

Storage Losses To Fruit And Vegetable Traders In Chitima Market, Masvingo, Zimbabwe

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Abstract: *The study assessed the nature and causes of storage losses incurred by informal fruit and vegetable traders in Masvingo, Zimbabwe. A survey was conducted and questionnaires were administered to various respondents in the informal sector of fruits and vegetables. The research study assessed the profitability of trading in fruits and vegetables to informal traders at Chitima market in Masvingo. An assessment of the traders' perception of the storage losses of fruits and vegetables and possible ways of reducing these storage losses so as to enhance profitability in the sector was carried. The study from a sample of 25 respondents revealed that informal traders experience losses during storage of their fruits and vegetables. Storage losses incurred by the fruit and vegetable traders during storage were due to the unavailability of proper storage facilities. This resulted in excessive exposure of fruits and vegetables to sunlight, attacks by insect pests as well as microbial or disease attacks. Storage losses affect profitability and growth of the fruits and vegetables sector. There is need for fruit and vegetable producers to improve on the quality of their produce and harvesting techniques as indicated by traders. Some storage losses were a result of poor quality produce supplied. Further storage practices should be improved by the traders on the provision of suitable storage equipment and storage conditions.*

Keywords: *Food security, Storage, vegetables, fruits, profitability, quality*

I. INTRODUCTION

Globally, there is population explosion which is expected to reach 10.5 billion by 2050. This population explosion demands the increase in the production and conservation of agriculture and food resources. In order to ensure food security, the production of the food should increase at least by 60% in order to meet the food demand in 2050, FAO (2013). Chebanga et al (2018) points out that Zimbabwe's economy mainly relies on agriculture and about 70% of the population depends on agriculture. However, storage losses of agricultural produce remain a concern for most of the farmers. The losses due to poor storage practices are both qualitative and quantitative food loss along the supply chain. Storage losses of fruits and vegetables can be qualitative and quantitative. Qualitative losses result in the reduction in the quality and consequently, the value of the food item. On the other hand, quantitative losses results in a reduction in weight and consequent loss in total value. Losses in quantity have been

found to be more common in developing countries, Kitinoja et al (2015). According to FAO (2013), at a global level, volumes of lost and wasted food in high income regions are higher in downstream phases of the food chain, but just the opposite in low-income regions where more food is lost and wasted in upstream phases. These losses need to be reduced so that traders may realize reasonable profits and contribute immensely to economic growth and poverty reduction in the country. There is need to assess traders' perception of the storage losses of fruits and vegetables, to examine the major causes of storage losses to informal traders, as well as to assess the profitability of fruits and vegetables trading to informal traders in Masvingo, Zimbabwe. The study assesses the causes of fruit and vegetable storage losses at Chitima Market in Masvingo and determines major solutions. The findings from the study will help to provide valuable information to fruit and vegetable traders on appropriate measures they should implement to reduce storage losses and enhance profitability of their business.

II. MATERIALS AND METHODS

The research was conducted in Masvingo Province in Zimbabwe. Masvingo province is located in the low veld of the country where rainfall is minimal and uncertain. It has a population of 1.485 million ranking fifth out of Zimbabwe's ten provinces. Its economy is largely centered on agriculture and tourism. The study area is the central business district of the town. In Zimbabwe, most of the fruit and vegetable traders operate in the informal sector hence the decision to mainly focus on the informal sector that is comprised of fruit and vegetable vendors. The formal traders are mainly retail outlets and wholesalers. Research was carried out using a variety of data collection methods to enhance the validity and reliability of the data collected. Primary and secondary data sources were used in the study. Secondary data collection involved gathering data that already existed either from internal sources of the company, documentation from governmental and non-governmental institutions, and free access data on internet, in professional newspapers, journals and magazines. Primary data collection involved the use of original primary data collected by the researcher. Telephone surveys, questionnaires and direct observation were used as primary research instruments. Field research was also performed for correct data analysis of the study.

