

Assess and Prioritize the Problems Related Postharvest Management of Horticultural Crops in Jimma Town, the Case of Bishishe Market

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Abstract

A study was undertaken to identify the causes of the postharvest losses of horticultural crops along postharvest chain and set solutions for the identified and prioritized problems related with horticultural crop's management in Jimma town, the case of Bishishe market. In the first phase of the study a survey was carried out using random sample to collect information on the present system of postharvest handling of horticultural crops. The market management of horticultural crops were identified by interview, questionnaires, and observation regarding to handling practice, hygienic condition of fruit handlers, problems related to transportation. The major stages of postharvest marketing sequence were identified and loss assessment was carried out at each stages followed by prioritizing the problems based on the loss assessment results. The survey result reveals that a major cause of postharvest loss of horticultural crops is mismanagement of commodities along postharvest system. Poor postharvest handling facilities and practices such as absence of sanitation, temperature management, uniformity of quality within containers, overfilling of containers and other quality and safety assurance problems were among the common causes for these observed losses. The second phase of this study was prioritizes the problems based on the loss assessment results obtained in phase one and intervene those problems.

Keywords: Postharvest; Storage; Bishishe market; Postharvest management; Agriculture

Introduction

Background of the assessment

Horticulture has become one of the most important agricultural development sectors both in the world and in our country today. Ethiopia has a great diversity of climate and soil condition which is favorable for the production of different horticultural crops like fruits, vegetables, root and tuber crops, coffee, tea, spices, ornamentals and medicinal crops for home consumption and foreign markets.. Currently, around eight years ago, the total production area is estimated to be about 227,000 ha (42%=vegetables, 41%=root and tuber crops excluding Inset, and the rest 15%=fruit crops) [1]. Horticultural crops play a significant role in developing country like Ethiopia, both in income and social spheres for improving income and nutrition status since they are rich in vitamins, carbohydrates and other nutrients that contribute to a major portion to an Ethiopian daily dish mix [2].

In addition, they provide employment opportunities as their management being labor intensive [3]. Therefore this time our country has given much attention for the quality and quantity production of horticultural crops for its contribution in food industry, in alleviate nutritional deficiencies, create jobs, generate income and provide raw materials for local industries, in export earning both in fresh and processed forms [4]. However, pre-harvest and postharvest handling has a decisive effect on the extent of post-harvest losses, the final quality, and the market value of horticultural crops [5]. The postharvest handling systems for fresh produce begin with harvesting

and involve preparation for fresh market or for processing (e.g. freezing, canning, drying), cooling, transportation, storage, and/or handling at destination (wholesaler and retail marketing) [6]. In all these stages, because of poor pre and Postharvest facilities, lack of awareness, poor management, market dysfunction, or simply the carelessness of farmers or workers, the loss of these commodities estimated to 25-28% worldwide, and 15-50% in developing countries [7].

Postharvest technologies such as grading, packaging, pre-cooling, storage, and transportation, can minimize losses, preserve quality, and enhance value-added of horticultural crops, have been used successfully in developed countries [8]. Some products also require one or more of the following treatments: trimming, cleaning, curing, disease or insect control, waxing, and ripening [9]. However, to overcome these activities, there is shortage of trained manpower on horticultural crops in general and on specific fields in particular near the farmers and traders. Therefore, this Study aimed to identify different problems raised above and to propose solutions and means of interventions at Bishishe market place of Jimma town.

Post-harvest loss and management of horticultural commodities

Though horticultural crops are known for their high return per unit time and area which is one major tool to achieve food security in the country, postharvest behavior and postharvest management of horticultural produce have not been given adequate attention over the years, most especially perishable horticultural produce, due partly to the dearth of studies on the magnitude of losses attributable to post harvest technology occupying a significant position along the food value chain within the context of market driven industry and industry benchmark. As a result of less attention given to this sector, a

significant proportion of postharvest loss of agricultural produce is experienced in Ethiopia, most especially in perishable horticultural commodities like fruits and vegetables accounting as high as 30 to 40% loss [10].

Horticulture is a benefit of nature, which is refined by human skill as a science to gain more reimbursements. It involves rigorous cropping expertise, including the improvement, production, distribution and use of vegetables, fruits, woody landscape and greenhouse plants. Horticulture is now one of the fastest growing industries with striking professional opportunities. An increasing proportion of the world's population is living in metropolitan environments where their understanding of farming, and therefore of food production, is becoming progressively more poor [11].

