest constraints which were divided into 3 levels were both

engineering and non engineering related and some of the problems were similar to the findings of [15], [16] and [3]. Similarly, the engineering aspect of post-harvest handling of tomato in Nigeria has been conducted [13]. This work however established the basis for these engineering efforts. The engineering constraints of the postharvest handling of tomatoes fall in the medium type constraints as established in the study and this connotes the desirability of any postharvest improvement machine.

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