

# Review of Post-Harvest Loss of Horticultural Crops in Ethiopia, its Causes and Mitigation Strategies

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## Abstract

Post-harvest loss is one of the concerns of food security and poverty reduction strategies in many developing countries. It causes reduction in producers' outputs, unavailability of food, effects on the economy of people and the country. The magnitude of loss is high in horticultural crops as compared to other due to the nature of the crops. Major causes of Post-harvest loss in horticultural crops in Ethiopia were reviewed in this paper. Many scientific studies reported numerous causes and the extent of the loss. Majority of the crops, particularly, fruits and vegetables were challenged during harvest and Post-harvest time. This might be because of financial, managerial and technical limitations in harvesting techniques, storage and cooling facilities in difficult climatic conditions, infrastructure, packaging and marketing systems. Hence, in order to minimize the amount of loss findings suggested proper variety selection and cultural practices, appropriate Post-harvest handling and good sanitation management practices. Besides, the need for improving marketing system, infrastructures and the importance of education and training on Post-harvest loss reduction at different level of Post-harvest chain were also suggested.

**Keywords:** Produce loss; Cause; Mitigation

## Introduction

Because of wide range of agro-ecology conditions diverse varieties of horticultural crops including temperate, tropical and subtropical crops grown in Ethiopia. Large number of horticultural crops such as fruits, vegetables, flowers, ornamental plants, aromatic and medicinal plants cultivate for local, national and international markets. Fruits and vegetables are crops of great economic importance with a prospect for local consumption, export markets and processing. Bananas, avocados, mangoes, citrus, guava, grape, papayas, tomato, onion, carrot, and cabbages are some among very important fruit and vegetables crops cultivated in the country [1]. Such crops play great role food security poverty reduction and economic growth. They are important sources of nutrients, minerals and vitamins for human health and wellbeing. Some of the crops can be used for pharmaceutical industry.

Potential horticultural crops were being produced in the country by large number of farmers, farmers unions, and private investors and public large scale farms. Different regional and federal research centers have been conducting experiments on horticultural crops at various geographical areas to enhance production and productivity of the crops. Universities have been training professionals for their better contributions in the development of horticultural sector. Even though supply chain channel of horticultural crops not well documented in Ethiopia domestic distribution has been handled by fresh produce marketing firm (Etfruit) enterprise. Produce from private producers and small holders supplied to different parts of the country through Etfruit enterprise.

Besides, exporters have been participating in distribution of commodities to various countries. However horticultural crops have great challenges from Post-harvest loss both in terms of quantity and quality between harvesting and final consumption [1]. There is considerable amount of change in the quantity or quality of horticultural product after harvest that alters its intended use or decreases its value. Farmers growing horticultural crops are facing high economic loss because of lack of appropriate methods to increasing the shelf life of these crops. These are major sources of food loss. Horticultural crops are more vulnerable to Post-harvest loss than other crops such as cereals and legumes because of they are perishable and bulk in nature.

Fresh horticultural crops are high in water content and subjected to desiccation and to mechanical injury. Fruits, vegetables and root crops are living plant parts containing more water, and they continue their living processes after harvest. Their post-harvest life depends on the rate at which they use up their stored food reserves and their rate of water loss. When food and water reserves are exhausted, the produce dies and decays. So that such perishable commodities need careful handling during harvesting operation and during Post-harvest handling so that deterioration of produce is minimized as much as possible during the period between harvest and consumption. For instance scientists reported total Post-harvest loss of banana as 26.5% where 56% of the loss was occurred at the retail level due to rotting before reaching consumers in Ethiopia [2]. Besides, Post-harvest loss assessment was conducted in Jimma zone and the result indicated that there were greater postharvest losses of mango (35.5%) and banana

(40.0%) in Jimma town and the postharvest losses were mainly attributed to poor handling during transportation and the use of poor marketing structures to sell their fruits [3].

Furthermore, climate and weather conditions, harvesting and handling techniques, packaging, storage and transportation facility, market situation, disease and pest were recorded as major causes for post-harvest loss in Dirre Dewa where post-harvest loss ranging from 20% to 50% was recorded in between marketing and consumption [4]. The severe post-harvest loss and quality deterioration of horticultural crops mainly occurred during harvesting followed by marketing, transporting and storage. Poor quality equipment and materials usage caused tremendous mechanical, physiological and pathological damages on horticultural crops. On the other hand poor transportation, storage and unsatisfactory market situation were reported following Post-harvest loss assessment in South Wollo [5].

Furthermore, cabbage Post-harvest loss assessment with in supply chain was conducted and resulted in 58.9% loss in Akaki due to storage/transportation temperature, mechanical damage during transportation, disease infection, poor quality of irrigation water, poor storage mechanisms [6]. This is one of the factors that affect production and marketing efficiency and even contribute to food insecurity in the county and has to be minimized.

