

Postharvest Management Challenges and Opportunities of Horticultural Crops in Selected Districts of Southwest Shewa, Oromia, Ethiopia

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Abstract

Initially identifying the constraints and opportunities in all the paths of horticultural crops value chain improvement targets are indispensable so as to secure food availability and accessibility. Post-harvest activities including market facilities are very important on top of productivity enhancement. Horticultural crops are highly productive compared with other crops, and also they are superior in nutrition content which is fundamental in balancing the diet. Derived from the research inquisition raised by society as a key point, the purpose of this study was to identify the post-harvest challenges and opportunities, and then generate baseline information that helps prioritize them for future intervention. Qualitative and quantitative data from both primary and secondary sources were collected from potential horticulture crops producing areas of the southwest Shewa zone, i.e., the selected three districts (Elu, Waliso and Wanchi) for this study. Finally, the data were analyzed with the help of SPSS software Version 20.0. Descriptive statistics (means, standard deviations, frequencies), and SWOT analysis for better illustration of postharvest issues such as storage, marketing, transportation, and postharvest handling were also applied. According to the study, the area has potential for producing horticultural crops on account of conducive agro-ecologies, the presence of ample labor, market options, and high interest of the farmers to produce are some of the opportunities identified. To utilize these prospects, however, there is a need for farmers' and experts' capacity building through different mechanisms such as among others training, provision and adoption of the latest technologies (e.g. cold truck), creating reasonable market alternatives, modern storage facilities, and securing crop protection programs for better prices. Conclusively, there is high potential to boost horticultural crop production. However, because of the recurrent challenges particularly marketing and price fluctuation, storage and transportation facilities were identified as major bottlenecks at postharvest.

Keywords: constraint, potential, identification, post-harvest, marketing

Introduction

Agriculture is the primary action in the Ethiopian economy and livelihood where about 84 percent of the country's population living in rural areas engaged in various agricultural activities and generate income for their household consumption to sustain their livelihood (CSA, 2015; MoANR and MoLF, 2017). It plays a prime role in a country's political, economic and social stability (CSA,

2017/18). As a consequence of the current population growth and the beginning of the industrialization tendency in Ethiopia, there is a great need to boost production and productivity in this sector; and in doing this, an affordable amount of the produce could be available for the market. Southwest Shewa zone is very potential to produce different horticultural crops including enset, potato, tomato, garlic, onion, shallot, cabbage, carrot, etc. (Ajabush, 2020; Ali and Martha, 2007). The study

conducted by Diriba *et al.* (2020) is an indication of the importance of this kind of investigation in which they identified problems and potentials in their study area which otherwise not revealed till then for professional further investigation and/or intervention. Food security can be increased by reducing postharvest losses and waste hence maximizing yield and quality; in fact, postharvest handling systems for fresh produce begin with harvesting and involve preparation for fresh market or other postharvest handling activities even at the destination including wholesale and retail marketing (Kader, 2013). Also, this scholar forwarded some of the strategies for reducing postharvest food losses including improving handling systems, especially at packaging and cold chain maintenance, overcoming socioeconomic constraints for instance inadequacies of infrastructure, poor marketing systems, and encouraging and supporting vertical integration among producers and marketers of horticultural crops. A similar study was reported by different scientists indicating the methods of handling the factors responsible for the loss of postharvest qualities and quantities of horticultural commodities (Banjaw, 2017; Nath, 2018; Negasa and Soruma, 2021).

Horticultural crops are highly productive relative to other crops, and also they are better rich in nutrition which is essential in balancing diet for health; i.e., it could have direct or indirect relation toward ensuring physical, mental, social as well as political aspects (CSA, 2017/18). These crops are significantly contributing to food security to feed the ever-rising population through increasing production and productivity. It also saves the need for high foreign currency by at least reducing crop importing from abroad. Besides, this sector contributes its part to the economy of our country, i.e. the lion's share of foreign currency which comes from the export of agricultural commodities currently contributed about 42 percent to the country's GDP (CSA, 2015). The sector unquestionably contributes to the current agriculture-led policy of our country in realizing the need for agricultural produce as raw input for the industries.