DATA COLLECTION

The study used questionnaires as the research instrument of data collection and a total of 25 questionnaires were administered. The information required from the questionnaire was about the types of fruits and vegetables traded by the fruit and vegetable vendors, fruits and vegetables storage equipment used, fruits and vegetables losses in storage as well as profitability. Random sampling was used as a method of selecting respondents and the results of the survey were analyzed and presented as percentages.

DATA ANALYSIS AND ORGANIZATION OF DATA

All the data that was collected from the respondents was entered into the Statistical Package for Social Sciences (SPSS). SPSS 14.0 was used for data analysis and generation of outputs. Qualitative and Quantitative analysis of data was done in order to produce an informative research. Graphs and charts were used in the study to represent diagrammatically the findings of the research so as to identify important variables, and their significations.

The type of data that was required to fulfill the research objectives is outlined below:

OBJECTIVE	DATA REQUIRED	DATA COLLECTION METHOD
To assess the traders' perception of storage loses of fruits and vegetables	Information about storage losses, causes and impacts	Questionnaires Observations
To assess the causes of storage losses incurred by informal traders at Chitima	Information about fruit and vegetable storage techniques, How	Observations Questionnaires Interviews

market in Masvingo	this causes losses	
To assess the possible mitigation strategies for the storage losses	The actions fruit and vegetable vendors are taking to reduce losses and increase profits	Interviews Questionnaires

III. RESULTS

DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

GENDER, MARITAL STATUS AND THE AGE OF THE RESPONDENTS

Data pertaining to distribution of gender status of the sample respondents is shown in Fig. 1. Of the 25 respondents from the informal traders only 44% of them were male while a larger proportion of these informal traders were females (56%).

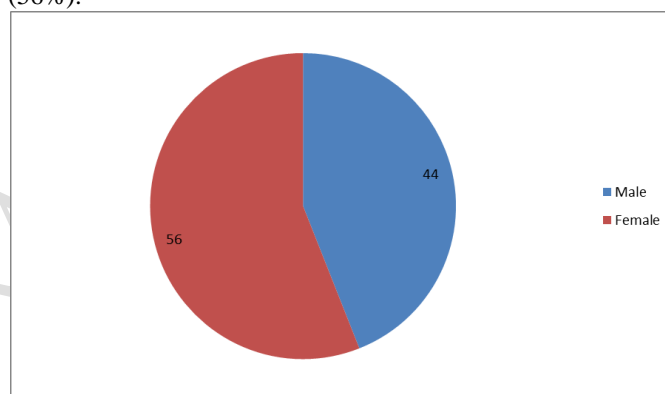


Figure 1: Distribution of gender status for respondents

Table 1 shows that the majority of the respondents in the informal traders were married (48%) while 32% were single, 12% widowed and 8% were Divorced. The lowest proportions of the respondents were divorced comprising only 8% of the informal traders.

DESCRIPTION	FREQUENCY	PERCENTAGE (%)
Single	8	32
Divorced	2	8
Widowed	3	12
Married	12	48

Table 1: Distribution of marital status of respondents

Data regarding the age distribution of the respondents from the informal traders is presented in Fig. 2. This data reveal that the age of the traders was ranging from 15years to 65years. The highest number of respondents was recorded from the 45-54 years age group while the age group 55-65 years recorded the least (8%) number of respondents. Many households in cities supplement their incomes by means of various forms of informal activities, Kirby (2006). This could explain the fact that almost half of the respondents were below the age of 40.