Producers, retailers, wholesalers, research institutes and other public and none governmental organizations need to have clear understanding of the causes of Post-harvest loss of horticultural crops in Ethiopia. Hence, the main purpose this paper is to review the causes and mitigation strategies of Post-harvest loss of horticultural crops in Ethiopia.

## Causes of Post-harvest Loss in Horticultural Crops in Ethiopia

Ethiopia is one of the developing countries in east Africa. Tropical, subtropical and temperate horticultural crops have been grown in the country where other crops like enset, coffee, Kebercho and anchote were originated. The country has comparative advantage in a number of horticultural commodities due to its favorable climate, high domestic demand and cheap labor. Majority of production operations conducted by small-scale farmers and supplied for near markets for sale. Variety of horticultural crops cultivated but not all produces reach consumers. This is because of environmental, technical and economic difficulties that hinder harvesting, handling and the normal distribution of produces from growers to consumers. According to researchers major causes are mainly connected to financial, managerial and technical limitations in harvesting techniques, storage and cooling facilities in difficult climatic conditions, infrastructure, packaging and marketing systems [7]. Similarly, some researchers reported the most common causes of postharvest losses such as lack of sorting to eliminate defects before storage and the use of inadequate packaging materials, rough handling and inadequate cooling and temperature maintenance [8].

Since Post-harvest management of horticultural crops have not been give satisfactory attention considerable loss occurs at harvest and Post-harvest phases and majority of post-harvest losses for horticultural produce are difficult to measure [3]. Even though the horticultural sector in Ethiopia is growing there is low and insufficient support for the improvement and reduction of post-harvest loss and quality deterioration of horticultural crops was reported [4]. On the other hand, an estimate of 15 to 70% of post-harvest losses of horticultural crops in Ethiopia was reported [9]. Thus, such losses during harvest are a major source of food loss and could be seen from food security and poverty reduction aspects in the country as such losses have direct effect on peoples livelihood and economy of the country as whole.

Generally majority of findings conducted in assessing cause and magnitude of Post-harvest loss in horticultural crops in Ethiopia resulted in similar problems that occur in developing countries. Biological, physical, mechanical, physiological, chemical and psychological losses are the most common primary causes of Post-harvest losses. However, there are a number of factors that accelerates the primary causes of losses. For instance, in adequate harvesting and handling, improper storage facility, inadequate transportation, inadequate packaging and inadequate marketing system enhances magnitude of Post-harvest loss. Crop nature and environmental factors can affect shelf life of horticultural produce. Over all Post-harvest loss in horticultural crops can be summarized from loss at farm level, at retailer and wholesaler, at processing and loss occurs at consumption level.

### Crop nature as factor of post-harvest loss

Horticultural crops contain relatively high moisture content, large in size and soft texture as compared to cereals and legumes and marketing immediately after harvesting is advantageous. This is because of the fact that horticultural crops are alive and can loss water through respiration and transpiration. In addition, researchers reported that vegetables are characterized by high metabolic activities and known to have short storage life [6]. The perishability nature and hugeness makes horticultural crops difficult to manage easily during postharvest period unlike that of dry grains [7].

They need careful handling and in the absence of appropriate handling and optimum environmental conditions their storability affected and the chance of loss enhanced. Thus, leafy vegetables are more affected than root crops and fruits produce and great care has to be taken to reduce rate of deterioration during harvesting, transporting, storage and marketing.

### Poor market facilities as factor of post-harvest loss

The horticulture products in Ethiopia are mainly produced by smallholder farms and most of the farmers sell their products on nearby market and a few sell both on farm and in nearby market such that the marketing condition is unsatisfactory and discouraging [5]. The reasons for unsatisfactory market condition indicated that higher supply of the produce at a time, middle men exploitation, and products sell on farm and on the nearby market.

Similarly scientist reported lack of market to absorb the production, large number of middlemen in the marketing system, absence (weakness) of marketing institutions safeguarding farmers' interest and rights over their marketable produces, lack of coordination among producers to increase their bargaining power, and imperfect pricing system of traders as major problems to producers [10]. Another finding on major Post-harvest loss assessment at Jimma zone elaborated presence of highest percentage loss for fruits during marketing that in Seka Chekorsa town as the fruits were sold in the open space being exposed to sun [3].

### Poor packaging, transportation and storage as factor of post-harvest loss

In adequate packaging material, transportation and lack of appropriate storage facility were reported as factor of Post-harvest loss of horticultural crops in Ethiopia [1,3,6]. On the other hand scientists described that absence of farm storage facility and proper packing station results in the perishable produce being marketed immediately after harvesting without primary processing and adequate packaging [11]. Different containers such as wooden box, baskets, plastic materials and sacks used in collecting various produces from farms during harvesting with inadequate handling that enhances level of produce damage. Packages need to be vented yet be sturdy enough to prevent structural change. If produce is packed for ease of handling, waxed cartons, wooden crates or rigid plastic containers are preferable to bags or open baskets, since bags and baskets provide no protection to the produce when stacked. Not packing, over filling of containers and mixing unlike produces was major problem in Post-harvest. Majority of traders store injured and unhealthy produce together with normal ones and finally come across losses.