The study area is largely embracing an especially suitable agro-climatic state for the production of enset which is one of the known root and tuber horticulture crops; and it is the major enset growing area of the country (ERA, 2012; Ashenafi *et al.*, 2016; Ashenafi *et al.*, 2017). Their study may indicate the gap exists in this zone regarding the circumstances of other horticultural crops in particular. So, the other horticultural crops, besides enset, require attention for the promotion of production and productivity but with equal attention to postharvest issues including better marketing and also storage facilities. However, according to Alemayehu (2016), among many problems in the study area, long-chain marketing system is one of the postharvest challenging factors identified and suggested to be rectified. This could be due to a lack of managing price fluctuation by the concerned government bodies in the study area to secure a better marketing system nearby.

Identification of constraints and opportunities is the initial and essential step in development processes aiming at the improvement of crop productivity (Kraaijvanger *et al.*, 2016); which should be applied across the whole value chain (through production to post-production). These investigators elaborated that intervention work intended to raise agricultural productivity in low-external input settings requires an understanding of farmers' preferences and motivations and the complex socio-cultural settings in which these farmers operate. Market availability is one of the crucial postharvest factors in agriculture particularly for horticultural crops which are naturally easily perishable. Hence, suitable storage (e.g. commodity specific cold room with optimum temperature and relative humidity) is very necessary until selling of the produce or to properly conserve before the end consumption. Generally, the major importance of postharvest technology includes reducing: postharvest losses of produces, cost of production, malnutrition, and economic loss; securing food availability; employment generation hence tackling the unemployment problem; export earnings through foreign exchange (Kiaya, 2014; Teferra, 2022; Adhiraj *et al.*, 2024).

Along the chain of crop production and productivity enhancement role in general and postharvest activities scaling up strategies specifically through research and study should be started primarily by identifying the challenges and opportunities so as to ensure a high chance of success. This should be done from the grassroots most preferably through farmers' participatory method (e.g. survey) inclusion of problem identification. So, it is vital to diagnose the opportunities, constraints, and then prioritize them. This research result will certainly lay a baseline for intervention design by stakeholders (researchers, governmental bodies, NGOs and any individual stakeholders). Besides, the result will guide the researchers towards the research inquiry raised by the society/farmers in the study area to extend further investigation. Therefore, the purpose of this study was to identify and prioritize horticultural producers' marketing and other postharvest constraints and opportunities in the study area in an attempt to get a baseline for formulating future interventions..

Materials and methods

Description of Study Areas

This research was conducted in selected districts of the southwest Shewa zone during 2021/22. Southwest Shewa zone is located at 8°16'-9°56' N latitude and 37°05'-38°46' E longitude and altitude ranging from 1600-3576 m.a.s.l. It receives annual rainfall ranging from 900 -1900 mm. The mean minimum and maximum air temperature of the area is 10°C and 35°C, respectively (Hailu *et al.*, 2015; Alemayehu, 2016).

Types of data, source and collection methods

The central focus of the study was on the postharvest management level data collection and analysis which includes qualitative and quantitative data on the socioeconomic structure of households and farms, and postharvest (e.g. marketing) activities. In consideration of the characteristics of the target

areas, both quantitative and qualitative open-ended and close-ended questions were used to gather data. Also, secondary data were collected from zonal and district agricultural offices.

For qualitative data generation, the Participatory Rural Appraisal (PRA) method was employed in order to utilize the knowledge and opinions of rural people as reference data for future planning. PRA, a qualitative survey methodology, is a process to generate genuine interdisciplinary in the formulation of problems for agricultural research and development (Ison and Ampt, 1992; Belay *et al.*, 2013). Hence, focus group discussion (FGD) having 6-12 members were used to identify and clarify shared knowledge among groups' of individuals in the communities, which would otherwise be difficult to obtain accurately with a series of individual interviews alone. Based on the points included in the questionnaire, open and rigorous discussion was conducted in each of the three districts by the FDG which was led by our research crew. Similarly, mini focus groups composed of 4 or 5 members were also used instead in some areas where the interviewed farmers were few (less than 6) due to their inconveniences.

Before conducting the survey, a preliminary visit to the selected community was made to obtain background information on the local farming system. Also, there was a direct observation, transect walking with the community key informant around crop farms and homesteads was made to have a better overview of the general horticultural products, marketing and other postharvest factors. Then, besides the questionnaire for individual interviews, the collection of data was conducted through systematic group discussions with key informants consisting of men and women to discuss extensively the problems and the available opportunities in their localities. These key informants include exemplar (role model) farmers, development agents and other horticulture experts from district agricultural offices. So, this information helped to rank the perceived constraints based on the severity and importance of constraints to horticultural crops outputs.