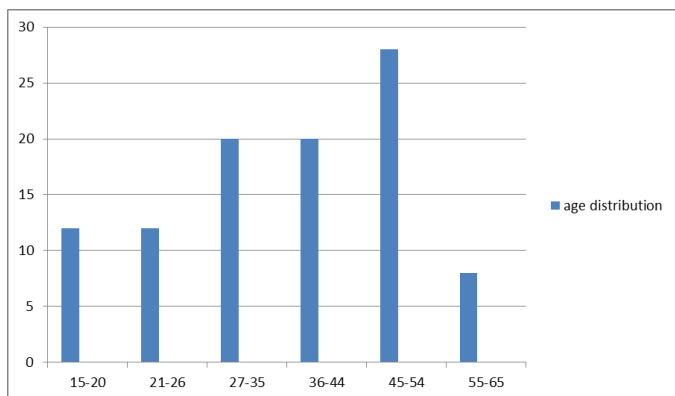


Figure 2: Age distribution of respondents

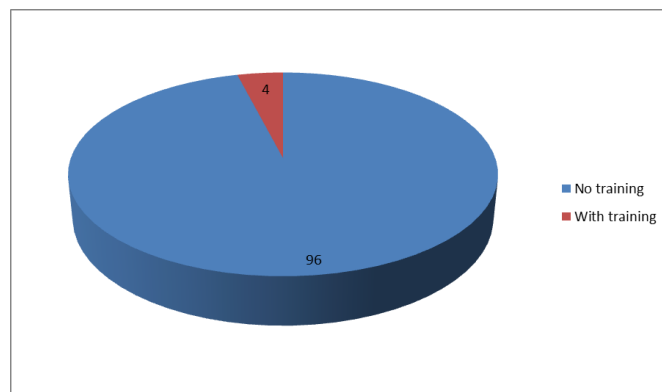


Figure 4: Distribution for Postharvest training acquired

DATA PRESENTATION AND ANALYSIS

LEVEL OF EDUCATION ATTAINED, PERIOD IN BUSINESS AND TRAINING ON POSTHARVEST HANDLING

Fig. 3 shows the data regarding the highest academic qualification attained by the sample respondents in this study. This data indicates that most of the respondents from the informal traders have Secondary level (36%) followed by Ordinary level (32%) qualification. The academic qualification with the least number of respondents from the informal traders was from those with no schooling at all and with Advanced level with 4%. The rest of the sample respondents either went to school up to Grade 7 or had some secondary education.

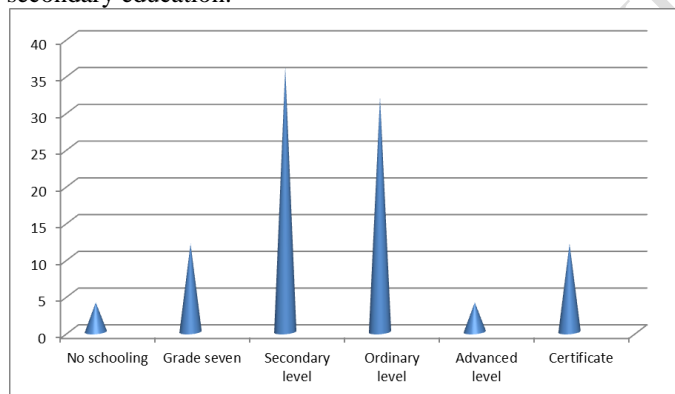


Figure 3: Education levels of respondents

Time Period in years	Frequency	Percentage (%)
More than 5 years	21	84
Less than 5 years	4	16

Table 2: The time period in years the respondent has been in the fruit and vegetable business

Table 2 indicates that 84% of the informal traders have been in the fruit and vegetable business for more than 5 years, and 16% of the respondents were under 5 years in the business.

The results from the study survey indicate that 96% of the informal traders do not have any training regarding storage of the fruits and vegetables which they sell (Fig. 4). However, only a few fruit and vegetable traders constituting 4% have got some general training from wholesale traders where they buy their fruits and vegetables for re-sell.

FRUITS AND VEGETABLES TRADED

Various fruits and vegetables are traded by the informal traders at Chitima market in Masvingo, Zimbabwe. Information relating to the most commonly traded fruits and vegetables by the informal traders is shown in Table 3. The study revealed that all the informal traders sell all types of fruits and vegetables. However, these fruits and vegetables may not be found all at the same time on their tables because of availability from the supply sources but they do sell all types of fruits and vegetables. The two most common sources of fruits and vegetables are local producers and Mutare, Zimbabwe. All the respondents indicated that they buy locally from local fruit and vegetable producers and Wholesalers. 70% of the sample respondents indicated that they also buy some of their fruits and vegetables from Mutare, Zimbabwe. Apples, grapes, peaches, pears, bananas and onions top the list of fruits and vegetables that the traders buy from Mutare.

