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Research Article

## ASSESSMENT OF FRUIT AND VEGETABLE LOSSES AT MAJOR WHOLESALE MARKETS IN NEPAL

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### Abstract

A study regarding the losses of harvested horticultural produces in the major fruit and vegetable wholesale markets of Nepal was conducted to identify the major causes of fruits and vegetable wastage. This study aimed at generating useful information about the causes of loss of horticultural produce, types of loss and also about the possibility of reuse and recycling of such organic wastes as resource for composting and vermicomposting. Survey of the three major market centers namely; Narayangadh, Pokhara, and Kalimati fruit and vegetable wholesale market was conducted. Forty five wholesalers and 90 retailers were selected for the study. Data were collected using structured questionnaires. From regression analysis it was concluded that lack of cold storage facility and inappropriate packaging facility had significant effect on the loss of the produce.

**Keywords:** wholesale markets; vegetable wastage; produce; Nepal; Horticulture

### Introduction

A considerable proportion of post-harvest loss of fruit and vegetable is a matter of great economic concern in Nepalese agriculture. Post-harvest loss could be rightly stated as the qualitative and quantitative loss of horticultural produce at any moment along the post harvest chain which includes the change in the edibility and wholesomeness i.e. quality of the produce finally preventing its consumption (Adeoye, 2009; Buyukbay *et al.*, 2010). The estimated post harvest loss of fruit and vegetable in Nepal lies in the range of 20-50 percent (Gautam and Bhattarai, 2006). Between the harvest location and the retail market, produce undergoes a number of processes including transportation and storage under various environmental conditions. For perishable fruit and vegetable marketing, post harvest loss during handling, transportation, storage and distribution are the major problems. Such loss resulting in low per capita availability represents not only the loss of much money but also increases the costs of transportation and marketing (Subrahmanyam, 1986) which is a double loss for farmers and traders. Turan (2008) reported that improper harvesting practices and improper post-harvest practices result in loss due to the spoilage of produce before reaching the market along with the loss in quality of the produce such as deterioration in appearance, taste and nutritional value. The high perishable nature of fruit and vegetable, lack of storage facilities, mechanical injuries due to improper handling, packaging, transportation and microbial infection are the major reasons for post harvest loss in vegetables and fruits. Careless handling of the packed produce during loading and unloading, corrugated roads leading to maximum vibration of the vehicles, lack of storage facility, tightly squeezed packages into the vehicles and lack

of air circulation facility within vehicles leading to heat buildup inside the vehicles cause deterioration and finally loss of the produce. Camargo and Perdas (2002) and Oyeniran (1988) have reported that horticultural produce losses are as high as 50 percent due to inefficient postharvest procedures. About half of the losses are due to physical injuries and improper handling during storage, and distribution (Cortez, Honório and Moretti, 2002). Losses during transportation can be high, particularly in developing countries due to lack of sophisticated means of transportation. Careless handling of the packed produce during loading and unloading, corrugated roads leading to maximum vibration of the vehicles, lack of storage facility, tightly squeezed packages into the vehicles and lack of air circulation facility within vehicles leading to heat buildup inside the vehicles cause deterioration and finally loss of the produce.

This study aims to assess the causes of fruit and vegetable wastage in the respective markets, the possible ways of reducing such losses as well as the possible ways of reusing and recycling such wastes in a sustainable manner.

### Methodology

The methodology of the research consists of a survey and a lab experiment. Surveys were carried out in the fruit and vegetable wholesale markets at three densely populated cities namely; Kathmandu, Pokhara and Narayangadh where almost all types of fruits and vegetables are being marketed. Forty five wholesalers and ninety retailers were selected for the study. Data were collected using structured questionnaires. All the available data were transferred to analytical software, SPSS and analyzed. With the use of SPSS, frequency of variable, ranking of the variables,

regression and weighted averages were analyzed. Weighted average analysis was calculated to value the overall wastage and regression analysis was performed to identify the determinants of overall losses.

## Results and discussion

### Major cause of loss of the produce

Different market functions such as packaging, grading, handling and storage availability are the main factors which contribute to waste generation in the market. The opinion of the wholesalers regarding the degree of contribution of these transaction processes to waste generation was analyzed. The respondents were urged to rank those market functions according to the degree of their contribution to waste generation. These responses are presented in Table 1.