Sampling techniques and sample size determination

Relatively potential horticultural crops producing districts from the southwest Shewa zone were selected in consultation with the zonal agriculture offices through preliminary survey. All horticultural crops produced in the study area were considered for this survey to identify and prioritize the challenges and opportunities related to each crop. From out of 11 districts found in Southwest Shewa zone, data were collected from purposively selected districts based on the potential production of horticultural crops. Hence, three districts including Elu, Waliso and Wanchi districts which consist of 15, 35 and 23 rural kebeles, respectively were identified and used for the study. Similar to district choice from the zone, two kebeles were purposively selected in each district for the aim of quantitative data surveying through simple random sampling. Accordingly, upon determining a sample size of 20 from each kebele and a total of 120 representative households from districts were used for data collection; it was determined based on the following (Yamane, 1967) formula to calculate the total sample size (n) for households; and it was proportionally fixed for each kebele. Further, for reliable qualitative data, in particular, key informants having better knowledge and experience were also included.

$$n = \frac{N}{1 + N(e)^2}$$

Where, n = designates the sample size the research uses;

N = designates total number of households;

e = designates maximum variability or margin of error 5%;

1 = designates the probability of the event occurring.

Data analysis

After summarizing the data, the software SPSS Version 20.0 (IBM, 2011) was used for analysis process. Descriptive statistics (mean, standard deviation, frequency) were also applied to the analysis. Likewise, SWOT (strength, weakness, opportunity and threat) analysis was used to analyze opportunities along with the challenges critically connected to the horticultural crops postharvest factors including storage, marketing, transportation and postharvest handling.

Results and discussions

Demographic and socioeconomic characteristics of sample households

There were different key variables used to describe the demographic as well as socioeconomic characteristics of sample producers. These include family size, age, education level, marital status and gender of the household that usually influence not only postharvest activities but also crop production as well. The result showed that the means of family size, age and educational level respectively are 4.392, 43.567 and 6.79. Similarly, minimum and maximum in that order are (2, 22 and 0) and (8, 69 and 13) as indicated below. From this study result, above the good education level and sufficient family labor, most of them are on productive age average of 43.6 years old which is in agreement with Tauer (2017) that found in their study the most productive age range of 35 to 44 years. Marital status and gender of the families in the surveyed area, based on the result, 90.83% are married, and 7.5% are not married, while only 1.67% are divorced. Most of the responders' gender diversity, 94.17%, is male; females take only 5.83% (Table 1). Generally, as indicated in the result, population diversity, age and education levels are very potential not only for postharvest period but also for all agricultural activities related to the study area.

Table 1. Demographic characteristics of respondents

	N	Minimum	Maximum	Mean	Std. Deviation				
Family size	120	2.0	8.0	4.392	1.5301				
Age	120	22.0	69.0	43.567	9.7634				
Educational level	120	0	13	6.79	3.355				
Valid N (listwise)	120								
Categorical variable									
		District							
		Elu		Woliso		Wanchi		Total	
		No	%	No	%	No	%	No	%
Marital status and sex of respondent	Married	34	85	38	95	37	92.5	109	90.83
Marital status	Unmarried	6	15	1	2.5	2	5	9	7.50
	Divorced	0	0	1	2.5	1	2.5	2	1.67
Sex of respondent	Male	37	92.5	38	95	38	95	113	94.17
	Female	3	7.5	2	5	2	5	7	5.83

Note: No=sample size; *Source:* survey result (2021/22)

Location and infrastructure

Mean distances from the nearest market (5.922 km) and the main road (4.954 km) are closely similar with only about 1km difference (Table 2). In both cases, the minimum distances are less than 1 km (0.2 and 0.1, respectively) while the maximums are 12 km to the nearest market and 21 km to the main road. According to

Hagos *et al.* (2018), as the mean value indicates, farmers are dwelling in the range of nearest distances (less than 10 km) both to the market and the main road which is one of the opportunities. Similarly, according to these authors, the maximum distances are on intermediate access which is less than 31 km. Mean, minimum and maximum total farmland in hectares owned by the farmers in the study area, respectively are 2.731, 0.5 and 12.