Fruit/Vegetable	Source
Oranges	Local Producers/Mutare
Nutches	Local Producers/Mutare
Betruide	Local Producers
Spinach	Local Producers
Tsungu	Local Producers
Onions	Local Producers/Mutare
Cabbage	Local Producers
Covo	Local Producers
Rape	Local Producers
Pepper	Local Producers
Tomatoes	Local Producers
Oranges	Local Producers/Mutare
Grapes	Mutare
Bananas	Mutare
Plums	Mutare
Pears	Mutare
Apples	Mutare
Peaches	Mutare
Onions	Local producers/Mutare
Potatoes	Mutare

Table 3: The most common type of fruits and vegetables sold and their Supply sources

STORAGE METHODS

The following storage methods used by the informal traders gives us more information on how these traders store their fruits and vegetables in order to reduce storage losses. This study revealed some of the storage methods which either promote or reduce the storage losses for the traders.

Storage method	Frequency	Percentage %
Plastic bags	2	8
Plastic buckets	3	12
Reeds baskets	9	36
Cud board boxes	11	44
Metal and Plastic drums	-	0

Table 4: Storage methods used by the Traders

IMPORTANCE OF STORAGE METHODS TO TRADERS

When asked on the importance of fruit and vegetable storage methods that they use to store their products, not all respondents from the traders gave an affirmative response as would have been expected as 44% of the respondents replied they were not apprehensive of these storage methods and their contribution to fruit and vegetable losses (Fig. 5).

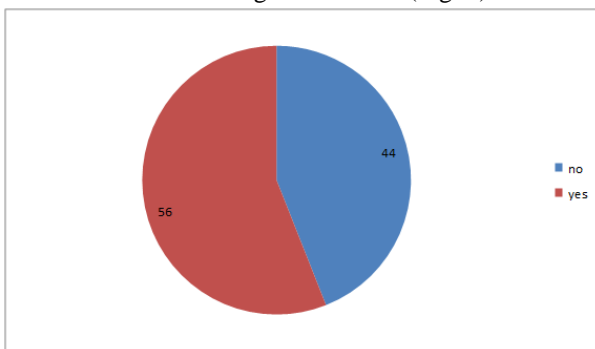


Figure 5: Importance of Storage losses to traders

DETERMINING PROFITABILITY

An assessment was done to find out how profitable the fruit and vegetable business is by these traders. The informal traders who turn over some of their stock within a day are 60% while others, on different commodities, the turnover is 5-10 times or more per month. The proportion of informal traders who reported more than 50% and below 50% monthly total revenue from the trading of fruits and vegetables are shown in Fig. 6.

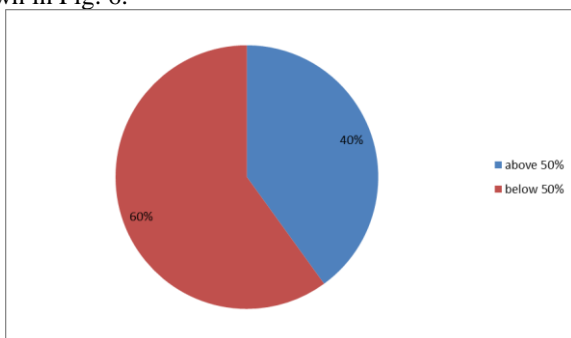


Figure 6: Proportion of monthly revenues from trading fruits and vegetables by the informal traders

DETERMINATION OF STORAGE LOSSES

The determination of the storage losses is measured in the number of buckets or boxes thrown away of the spoiled fruit and vegetables. None of the traders weigh the quantities that they throw away from the simple reason that they do not have the scales and also do not pay much particular attention to their fruit and vegetable storage losses. The respondents also highlighted that there are some consumers who are willing to buy some damaged fruits and vegetables at a reduced price of up to 50% of the initial selling price. This allows traders to recover the cost incurred in buying the fruits and vegetables from the farmers. Figure 7 shows the proportion of those traders who reduce their prices by either 50% or more than 50% of the selling price.