Losses of horticultural produce are a main problem in the postharvest. They can be caused by a wide variety of factors, ranging from growing conditions to handling at retail level. Not only are losses clearly a waste of food, but they also represent a similar waste of human effort, farm inputs, livelihoods, investments and scarce resources such as water [12].

Fresh fruits, vegetables and flowers must be in excellent condition and have excellent quality if maximum shelf life is desired. The best possible quality of any commodity exists at the moment of harvest [13]. Commodities that will be stored should be harvested at optimum maturity, because storage life may be reduced if they are immature or over mature. Fresh fruits, vegetables, and flowers may be infected with various pathogens which are not visible prior to storage but will cause decay and rot during storage and transportation losses [14].

Objectives

General objectives: To assess and prioritize the problems related with horticultural crop management in Jimma town, the case of Bishishe market and set possible solution through intervention activities in multi- disciplinary approach.

Specific objectives:

- To acquire a real practical knowledge and skills through working in collaboration with the community and concerned stakeholders.
- To collect, organize, analyze, and interpret the data for all activities to be implemented based on identified and prioritize community problem and set solutions by discussing with the community.

Materials and Methods

Description of the study area

The assessment was conducted Jimma town specifically Bisheshe market, Southwestern part of Ethiopia. Bishishe is small place around market where fruit, vegetable and cereals are sold in large amount. It is found in Jimma town, the capital of Jimma zone, located in Oromia Regional state, 346 km Southwest of Addis Ababa at latitude of about 7013'-8056' N and longitude of about 35052'-37037' E, and at an elevation ranging from 880 m to 3360 m above sea level (Figure 1). The study area receives a mean annual rainfall of about 1530 millimeters which comes from the long and short rainy seasons [15].

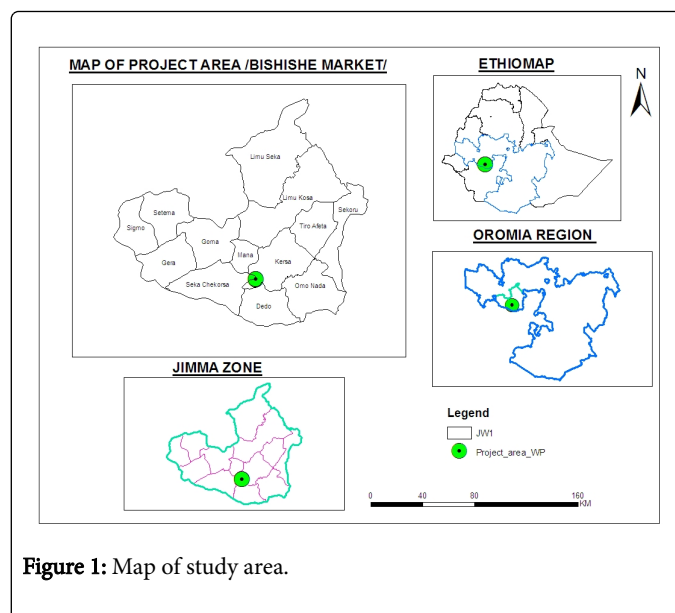


Figure 1: Map of study area.

Methodology

Site selection procedure

Assessment was conducted with the collaboration of Jimma town urban agriculture office and identified working site with their respective problems. Jimma town urban agriculture office identifies hermata kebele (Bishishe area) as one of the potential area for exchanging horticultural commodities from Jimma town surrounding kebeles. Depending on information obtained from Jimma urban agriculture office Bishishe market was selected as one of the potential working area under surrounding kebele of Jimma town.

Based on the information obtained it was planned to identify the major problems of the area, and survey was conducted to identify the major problems during first phase of the study. With all participation of the stakeholders and community members the major problems were raised and based on the rank of prioritization, Postharvest loss of horticultural commodities is identified as the major problem of the areas, due to mishandling along different Postharvest chains.

This project was planned to achieve the objective by using purposive sampling techniques to select Jimma zone from Oromia region, Jimma town from Jimma zone, Harmata Kebele from Jimma town because of the limitation of our capacity and the proximity of the selected places.

Sampling procedure and data collection

The questionnaires were prepared to assess the based on the objective of the research particularly on Postharvest loss of horticultural crops in the study area.