Table 2. Respondents' distance from the market center and main road and resources holding

	N	Minimum	Maximum	Mean	Std. Deviation
Distance from the nearest market in km	120	.2	12.0	5.922	3.8797
Distance from main road in km	120	.1	21.0	4.954	4.7862
Total farmland in hectare	120	.5	12.0	2.731	1.7785
Valid N (listwise)	120				

Note: N=sample size; *Source:* survey result (2021/22)

Marketing constraints of horticulture crops

There are a lot of constraining factors regarding the market. Sequentially listed marketing constraints include most importantly poor linkage with different stakeholders, low price of products, lack of storage facilities and

market, perishable nature of the produce, lack of transport services and market information, and quite remoteness of the marketplace. In view of that, 73.3%, 65.8%, 60%, 58.3%, 45%, 40.8%, 61.7% and 19.2% are the results obtained from the sample respondents (Table 3). Market fluctuation related to prices is a very problematic factor that forces farmers to focus

the subsequent year on producing crops that were sold at the best prices in the last year. On top of this, there is a lack of crop calendars and hence all the crop products are availed for the market simultaneously otherwise farmers have no storage alternatives to keep some of their produces until a better price comes. Likewise,

owing to market instability, crops such as potato are usually left on the farm for a distinct period of time. This indicates that because of a lack of storage and/or market, farmers leave potato tubers on the farm both for seed and for consumption which widens the chance of quality deterioration.

Table 3. Marketing and other postharvest constraints of horticultural crops in the study areas

No	Major Constraints	No/Yes	Frequency	Percent	Valid Percent	Cumulative Percent	Rank
1	Low price of products	No	41	34.2	34.2	34.2	2
		Yes	79	65.8	65.8	100	
2	Perishability	No	66	55	55	55	5
		Yes	54	45	45	100	
3	Lack of storage facilities	No	48	40	40	40	3
		Yes	72	60	60	100	
4	Poor linkage with stakeholders	No	32	26.7	26.7	26.7	1
		Yes	88	73.3	73.3	100	
5	Lack of market	No	50	41.7	41.7	41.7	4
		Yes	70	58.3	58.3	100	
6	Lack of market information	No	74	61.7	61.7	61.7	7
		Yes	46	38.3	38.3	100	
7	Lack of transport services	No	71	59.2	59.2	59.2	6
		Yes	49	40.8	40.8	100	
8	Long distance of marketplace	No	97	80.8	80.8	80.8	8
		Yes	23	19.2	19.2	100	

Marketing opportunities for horticulture crops produces

In order to satisfy the market demand for horticultural produces, the area is potentially endowed with suitable agro-ecologies be it edaphic (soil factor), climatic, water, plenty of labor availability, etc for the production of horticulture crops. Moreover, there are some

non-governmental organizations (NGOs) that can support agriculture sectors, particularly horticulture. Organizations namely SNV (*Stichting Nederlandse Vrijwilligers* = Foundation of Netherlands Volunteers), Save the Children and World Vision are currently doing different farmer supporting activities (production, marketing, training, etc.) in the study area. Probably the other most importantly

noted thing, though on commencement, is that the government focuses on the establishment of fruit crops production in clusters of farmers nowadays so as to fulfill the current market demand is encouraging.

Regarding marketing issues, a lot of promising motives were being identified. Access to road and transportation is better among the infrastructures required for the sector. Also, the closeness of the area to the capital, Finfinnee/Addis Ababa, and other urban (e.g. Sebeta) for easy marketing besides the presence of nearby local markets is another prospect of enhanced market access. Agro-industries are rising at Finfinnee and the surrounding, and this is a good opportunity especially if there is an intimate linkage with the farmers to reduce illegal intermediaries. There are also a few value addition works (e.g. potato chips) by some individuals around the towns that indeed require input (potato tuber) from producers so opening marketing occasion. Generally, section 3.5 below briefly summarized what was mentioned above and other information such as strengths, weaknesses, opportunities and threats at postharvest particularly storage, transportation, marketing and postharvest handling.

SWOT of horticulture crops marketing and other postharvest activities

Analyzing the SWOT of horticultural crops as a function of Storage, Marketing, Transportation, and Postharvest handling (starting at the harvesting point) was done critically by involving mainly key informants from producers and professionals from different levels of agriculture offices at the study area. The detail is briefly stated as follows:

Storage

Strength: Good experience of seed producer farmers' group on potato storage house construction (Wanchi district) from local material for better storage of their seed tubers until planting.