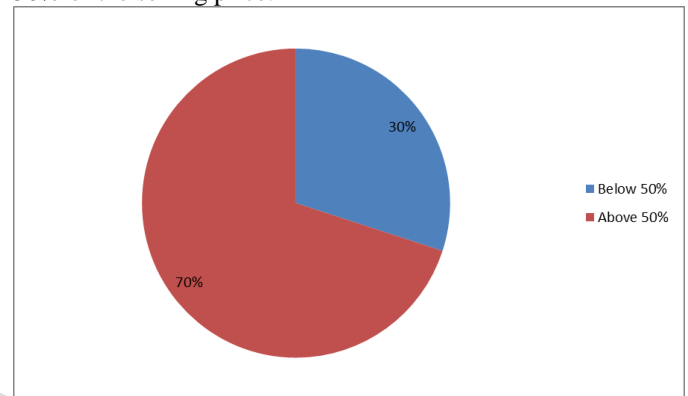


Figure 7: Proportions of informal traders who reduce prices below 50% and above 50%

The informal traders have indicated that storage of their fruits and vegetables attract a charge which vary from USD\$1.00 per week to USD\$2.00 per week. Fig. 8 shows the USD average weekly and monthly storage costs incurred by informal traders at Chitima market. The average weekly cost is \$1.50.

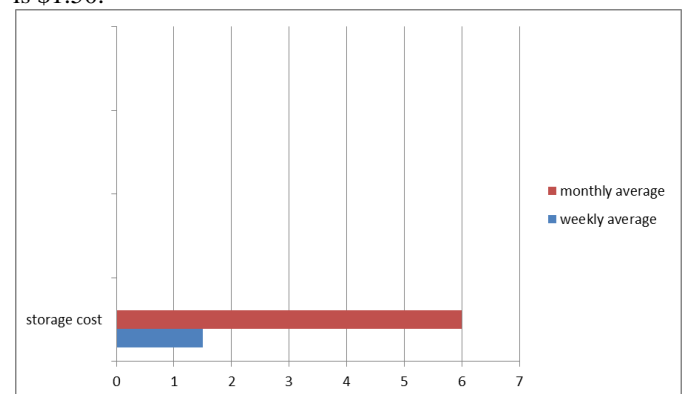


Figure 8: Storage costs incurred by fruit and vegetable traders

MEASURES TO MINIMIZE POSTHARVEST LOSSES

Table 5 shows measures that were perceived by informal traders to be important to minimize fruit and vegetable storage losses in order to ensure profitability of the business.

Measure	Respondents(%)
Use of cooler boxes	50
Zero energy cool chamber	-

Use of card board boxes	40
Avoiding exposure to sunlight	20
Avoidance of over stacking of items	40
Proper storage handling	16
Giving storage education	18
Making use of proper handling containers	28
Use of reeds basket	32

Table 5: Responses on measures to minimise fruit and vegetable Storage losses

IV. DISCUSSION AND INTERPRETATION

The study reveals that the majority of the informal traders acknowledge that storage losses are experienced in their fruit and vegetable business. Most of the respondents were fairly educated (at least Grade 7) but a lack of basic training in handling their commodities in storage was attributed to the resultant losses. Close observations on the storage methods adopted by these traders reveal that knowledge of crop physiology is lacking. It would be assumed that since most of them have been in the business for a number of years (>5 years) they would have gained some wealth of experience. The containers which these traders use to carry their commodities inflict much damage to the fruits and vegetables. The containers used are too large because the traders want to store everything in one container to save storage space which is limited. As a result, overloading results in either fruits or vegetable at the bottoms to suffer mechanical damage from the inappropriate containers and the overload. Inappropriate vending sheds have contributed to great storage losses because the fruits and vegetables are exposed to too much sun. The reeds baskets and the sacks used for storage bruise and cut the fruits and vegetables during storage. Kikulwe (2018) also noted that storage losses to be attributed to rough handling in storage and lack of appropriate storage facilities.