About 67 percent of the respondents had the opinion that the major function causing the loss of the produce was the lack of cold storage facility. Whereas, 22 percent opined inappropriate packaging and poor handling and 11 percent had the view that poor quality of the produce as the major cause of post harvest loss of the horticultural produce. From these observations, it is evident that the major factor causing the loss of the produce was the lack of cold storage facility followed by inappropriate packaging and poor handling of the produce and finally poor quality of the produce. Lakshmi (2010) stated that around 5-10 percent of the perishable horticultural produce arriving at the wholesale market in the city of Chennai is discarded every day due to the under use of proper temperature and humidity controlled storage facility. MFPI (2007) had the view that wastage in fruits and vegetables is 35 percent due to the unavailability of proper post-harvest practices viz. storage, transportation, cold chain facilities and other infrastructure support facility. During the survey, all respondents in Narayangadh market and more number of respondents in Pokhara market responded that lack of cold storage facility was the major cause of the loss of the produce. However, in Kalimati market they responded that inappropriate packaging and poor handling and poor quality of the produce were also equally liable for the loss of the produce.

### Regression analysis

In order to identify the determinants of overall loss, multiple regression analysis was performed. The wholesalers were surveyed about the extent of percentage loss that may be due to poor packaging, lack of cold storage, improper transportation and handling and poor quality. In the analysis, the dependent variable was overall loss and the independent variables were losses due to poor packaging methods, losses due to the lack of cold storage facility, losses during transportation and handling and losses due to poor quality. The  $R^2$  value,  $R^2= 0.341$  and F value,  $F= 10.98$ ,  $R^2$  being statistically significant, indicated the fitness of equation for interpretation. It could be noticed from the equation that the lack of cold storage facility in the market centers is contributing more loss i.e. for every unit increase in the unavailability of cold storages in the wholesale markets the loss would increase by 0.39 units. Loss of the produce was also found to be influenced by the use of inappropriate packaging materials and for each unit increase in the poor packaging method the losses would increase by 0.35 units. Arrival of fruits and vegetables in wholesale markets in absence of cold storage and appropriate packaging would contribute significantly in losses of the produce. Availability of proper storage and proper packaging would lead to

reduction in the loss of the produce. These two factors contribute much to wastage accumulation. Other factors except these two were found non-significant and thus they would not contribute much in wastage of fruits and vegetables (Table 2).

**Table 1:** Contribution of different market functions to loss of the produce as ranked by the wholesalers at three major wholesale markets in Nepal, 2012

Market functions	Responses	
	Number of respondents	Percentage of respondents
Lack of cold storage facility		
Ranked 1 <sup>st</sup>	30	66.7
Ranked 2 <sup>nd</sup>	8	17.8
Ranked 3 <sup>rd</sup>	7	15.5
Total	45	100
Inappropriate packaging and poor handling		
Ranked 1 <sup>st</sup>	10	22.2
Ranked 2 <sup>nd</sup>	17	37.8
Ranked 3 <sup>rd</sup>	18	40
Total	45	100
Poor quality of the produce		
Ranked 1 <sup>st</sup>	5	11
Ranked 2 <sup>nd</sup>	20	44.5
Ranked 3 <sup>rd</sup>	20	44.5
Total	45	100

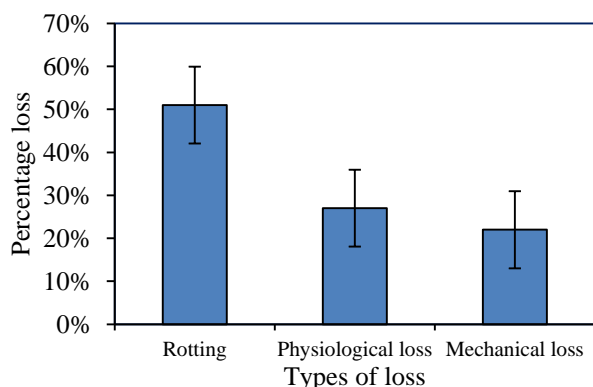
### Types of losses during handling

The types of losses that occur during handling are presented in Fig. 1. The result shows that 51 percent of the loss was due to rotting, 22 percent and 27 percent loss was due to mechanical damage and physiological loss respectively. Similar types of loss were observed in three markets during the study. The samples of fruit and vegetable wastage from the pile of the wastage at the market centers were observed and segregated for the purpose. Rotten fruit and vegetables were clearly identified. Similarly, the produces discarded due to bruises and scratches on its surface and also squeezed fruits and fruit vegetables were specified as mechanically damaged. The wilted and shriveled produce discarded was specified as physiological loss. The high percent score in rotting could be explained by the fact that during handling, fruits are infected with various pathogens which are not visible prior to handling but will cause decay and rot during handling. It is therefore, advised to leave fruits free from any contamination of microbes, pests, rodents, insects and dust as a means of preventing fruits and vegetable quality loss. Dirty handling environment with temperature mismanagement might be the source of fruits and vegetable contamination and quality loss from microbes, pest or insect all of which contribute to the spread of disease in the fruits and vegetables.

