Postharvest Losses and Management Assessment of Commercial Fruit and Vegetable at Wolaitazone, at Sodo Market

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I. INTRODUCTION

Food security, both in terms of availability and access to food, poses a challenge to rapidly growing populations, in environments of dwindling land and water resources. The horticultural sector has established its credibility for improving land use, and generating employment and nutritional security (Kader, 2005). Horticulture, which includes the production of fruits, vegetables, flowers, spices medicinal aromatic plants and plantation crops has emerged as a major economic activity in the world. More than 85% of the Ethiopian population, residing in the rural area, is engaged in agricultural production as a major means of livelihood (EARO, 2000).

An agriculture towards development in to a modern production sector, strengthening the post-harvest sector or system is essential. The current development strategy in the country is Agricultural Development Led Industrialization (ADLI), and a lot is expected from the post-harvest sector. Finally, in order to attain a high nutritional status, improved post-harvest management, reduced post-harvest losses, production of value added products, effective and efficient research programs on the post-harvest sector must be strengthened and promoted (EARO, 2000).

A diversity of vegetables is grown all over the world for their nutritional value, test and cuisine. Global vegetable production was 965.65 million ton (t) and continues to grow in order to meet an ever increasing consumer demand (FAO, 2012). A limited volume of fresh vegetables is traded globally, with just 3% comprising the export market (Baas, 2006). Improved productivity of vegetables can be attributed to widespread use of mechanization, improved quality inputs like seeds, technological advances and better cold chain management skills (Hodges et al., 2011). Consumption of vegetables is important for preventing non-communicable diseases (NCD) including malnutrition and obesity related disorders (FAO, 2010, Kitinoja, 2010, Keatinge et al., 2011). Post-harvest loss is a "measureable quantitative and qualitative loss of product at any moment during the post harvest chain and includes the "change in the availability, edibility, whole Sameness or quality of food that prevents its consumption "(Adeoye et al., 2009, Buyukbay et al., 2010). Post-harvest loss of fruits and vegetables estimated to be 30-40% in developing countries (Karim and Hawlader et al., 2005, Ajula et al., 2011).

Fruits and vegetables are known to have commercial and nutritional importance. They play a vital role human nutrition by supplying some necessary nutritional substances such as vitamins and essential minerals in human daily diet that help to keep a good and normal health. Fruits are widely consumed. One of the factors that imparts negatively on the economic value of fruits and vegetables is that they have a short shelf-life.

In developing countries, post harvest losses mostly occur during transportation, handling, storage and processing. Rough handling during preparation for the market increases bruising and mechanical damage and limits the benefits of cooling. In addition, mechanical damage such as tissue wounds, abrasion, breakage, squeezing and escape of fruits or vegetables is caused by in appropriate methods used during harvesting, packaging and inadequate transportation, and thus increase susceptibility to decay and growth of microorganisms (Barbosa-canuas et al., 2003).

1.1 Statements of the Problem

Horticultural products are perishable with some estimates suggesting a post -harvest loss of 30 to 50% in...
fruits and vegetables. The loss occurs due to poor pre-
production and post-harvest management as well as lack
of appropriate processing and marketing facilities. These
losses have several adverse impacts on farmer income
prices and nutritional quality of the produce (Atanda et al.,
2011).

Moreover, human factors such as handling practices,
atitudes and technological aspects such as improper
infrastructure and handling techniques, could contribute to
post harvest losses of fruits and vegetables (FAO, 2009).

1.2 Objectives

1.2.1 General Objectives

This study was carried out to assess post-harvest losses
and management of selected commercial fruits and
vegetables in Sodo market.

1.2.2 Specific Objectives

To identify post-harvest loss of constraints of fruits and
vegetables in the area.

To determine postharvest handling activities that is
practiced in the area.

To evaluate the attitude and perception of retailers,
about post harvest losses and management.

1.3 Scope of Study

The study was conducted in Sodo market due to time
and financial constraints the assessment of postharvest loss
of fruits and vegetables analysis will be conducted at
selected major horticultural crops of the area

II. LITERATURE REVIEW

2.1 Post Harvest Losses of Fruits and Vegetables in
Developing Countries

The major of rural populations in developing countries
has limited and solely depends on the agricultural sector
for their subsistence, livelihood and revenue. Therefore
post harvest losses are often felt with greater magnitude than in
developed nations, while in developing countries the share
of post harvest activities in total value added of food
products tends to be lower, there is a tendency towards
greater importance of post harvest operations. Careful post
harvest handling is the major but often neglected step
towards offering a greater volume of nutritious food to the
planet and to prevent loss between harvesting and
consumption (Goletti and Wolff, 1999).