Most fruits and vegetables are delicate by nature as some bruise or crack easily and some cannot withstand harsh weather conditions such as heat or too much wind as they can tear-off. However, results have shown that the informal traders use no storage facilities for their fruit and vegetables. This has been identified as the cause of storage losses experienced as fruits and vegetables stay in the open and are exposed to harsh weather conditions. Storage losses also occurred as a result of overstocking and over-stacking. There is need to avoid over stacking of fruits and vegetables. Over stacking results in heat generation which then causes deterioration of fruits and vegetables. Different fruits and vegetables require different storage temperatures and facilities but because of lack these facilities, the same temperature is exposed to the stored fruits and vegetables. Now, because a significant large number of these traders are not knowledgeable about the storage losses (Fig. 6), they do not practice any basic grading or sorting of the commodities when it reaches to them from supply sources. Observations indicated that fruits and vegetables that are bruised, cracking and with sunscald even rotten find their way into storage causing the good ones to deteriorate as well. Improvement in the grading and/or sorting before storage will drastically reduce postharvest losses.

The traders also experience storage losses due to microbial, pests and/or diseases attack. This challenge is caused by the fact that not much grading or sorting is done prior to storage of the fruits and vegetables. When further asked about their knowledge on identification of diseases on their commodities most of these traders showed very limited know-how. It was also observed that fruits and vegetables are affected by fungal diseases to a larger extend and less bacterial diseases. As a result of over-piling and over-stacking during storage, the diseases are noticed very late when a significant amount of the commodity have been spoiled beyond recovery. Other causes of storage loses such as exposure to sunlight and poor packing are a result of poor adoption of new storage technologies that could prevent such losses in storage.

The study also showed that informal traders do not appropriately account for losses as they simply throw away products that may have gone bad. Informal traders calculate their profitability basing on the initial capital invested in purchasing the fruits and vegetables and the resulting revenue. However the majority of informal traders indicated that storage cost affects their profits to a limited extent. Fig. 8 shows average weekly and monthly storage costs. This is further exacerbated by losses incurred due to poor storage facilities. Despite the informal traders not appropriately accounting for losses through weighing of baskets of fruit and vegetables lost, the study indicated that a significant proportion (60%) of the traders are able to make revenue of above 50% while the remaining (40%) made revenue of below 50%.

The study identified some measures for minimizing postharvest losses (Table 9). Use of cooler boxes has been noted to greatly reduce storage losses by the traders as this reduces storage temperatures. Due to over stacking heat builds up thus accelerating the rate of deterioration of the fruit and vegetables while in storage. Lack of storage sheds results in exposure of the commodities to excessive sun which in turn result in sun burns on the skin of fruits and vegetables thereby enhancing the chances of easy bruising and later growth of microbes. Since some fruits and vegetables easily bruise, demonstration of storage handling techniques was identified as a measure which could reduce postharvest losses. Use of appropriate storage containers was also identified to significantly reduce storage losses. The traders acknowledge the need for training in storage handling of the different fruits and vegetables which they sell. Due to the difference in the perishability, nature and shelf-life of these fruit and vegetables, storage techniques can therefore not be generalised and one method cannot be used for all commodities.

V. CONCLUSION

The study indicated that significant losses in fruit and vegetables occur in storage. On this note there is need for the traders to learn to apply effective methods of storage, grading and sorting of their commodities to reduce losses. The use of outdated storage containers leads to higher fruit and vegetable storage losses. The study further identified the potential for the fruits and vegetable sector to be profitable and viable if storage losses are reduced. Storage losses resulting from fruit

and vegetable deterioration through microbial disease attacks and poor storage facilities affects profits significantly. Storage losses therefore hinder growth, and viability of the fruits and vegetable sector. The majority of traders outlined the need for farmers to improve on the quality of their produce and use adequate input when producing fruits and vegetables. Some goods traded have suffered poor shelf life and this has been attributed to production of low quality product. Farmers are therefore encouraged to improve on their production practice so that they can supply quality goods to consumers. Masvingo City Council should provide and promote a conducive environment for informal traders so that they can contribute more to the country's gross domestic product (GDP). This can be done by providing properly constructed vending structures free from direct sunlight and charging operating licenses at a price within the reach of most vendors.

ACKNOWLEDGEMENTS

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