After questionnaires preparation On the next five consecutive days data collection were employed based on the prepared questionnaires by randomly selecting respondent trader's in the kebele(PA). Data were collected by face-to-face interview with horticultural crops trader of selected kebeles. The respondents were selected by random sampling methods. Among horticultural crop trader in the selected kebele 50 respondents were randomly selected in order to gather relevant data for the successes of our finding.

Survey and data collection on postharvest practices of horticultural crop were conducted with actual observation and by making an interview with horticultural trader at Bishishe market. During survey a lot of information about origin of fruit, and packing material, transportation method, and ripening methods, storage practice, sanitary condition of the marketing area, marketing practice etc. was obtained from the horticultural seller.

From survey site, four (4) whole sellers were randomly selected based on the amount of fruit they have in store, and data regarding fruit damage and disease incidence were collected to know the extent of those problems.

Fruit damage assessment assay: Percentages of damage on selected fully unripe fruit were assessed from whole seller shop at bishishe market. From each whole seller store, 24 selected fruit were assessed and the percentage of fruit damage was calculated using the following formula [16].

$$DI \text{ (Incidence Disease)} = \frac{\text{Number of infected fruit}}{\text{Total number of fruit}}$$

Data analysis

The data analysis was done by the SPSS Version 20 software and Microsoft office Excel 2007. Descriptive statistical analyses were adopted for the comparison of the respondents in different parameters.

Result and Discussion

Assessment result

Sampling and observation of postharvest losses and quality attributes at wholesale and retail markets, and interviews with vender indicated a wide range of postharvest handling practices that contribute to high levels of quantity and quality losses, as well as market value decreases. This Mishandling methods need to be addressed in order to reduce Postharvest loss of horticultural Crops [17].

Among 50 horticultural trader who interviewed 14(28%) of them males are females. The 19(38%) members were less than 25 years of age; 13(26) Of the respondent falls at age of 25 to 35 years and 10 (16) at age 35 to 45 years remaining of respondents 8(16%) venders belongs to at age greater than 45 years. From respondents 23 of them were illiterates, 27 of them were took varies level of education starting from elementary school to higher level (Table 1).

Socio demographic characteristics of horticultural crop traders		Frequency	Percentage
Sex	Male	14	28
	Female	36	72
Age	<25	19	38
	25-35	13	26
	35-45	10	20
	>45	8	16
Educational level	literate	23	46
	illiterate	27	54

Number of respondents (N=50)

Table 1: Socio demographic characteristics of the fruit venders in Jimma town horticultural marketing area.

The assessment revealed that thirty seven (74%) respondents they have no transport system with good sanitary. More than forty six (92%) of the respondents received unpacked fruits which is the main cause of the sanitary problem. Forty five (90%) of the respondents received covered in dust fruits. All the respondents always receive physically injured and rotted fruits with healthy fruits (Table 2).

Interview statements	Response (percent)		
	Always	sometimes	never
Have you ever received muddy and dusty fruits from the distributors	37(74%)	6(12%)	7(14%)
Have you ever received physically injured fruits from the distributors	100%	–	–
Have you ever received both spoiled and healthy fruits in the same container from the distributors	78%	17%	5%
Have you ever received fruits in packed form	–	4(8%)	46(92%)
Number of respondents (N=50)			

Table 2: Interview results related to horticultural crops transportation.

About 80% of the respondents interviewed in study area (Figure 1) sell their mango fruit in an open space and tent like structures. Only 20% of them were observed selling their mango fruit in shop intended for this propose. 58% of the respondents interviewed were found selling banana in open air hanging the bunch on the support prepared for this purpose and intent like structure. Similarly, more than fifty (50%) of the respondents were found selling their onion, tomato, potato and orange in open space by simply disposing the product to the normal environmental condition. The remaining few percent respondents' house were selling in house (shop) and tent like structure intended for this purpose. The assessment result revealed that 65.6% of horticultural shops, fruits and vegetables kept for 3-6 days, however in 21.9% of shops fruits and vegetables kept for 2-4 days. Among the shops only 22(44) of them stores physically injured and rotted fruits separately and rest of them not store separately (Table 3).

Interview statements	yes	No
	Frequency (%)	Frequency (%)
Have you stored injured fruits, spoiled fruits and healthy fruits separately?	22(44%)	28(56%)
Do other people touch by hand for sorting during marketing?	38(76%)	12(24%)
Is the area and the shop free from pests	10(20%)	40(80%)
Is the marketing area free from dust	9 (18%)	41(82%)
Is there waste collecting bin?	5(10%)	45(90%)

Is the area free from horse, donkey or other animal dung or wastes?	16(32%)	34(68%)
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Table 3: Interview result about problems related to marketing and marketing area/shop.