Weakness: Poor awareness about storage and lack of accessing storage technologies for farmers on horticulture crops; storing traditionally (e.g. in field /soil storing potato tubers).

Opportunity: Ware and seed potato storage trial at Wanchi district; local materials ease of access for storage construction; government projects for instance Agricultural Transformation Agency (ATA) and Agricultural Growth Program (AGP),) work on adopting new storage technologies for vegetables.

Threat (constraints): Unavailability of better technologies for this perishable horticultural crops storage; lack of knowledge; low government attention.

Marketing

Strength: some value addition experience (e.g. potato chips).

Weakness: Poor/lack of grading affecting the market preference for produce; market linkage lacks; well-planned market centre for vegetables is lacking.

Opportunity: Rising of Agro-industries at Finfinnee, and presence of nearby local markets; access of road and transportation; closeness to Finfinnee and other urban for better market access; Presence of collectors from few vegetable producers; availability of local markets (e.g. roadside market at Waliso district on the way to and from Finfinnee; high demand; farmers get information easily.

Threat: Fixing of price made by brokers; fluctuation of price; brokers decide price without any control; absence of price fluctuation supervision; price fall when maximum production at peak time;

Transportation

Strength: On-farm product collectors (traders) from a few farmers; few producers form groups and transport their produce.

Weakness: Improper packing/ using packing material and transporting, overloading; e.g. tomatoes using donkey back; poor damage control.

Opportunity: Accessibility of rural roads and transportation; access of roads in areas; plenty of labor for loading and unloading

Threat/constraint: Better transportation technologies are not affordable/ lacking for farmers; lack of year-round roads for some areas.

Postharvest handling (starting at harvesting point)

Strength: Some producers started proper harvesting; i.e. harvesting at proper maturity stage and method of collecting to maintain quality (e.g. onion curing) of some crops: leafy vegetable, root and tuber crops, coffee and spices; post-harvest handling awareness for a vegetable is increasing relatively.

Weakness: Not all farmers are practicing proper harvesting; farmers are not grading based on size, quality, etc.; postharvest problem; poor awareness of harvesting techniques for horticulture crops especially fruits.

Opportunity: Increasing Agro-Industries around Finfinnee that can receive quality produce for processing; labor availability.

Threat/constraint: Unavailability of improved/mechanized technologies.

Suggested key intervention points

Based on this study, the following areas of intervention have been suggested for the improvement of the horticulture sector in general and in the study area in particular; that is, due attention should be given to the postharvest (e.g. facilities such as storage, transportation, and marketing) similar to production. We believe that the direct involvement of different concerned government sectors is very imperative. Besides, these sectors should also play their role in awareness creation, mobilization and participation of

others such as private sectors, NGOs, etc in order to practically improve the horticulture area. This becomes implemented if we can invest also in capacity building strategy for farmers and other postharvest actors. Thus, based on the *suggested points by the society* the below mentioned ideas should be considered: *Higher institutions and other similar sectors should support farmers* in different intervention areas for instance supply chain problems about marketing from producers (farmers) to the end users or consumers; similar study result was reported by Tadesse (2018) indicating that there should be due attention to help farmers benefited the reasonable proportion from the selling of their enset produce. *Research and/or training* have been considered to be the essential areas of concern through, for instance, *detailed market value chain investigate* besides training on market, produce quality, etc; and *clear awareness and motivation* towards making people business minded further for market instead of only producing for home consumption.

Conclusion and recommendations

In conclusion, to secure the availability of quality produce for the market demand, both pre- and post-harvest factors should be visibly considered. According to the study the following important recommendations could be forwarded: the primary important issue suggested is that all stakeholders such as governmental, NGOs, and any concerned individuals and/or professionals should seriously contact farmers to understand their needs and hence always support them. This could include financial, professional, material, and any other support required starting from the farm community across the whole value chain. There should be storage facilities that are affordable and accessible. There should also be marketing management strategies (controlling illegal intermediates, creating and/or improving market linkage, etc.). Similarly, attentively working on transportation (e.g. trucks with reasonable cost, improving road facility) is another postharvest pillar of concern.

Conflict of interest

The authors have no conflicts of interest to declare.

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