Poor road facility associated with the rough handling of the commodities and the packages during loading and unloading and unscientific stacking of fruit packages one upon the other is the main cause for the mechanical damage of the produce. Moreover, due to the lack of ventilation facilities in the closed trucks there is a high temperature build up which leads to the alteration in the physiology of the produce and finally loss of the produce quality.

**Table 2:** Regression analysis to identify the determinants of overall losses

Model	Coefficient	T	Sig	95 percent confident level	
Losses due to poor packaging methods	0.35	2.51	0.014**	0.073	0.63
Losses due to the lack of cold storage	0.39	2.2	0.03**	0.03	0.74
Losses during transportation and handling	0.4	0.17	0.864	-0.427	0.5
Losses due to poor quality	0.23	1.1	0.275	-0.18	0.65
Constant	8.95			6.67	11.22

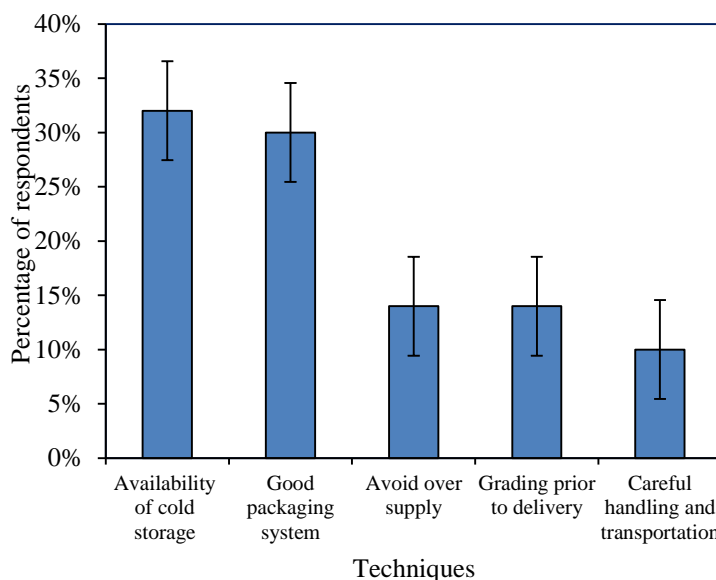
**Fig 1:** Types of losses of the produce during handling at three major wholesale markets in Nepal, 2012

### Waste reuse and recycling

All the respondents think that the wastes generated inside the market can be recovered through reuse/recycling. Regarding the methods of recovering, 67 percent of them responded that composting could be the best idea while 33 percent of the respondents were in favour of reusing by stall-feeding to livestock. They further argued that such organic waste could be utilized as the resources for composting and vermicomposting projects. Pant and Yami (2008) reported that organic wastage i.e. agricultural wastage could be recycled into valuable organic fertilizer by vermicomposting and similar findings were also reported by Yami and Shrestha (2005) and Simko (2000). Dumping the fruit and vegetable waste into landfill sites may be an immediate solution but it is not a sustainable way of wastage management, so the concept of reuse of organic waste is emerging as an acceptable technology to deal with the wastage management.

### Reduction of post-harvest losses

Improvement over the prevailing marketing functions can help in reducing post-harvest losses of the horticultural produce. A total of 90 retailers were surveyed; the felt needs of the respondents are presented in Fig. 2. Among them 32 percent think that losses could be reduced by the availability of cold storage at the market centers, 30 percent had the opinion that there should be a good packaging system, 14 percent argued that over supply of products should be avoided at the market centers, 14 percent had the view that grading commodities before delivery by the producers could minimize loss and 10 percent of them were in favour of careful handling and transportation facility to reduce loss of produce during marketing. More number of respondents at Narayangadh market were in favour of cold storage availability while at Kalimati market the respondents were in favour of good packaging and careful handling.

**Fig 2:** Suggestions to reduce post-harvest losses

### Conclusion

Huge amount of fruit and vegetable is wasted everyday due to the lack of proper post-harvest facilities at the fruit and vegetable wholesale markets. The fruit and vegetable wastage being biodegradable is easily recyclable. This cheap and easily available resource can be recycled through vermicomposting and composting, and the final product reused as vermicompost and compost. In fact, the exploited nutrients by the fruits and vegetables from the farmers field could be brought back again in farmers field by the method of composting and vermicomposting.

Unavailability of chemical fertilizers in right time and amount is one of the major hindrances for the development of agriculture industry in Nepal and hence the farmers are facing the problem of lower yields than recommended. Composting and vermicomposting could be an innovative idea to minimize the headache of increasing cost of collection and disposal of wastage and it could be a sustainable utilization of available resources. In fact, new employment opportunities could be created with the adoption of the composting and vermicomposting technology which may substitute the import of chemical fertilizers, though partially. The technology could be a sustainable way of safe disposal of fruit and vegetable wastage from the market centers of Nepal.

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