Researcher reported as there was only 31.1% shops that stored physically injured and spoiled fruits separately in the assessment of fruit management conducted in Gonder town [1]. The transport systems in Post-harvest produces done loading one over the other which subjects product injury and damage and finally shortens its shelf life. Mixed loads of bulk commodity is a serious concern as the produces have different responses to temperature, transpiration, dehydration, ethylene are transported together which all together affect durability of the commodities through enhancing physiological, mechanical, biological and chemical losses. According to scientists, potato Post-harvest loss of 3.98% at transport and 10.08% at storage reported at Jeldu districts of West Shewa Zone, Ethiopia [9].

## Strategies for Reducing Postharvest Losses

### Appropriate cultural practices and variety selection

In order to minimize Post-harvest losses appropriate and feasible agricultural techniques such as the general principles of extending shelf-life of these crops must be put in place [9]. The importance of agricultural practices such as selection of planting material and cultural practices including harvesting methods and

handling practices on the quality of harvested produce was reported [11]. Appropriate cultural practices help to reduce Post-harvest loss in horticultural crops. Proper spacing, weeding, fertilizing, pesticide application could be conducted with great care. Besides, harvesting age and harvesting time has to be known for each crop to collect produces from the places where they produced so as to reduce risky of under maturity and/or over maturity. This can be corrected by using a maturity index standard and pre-sorting loss greatly reduced. Selection of relatively durable crop variety plays great roles in reducing Post-harvest losses and genetic attention is important.

### Proper harvesting technique

Harvesting should be carried out as carefully as possible to minimize mechanical injury such as scratches, cuts, punctures and bruises to the crop. This should be carried out during the cool part of the day, which is early morning and late evening harvest crop at appropriate stage. Farmers or producers have not harvest immature crops and have not wait too long before harvesting.

### Proper Post-harvest management

Inadequate Post-harvest management of horticultural crops resulted in losses. For instance, scientists reported that the postharvest management of banana has not been given sufficient attention hence fruit handlers lack information about postharvest handling practices [2]. On the other hand, researchers reported estimate of average total post-harvest losses of 22.05 percent of the total banana produce handled/purchased for sale at wholesale [12]. This has impacts on the economies of all involved in the chain. Hence, there could proper handling, good sorting and cleaning, good packaging, adequate transportation and good storage facilities so as to reduce Post-harvest losses of horticultural crops [7,8,11].

Good handling enables reduction in mechanical injuries that otherwise affects produces, separation of damaged produces from the normal once minimizes chance of damage, crop specific packaging supports in reducing damages to products during storage and transportation. During transport crop compatibility has to be identified to reduce damage that can resulted on the other crop, appropriate means of transport has to be selected, during loading and unloading care has to be taken not to damage crops.

### Sanitation management

Postharvest losses can also be the result of pathogen contamination particularly fruits and vegetables can become contaminated during harvest. Scientists reported the importance of sanitation management in produce handling particularly during all pre and post-harvest operations in horticultural crops to eliminate sources of infection and reduce levels of crops contamination [11]. Good hygiene practices are important during throughout produce handling practices. Producers, wholesalers, retailers and consumers should aware of the impact of sanitation. Beside, all tools or components of harvesting, containers, storage, transports tools and packing

houses should be sanitized to minimize factors of Post-harvest losses that speed up deterioration of products.

## Summary and Conclusion

Post-harvest losses occur from the field to the fork and even pre-harvest practices and decisions are strongly affect the magnitude of losses that occur at a later stage. It is the issue of food security and concern of all people. Producers, middlemen, traders and consumers should have enough knowledge of the cause of losses and means of protection or reduction of the losses. Growers should harvest at the appropriate stage and time, sort carefully, keep the product in shade to minimize harvest unnecessarily heat, wash harvest containers as much as possible, use appropriate transport means so as to reduce injuries. Losses at retailers and whole sellers should be minimized. This can also be obtained by using appropriate storage facility.

Therefore, educational and training programs could be seen as one of the best strategies to deal with Post-harvest loss minimization both in the field and during storage. Development agents, extension workers and horticulturists should have enough understanding the issue and impacts of Post-harvest loss and should participate in training farmers to take care in controlling losses.

Poor marketing and infrastructure such as roads facility could be improved to reduce Post-harvest losses that might otherwise result in food insecurity and poverty. Furthermore, low investment technologies capable of reducing Post-harvest losses might be the most appropriate solutions for producers and handlers and has to be utilized. With the assistant of government programs related to post-harvest handling, and government extension services, post-harvest technology from other countries could be adapted for economically important perishable horticultural crops. Improvements in post-harvest handling would greatly benefit the final consumer in terms of product quality, price, and availability of food.

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