Kader and Rolle (2004) explained that the past thirty
years less than 5% of the finding provided for horticultural
development efforts has gone towards post harvest areas
of concern, while more than 95% has gone towards trying
to increase production. Kader (2002) indicated that,
reducing post harvest losses for fresh fruits and vegetables,
reported to be in the 30 to 50% range, has been
demonstrated to be an important parts of sustainable
agricultural development efforts meant to increase food
availability.

International agencies that monitor world food resources
have acknowledged that one of the most feasible options
for meeting future food needs is reduction of post-harvest
losses (Kelman, 1984). Kader (2002) argued that it is
impossible and uneconomical to eliminate post harvest
losses but it is possible and desirable to reduce them by
50%. He went on to say that minimizing post harvest
losses of food that has already been produced is more
sustainable and environmentally sound than increasing
production areas to compensate for these losses.

2.2 Pre-Harvest Factors that Contribute to Post
Harvest Losses of Fruits and Vegetables

There are numerous pre-harvest factors affecting the
post harvest quality and shelf life of fruits and vegetables,
including harvest maturity, cultivar or variety, climate, soil
used for production chemicals applied, and water status
(Thompson 2003). Within each commodity there is a
range of genotypic variation in composition, quality, and
post-harvest life (Kader 2002). Knowles et al., (2001)
indicated that the soil type and its fertility also affect the
chemical composition of produce. Rabus and streif (2000)
also explained that in some cases, the mineral content of
fruits, such as phosphorus potassium and calcium can be
used to predict their post harvest quality.

Root stocks used in fruits production vary in their water
and nutrients up take abilities and in resistance to pests
and disease, and thus have a profound effect on the post
harvest life of the produce (Tomala et al., 1999). Ferguson
et al., (1999) also cited climate factors, especially light
intensity and temperature, as having strong influence on
the composition and nutritional quality of fruits and
vegetables. Those constantly exposed to the sun may have
different quality and post harvest characteristics from
those growing on the shady side.

2.3 Harvesting Factors that affect Quality of Fruits
and Vegetables

Kader (2008) reports, that there are several factors
which affect Fruit quality. He mentioned maturity at
harvest as an important factor in determining eating
quality of ripe fruits. However, Mitra and Baldwin (1997)
reports that many maturity indices have been tested
however, due to differences among cultivars, production
conditions and locations, there is no consensus on indices.
Kader (1999) asserted that the eating quality of fruits when
ripe depends up on maturity at harvest, avoiding Physical
damage and chilling injury during post harvest handling
that minimized disease incidences. Sharma and Singh
(2000) and Kader (2002) explained that harvesting
practices determine the extent of variability in maturity
and physical injuries lead to accelerated loss of water and
vitamin C and increased susceptibility to decay by fungi or
pathogens during storage.

2.4 Quality Attributes and Grade Standards of Fruit
Vegetable for Marketing

Appearance is the most quality attribute of fresh and
minimally processed produce, with primary concern for
size and colour Uniformity, glossiness, and absence of
defects in shape or skin finish (Aked, 2000). According to
Nune et al., (2007), appearances, colour, texture and
aroma are probably the most important criteria used by a
consumer to evaluate the immediate quality of a fruit and
thus, persuade him or her to buy it. Zuniga-Arias and
Ruben (2007), also suggested that the different attributes
included in the concept of quality depends on the relevant
actor who is acquiring the product.
The major actors participating in the valuation of food quality for the export market are producers, processors, exporters, importers, wholesalers, retailers and the government. May influence these perceptions. Wholesalers and retailers emphasize visual attributes such as size, form, colour and shelf life, taking into consideration consumer preference. Government officials are involved in regulations concerning health and safety aspects. Producers and processor commonly give preference to profit attributes, like higher yields, suitability for mechanical harvesting and industrial preparation, and resistance against pest and diseases. However, consumers are interested in many more aspects related to food quality such as taste, freshness appearance, nutritional value and food safety (Zuniga-Arias and Ruben, 2007). This criterion of consumers described by the above authors are supported what Zind (1989). Described about consumers.