Most of the fruits sold in Jimma town were brought from distant places using different packing materials and transportation means. Means of packing material used were different with type of fruit and vegetables. About 35% of the respondents use wooden box for packaging mango whereas the remaining 65% of them were using basket and majority of mango fruit had no packing materials (Figure 2). 85% of the respondents interviewed were observed using wooden box to pack banana to during transportation and marketing.

As can be seen from the result, most of the respondents have been observed using sack and plastic Packages for handling onion, potato and orange. Wooden box used as packing material in study area were too big, too rough, and too fragile to provide protection for fresh produce during handing and transport. These wooden crates were too large to provide protection, and much of the fruit on the bottom of the crates was crushed and typically discarded before sale. Across all horticultural shop' package protections seen were uniformly low and the containers were of inferior quality. The fruit were packed in large sacks or cloth bundles, in open baskets and the majority of fresh commodities had no package at all (Figure 2).

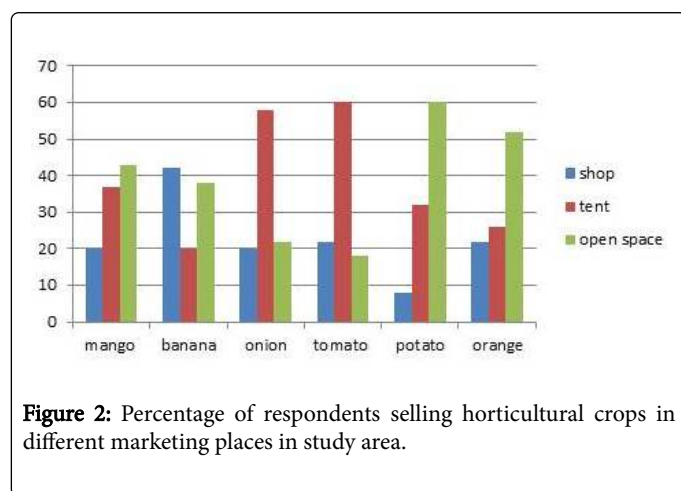


Figure 2: Percentage of respondents selling horticultural crops in different marketing places in study area.

The percentage of fruit damage at whole seller of bishishe market was described in Table 1. From damage assessment result maximum damage (83.4%) were observed on tomato stored in shop four and minimum damage (8.4%) was recorded on mango fruit stored in the third shop (Table 4).

Shop no	Type of fruit	No. fruit assessed	No of fruit damaged	No of fruit undamaged	Damage in percent
1	Banana	24	6	18	25
	Tomato	24	19	5	79.1
	Mango	24	4	20	16.7
2	Banana	24	9	15	37.5
	Tomato	24	15	9	62.5
	Mango	24	6	18	25

3	Banana	24	8	16	33.4
	Tomato	24	18	6	75
	Mango	24	2	22	8.4
4	Banana	24	5	19	20.8
	Tomato	24	20	4	83.4
	Mango	24	8	16	33.4
Formula \Rightarrow Percentage of damage = $\frac{\text{Damaged sample}}{\text{Total sample}} * 100$					
Number of respondents (N=50)					

Table 4: Percentage fruit damage taken from four whole seller of bishishe market for most commercial fruit in the area.

As can be seen from the result, the extent of fruit damage varies with types of fruit and management practice in the shop. The most extensive causes of losses at this stage were mechanical damage such as wound, bruising and abrasion as a result of over ripening and mismanagement. Interview results with horticultural shop owners showed us damage occur due to careless handling of fruit during harvesting in the field and during loading and unloading from the track. For Jimma market banana fruit transported from long distance and because of poor infrastructures (road), careless driving, over loading of fruit, and loading with materials in the truck induce mechanical injury on the fruit. In addition during ripening process bunches are piled on the floor and there is a possibility of physical damage for fruits due to over loading one on another. Additionally there is no control mechanism for temperature, humidity and ventilation in the ripening and storage room according to fruit and horticultural postharvest management regulation [18]. They simply apply methane gas as a source of ethylene which can facilitate ripening recess. This sometime causes deterioration of product trough enhancing physiological process of fruit and creating favorable environment for disease development by weakening the host cell. This all factors may contribute the observed damage on the fruit during the assessment.