According to Kader (1999) and Zuniga-Arias and Ruben, (2007), quality, which is, the degree of excellence or superiority of fresh fruits and their products is a combination of attributes, properties, or characteristics that give each commodity value in terms of human food. They further stated that the relative importance of each quality component depends up on the commodity and intended use (e.g. fresh or processed) and varies among producers, handlers and consumers. Romano et al., (2006) and Kader (1999) reported that quality has different meaning for different stakeholders (producers, distributors, consumers etc) but consumers’ acceptance seems to be the most important factor to consider. To producers, a given commodity must have high yield and very important from the point of view of wholesalers and retail marketers whereas consumers judge quality of fresh fruits on the basis of appearance (including freshness) and firmness at the time of initial purchase. As Kader 1999 and Kader (2008) stated that although consumers may buy fruits on the basis of their appearance and firmness, subsequent purchase depends on their satisfaction with how these fruits taste. He further stated that fruit quality in term appearance, it must be easy to harvest, and must with stand long distance shipping to markets. Appearance quality, firmness, shelf-life and flavor are influenced by the cultivar, maturity stage at harvest, post harvest handling procedures and environment condition (e. g avoiding mechanical damage and chilling injury), ripeness stage at the time of eating the fruit.

III. RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was undertaken in Sodo town Markato Market, it is known for fruit and vegetable production which is found in SNNP regional state. It located in the southern parts of Ethiopia which 332km for from Addis Ababa and geographically located altitude of 18000mass 16 49N and 37 45E with annual mean temperature and rain fall of 1212mm respectively.

3.2 Data Collected

Data were generated by preparing structured questionnaire and interviewed the targeted respondents /retailers through open questions. The data were gathered both interims of qualitative and quantitative expiration. Therefore the presents data collection was carried out with the aim of determining post harvest handling activities that are practiced in Sodo market and the factors that contribute to postharvest losses of selected vegetables (pepper, lettuce, cabbage, tomato and onion) and fruits (mango, Avocado, Banana, Orange and Papaya). The questions are specifically focus on information of the market changes on fruit postharvest handling practices and associated losses of selected crops. In addition to individual respondents the structure questionnaires are supplemented by group discussion.

3.2.1 Sample Size and Sample Techniques

For the purpose of this study a sample size of 30 traders will be selected from Sodo market and all are retailers and there are no wholesalers in the market chain. A purposive sampling technique will be adopted to obtain trader of fruit and vegetable who have the knowledge and experience in the market chain. The 30 retailers will be selected by systematic random methods and interviewed smartly. Table 3.1 shows the number of retailers (Men and Women) interviewed.

Table 3.1 number of respondents /retailers and their sex categories.

<table>
<thead>
<tr>
<th>Sex categories</th>
<th>Total respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
</tr>
<tr>
<td>----------------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>

3.3 Data Analysis

Data on the determination of the postharvest handling activities and factors that contribute to postharvest losses of selected fruit and vegetables being practiced.

IV. RESULT AND DISCUSSION

4.1. Demographic Features of Respondents

Demographic profile obtained from the survey carried out in the selected respondents’ is shown in table 4.1. The data obtained indicates that the age interval of respondents is 18-30 years old and the majorities were women. This indicates that most of them were in the productive stage. Most of the respondents had either illiterate (38.1%) or first cycle (32.4%) and second cycle (23.5%) education. This result indicating that above 3/4th of them did not have tertiary and higher education.

Table 4.1 Demographic profile of respondents

<table>
<thead>
<tr>
<th>Serial No</th>
<th>Factors</th>
<th>Description</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age category</td>
<td>18-30 years</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>31-40 years</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>41-50 years</td>
<td>26.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Educational level</td>
<td>Illiterate</td>
<td>40.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First cycle (1-4)</td>
<td>36.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second cycle</td>
<td>23.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>
4.2. Major Fruits and Vegetables Available in Sodo Market

Major fruits and vegetables available in sodo market were tomato, banana, cabbage, pepper, lettuce, onion, mango, sweet orange and papaya. From fruit crops mango had the highest coverage (43.1%) followed by banana (25.3%). The rest two fruits cover 31.6%.

From vegetable crops onion had the highest coverage (32.3%) followed by tomato (29.3%) in the market place (table 4.2). The probable reasons for the large availability of the onion, tomato and mango were due to high demand and the nutritional addictiveness of the consumers in the area. Moreover, onion and tomato is the starter vegetable crop in any Ethiopian dish or supplementary food preparation.

Table 4.2 Major types of fruits and vegetables in sodo market

<table>
<thead>
<tr>
<th>Types of commodities</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td>29.3</td>
</tr>
<tr>
<td>Cabbage</td>
<td>15.4</td>
</tr>
<tr>
<td>Pepper</td>
<td>10.1</td>
</tr>
<tr>
<td>Lettuce</td>
<td>13</td>
</tr>
<tr>
<td>Onion</td>
<td>32.2</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
<tr>
<td>Fruits</td>
<td></td>
</tr>
<tr>
<td>Banana</td>
<td>25.3</td>
</tr>
<tr>
<td>Mango</td>
<td>43.1</td>
</tr>
<tr>
<td>Sweet orange</td>
<td>20.4</td>
</tr>
<tr>
<td>Papaya</td>
<td>11.2</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

4.3. Storage Material of Fruits and Vegetable in the Market

According to the respondents all the commodities (vegetables and fruits) in sodo market were stored in locally available (traditional) materials. Based on the present result 50% the retailer’s vegetables and fruits were stored in sack’s 23.3% baskets, and 26.7% in wooden box (figure 4.1).

Fig. 4.1. Locally available storage material in sodo market.

Almost 1/2th percentage of the commodities was stored in sacks. This is probably due to easily available, holding capacity and cheapness of the storage material. However, these handling materials are reported to be cheap; they have several disadvantages because the sides are too deep and bruise the produce. The use of sacks does not protect the fruits from mechanical damage as it causes fruit losses by crushing. Moreover, large congestion of fruits creates high heat in the sacks due to physiological change by metabolic reaction which in turn accelerates mechanical damage and microbial attack (kader, 2004). The wooden box a slight negative impact on mechanical damage of fruits compared to other storage material.

4.4. Post-Harvest Loss Factors of Fruits and Vegetables

There are so many causes for losses in the post-harvest food chain. Based on the survey result of the present study some of causes were forwarded, these were during transportation. From long distance to market place, traditional storage material, high temperature (high light intensity) in the market and perception and attitude of retailers towards postharvest loss and handling practices of fruits and vegetables.

4.4.1. Transportation mode of Fruits and Vegetables from Long Distance Area

The result of study showed that the major means of transport fruits and vegetables from long distant place Arbaminch to Sodo market were by Lorries. During transportation the fruit and vegetable crops were vary their physical damage capacity from the highest in lettuce crop with 18% followed by tomato 14.8% to the lowest value in onion crop which is 6% (figure 4.2.).

Fig. 4.2. Variations of crops to physical damage during transportation.

This variation in sensitivity of the crops to physical damage was because of the perish-ability nature of the crop and high water content inside the commodity. The mode of transport also contributes to postharvest loss by practical of poor arrangement of sacks to each other and making a huge of fruits and vegetable. Mean while the accumulation of unarranged packed fresh commodities in Lorries during transportation may also lead to increased heat due to metabolic reaction of the cells and it may accelerate their mechanical damage. The breakdowns of vehicles can be a significant cause of losses in some area as perishable produce can be left in the sun for a day. Moreover, postharvest losses of commodities were associated with longer transport distance on poor roads.
because of increased physical damage incidence and severity and this finding correlates with the statement of reported below. Inadequate transportation increase susceptibility to decay and growth of microorganisms (Barbosa-canovas et al., 2003).

4.4.2. The Effect of Storage Material on Crops

The result of the study showed that of the traders use local storage materials like sacs, wooden box, and basket, among the fruits and vegetables the result shows that the highest losses were reported in banana and tomato with a value of 22% and 21% respectively, due to sac storage material. While the least loss was exhibited in onion with a value of 1%, due to wooden box handling material.

4.4.3. High Temperature (High Light Intensity).

The effect of high temperature (light intensity) to fruit and vegetable quality were reported from developing countries. According to the present result that great losses of fruits developing quality occur due to high intensity and this causes commodity rotting and drying. The highest loss was revealed in lettuce and tomato with a value of 34.4% and 30% respectively. While in crops like mango and banana postharvest loss values were reported 33.6% and 23.1% (table 4.3). The expected reason is exposing fruits and vegetables to high light intensity leads to water loss through vapor-transpiration and finally the commodity drying or rooting.