Disease incidence assessment result shows that the maximum number (83.4%) of infected fruit observed on banana fruit in shop number three and the minimum (4%) of infected fruit was observed on tomato stored in third shop (Table 5). This result contradicts with percentage of losses recorded loss assessment result.

Banana Store	Type of fruit	No. fruit assessed	No of infected fruit	No of healthy fruit	incidence in percent
1	Banana	24	13	11	54.2
	Tomato	24	9	15	37.5
	Mango	24	12	12	50
2	Banana	24	10	14	41.7
	Tomato	24	3	21	12.5
	Mango	24	12	12	50
3	Banana	24	20	4	83.4
	Tomato	24	1	23	4

	Mango	24	12	12	50
4	Banana	24	10	14	41.7
	Tomato	24	9	15	37.5
	Mango	24	2	23	8
Formula $\Rightarrow DI \text{ (Disease Incidence)} = \frac{\text{Number of infected fruit}}{\text{Total number of fruit}} * 100$					
Number of respondents (N=50)					

Table 5: Percentage of disease incidence taken from four whole seller of bishishe market for most commercial fruit in the area.

About 17% of respondent use animal back to transport fresh commodities to the marketing area. Whereas about 23% of the respondent uses their back to transport their fresh commodities to Jimma market and the rest uses track usually for those commodities transported from longer distance such as banana. For those commodities transported from longer distance by truck there is largest percentage of loss because the fruits travel longer distance to reach Jimma town on a bumper road. In addition to the nature of the road, the packing material used to transport the commodities to the town was also contributing to this amount of loss.

Identified and prioritized problems

Based on the assessment result the following problems were identified and prioritized for proffering genuine solutions through intervention activities. Postharvest losses of horticultural at study area were related to one or more of major factors listed below which are well known to be important for maintaining quality and extending shelf life:

Lack of temperature management: Temperatures we observed during transport and handlings at marketing site were much higher than those recommended for quality maintenance of the fruit. They simply left exposed to ambient conditions during the Postharvest period. Mean air temperatures ranged from 27 to 38°C in Jimma while, Mean recommended temperature for banana fruit is around 15°C according to the Robinson & Saúco [19] which were typically 10 to 20° higher than handling temperatures recommended for the produce.

Poor quality containers: Packages used for handling fresh in study area were too big, too rough, and too fragile to provide protection for fresh produce during handing and transport. Across all horticultural crops venders package protection seen were uniformly low. The fruit were packed in large sacks or cloth bundles, in open baskets and some had no package at all. These wooden crates were too large to provide protection, and much of the fruit on the bottom of the crates was crushed and typically discarded before sale. The large presentation of mechanical damage for individual samples of commodities handled in very large sacks where observed which is similar to the [20].

Summary and Conclusion

The study was carried out to estimate the kind of Postharvest losses of horticultural sellers experienced in the Bishishe market. Largest percentage of fruit damage (83.4%) was observed because the fruits travel longer distance to reach Jimma town market on a bumper road. Improper handling along Postharvest system which causes fruit injuries such as cuts, bruises and blemishes were among the common causes for observed losses. However, fruit sellers recognized only over

ripeness as the main problem. In addition to the nature of the road, interview result show that the packing material used to transport the fruit to the town was also contributing to this amount of loss. They were sold in an open where the west management is poor space being displayed in a very hot condition that increases the deteriorations after harvest. I saw very poor postharvest handling facilities and practices such as lack of sanitation, temperature management uniformity of quality within containers, overfilling of containers and other quality and safety assurance problems.

It was also observed that there is knowledge gaps between the respondent interviewed in their experience of managing horticultural crops at market place and using appropriate package materials. This therefore calls for public awareness campaigns that must be implemented to increase their knowledge of properly managing the fruit at market using suitable packing materials.

Recommendation

Recommendations that are forwarded for the postharvest management of horticultural crops in Jimma town, the case of bishishe market are:-

- Plastic containers can be used as an alternative package to wooden boxes to reduce the cost of transportation, because wooden boxes are heavier than plastic container.
- Provide training on postharvest t handling of horticultural crop for producers, wholesalers and consumers to building the local understanding, Postharvest loss management capability and community responsiveness.
- The government should always legitimize and assist local groups to formulate and enforce rules to keep the quality products of horticulture available on the market as well for consumers.
- Encourage traders to have cooling warehouse/mobilize stakeholders to construct.

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