Table 4.3. Effect of high temperature (sun light) to commodities loss.

<table>
<thead>
<tr>
<th>Crop type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomato</td>
<td>30</td>
</tr>
<tr>
<td>Cabbage</td>
<td>18.4</td>
</tr>
<tr>
<td>Pepper</td>
<td>10.2</td>
</tr>
<tr>
<td>Lettuce</td>
<td>34.4</td>
</tr>
<tr>
<td>Onion</td>
<td>7</td>
</tr>
<tr>
<td>Banana</td>
<td>23.1</td>
</tr>
<tr>
<td>Mango</td>
<td>33.6</td>
</tr>
<tr>
<td>Sweet orange</td>
<td>22.2</td>
</tr>
<tr>
<td>Papaya</td>
<td>21.1</td>
</tr>
</tbody>
</table>

It was also observed that majority of the respondents reported that temporary poor roofing (shading) materials used partially to protect fruits and vegetable from high light intensity.


The perception of the retailer is important in considering the reduction of post harvest loss of fruits and vegetables in marketing chain. Since retailers of fruits and vegetables in the market chain and they think about post harvest loss of fruits and vegetables. The survey result showed that almost 50% of the retailers have knowledge on postharvest loss, 100% of the retailers were interested in selling loss free commodities theoretically and approximately 60% of the retailers were willing to handle commodities properly.
V. SUMMARY AND CONCLUSION

Post harvest losses of fruits and vegetables are considered to be a major problem in the surveyed area. Constraints were also major impediments to effective post-harvest practices in the market place. Poor postharvest handling practices in the market chain accounts for great losses in the market. For example, rough handling, rough stronger materials/traditional, poor shading material to protect from high light intensity, and duration of the produce in the market.

Mechanical injuries are major causes of losses in quality and quantity of fresh vegetables and fruits in the study area (during transportation loading and unloading). The perception retailers about postharvest handing practices during storage and postharvest losses factors and their consequences are low in Sodo market. Furthermore, some of retailers have no detail knowledge about unique characteristics of fruits and vegetables and they sell without giving attention about their commodities.

RECOMMENDATION

Based on the findings of this study it is recommended that:

✓ Voluntary/government organization should provide affordable financial support/loan to use/buy modern and suitable storage material.
✓ Agricultural extension agents should organize training on post-harvest practice and loss in order to increase their perception towards post harvest loss and to minimize fruits and vegetables wastages in the study area.
✓ Retailers should from themselves into cooperatives in order for them to assess loans and subsidies material from the government and NGO institutions.

REFERENCE


APPENDIX

Interview questions

Foreword:
This interview is will prepared to assemble information which can help to study the constraints of post-harvest loss of fruits and vegetables; post harvest handling activities and attitude and perception of retailers about post harvest losses in sodo market in fulfilling the requirement of degree in horticulture. Your reliable information and honesty will have a significant role for the success of our research work. In addition we here kindly request you to give relevant information. Finally, we would like to thank you in advance for your co-operation.

Name of respondents _________________________
Age ______________________________
Sex: male/female________________
Educational level: _________________

1. How much do you about the unique characters of fruits and vegetables when compare with cereals and other crops. Mention

2. What are the major fruits and vegetables available in the market?

3. Which commodity do you have? A. vegetable B. fruits C. Both

4. If your answer from Q. 3 is either of them or both, why do you prefer?

5. From where do you get these vegetables and fruits?

6. Do you consider the effect of storage material on shelf life of fruits and vegetables? A. Yes B. No. if your answer is yes, explain the positive and negative impacts.

7. Which storage material do you use to extend the shelf life of the commodity?
A. Traditional/local, specify ________
B. Modern/local, specify ___________

8. From Q. 6 if you storage material is local, what is the advantage and disadvantage on the commodity shelf life?

9. Do you know about posy-harvest loss of fruits and vegetables? A. Yes B. No

10. If your answer 10 Q.8 is yes, what are the major cause’s post-harvest losses/deterioration of fruits and vegetables in the hands of retailers? List them.

11. Which crop is more influenced by the above factors of losses from your commodity? Put all the commodities in ascending order of deterioration?

12. Can you predict the degree of losses in fruits and vegetables? A. high B. medium C. low

13. If the loss is high, what is your correction measure to minimize the negative impact? Mention.