

Research Application Summary

Post-harvest losses in tomato market value chain in Namasale sub-county, Amolatar, Uganda

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Abstract

Post-harvest losses are among the key constraints affecting farmers in developing countries such as Uganda. This study was designed to investigate the post-harvest losses in the tomato (*Lycopersicum, esculentum*) market value chain among smallholder farmers in Namasale sub-county, Amolatar District, northern Uganda. Groups of 44 active tomato farmers from the Namasale Tomato Growers' Association were selected and administered a questionnaire to provide responses regarding post-harvest losses. The study examined post-harvest practices, losses incurred along stages of the value chain, their causes, other constraints and the data obtained was analyzed by simple Excel. The results showed that the majorly young adult female farmers grow three tomato varieties that are harvested all through from the mature green to the very ripe stages; packed in nylon sacks, polythene bags and wooden crates, without cleaning or disinfecting. Harvest losses majorly arose from unhygienic handling, use of inappropriate containers, poor transport mechanisms, poor storage and lack of bulk consumption. To the Namasale tomato farmer, fruit production is costly and the post-harvest losses are high requiring well-planned support, guidance and management for mitigation.

Key words: Post-harvest losses, production practices, small-holder farmer, value chain

Résumé

Les pertes post-récolte font partie des principales contraintes auxquelles sont confrontés les agriculteurs des pays en développement comme l'Ouganda. Cette étude a été conçue pour étudier les pertes après récolte dans la chaîne de valeur du marché de la tomate (*Lycopersicum, esculentum*) chez les petits exploitants agricoles du sous-secteur de Namasale, dans le district d'Amolatar, dans le nord de l'Ouganda. Des groupes de 44 producteurs de tomates actifs de la Namasale Tomato Growers' Association ont été sélectionnés et ont reçu un questionnaire pour fournir des réponses concernant les pertes après récolte. L'étude a examiné les pratiques post-récolte, les pertes subies tout au long des étapes de la chaîne de valeur, leurs causes, d'autres contraintes et les données obtenues ont été analysées par un simple Excel. Les résultats ont montré que les agricultrices adultes, majoritairement jeunes, cultivent trois variétés de tomates qui sont récoltées du stade vert mature au stade très mûr ; emballés dans des sacs en nylon, des sachets en polyéthylène et des caisses en bois, sans nettoyage ni désinfection. Les pertes de récolte sont principalement

dues à une manipulation non hygiénique, à l'utilisation de conteneurs inappropriés, à de mauvais mécanismes de transport, à un mauvais stockage et à un manque de consommation en vrac. Pour le cultivateur de tomates de Namasale, la production de fruits est coûteuse et les pertes après récolte sont élevées, ce qui nécessite un soutien, des conseils et une gestion bien planifiés pour les atténuer.

Mots clés: Pertes après récolte, pratiques de production, petit exploitant agricole, chaîne de valeur

Introduction

Agriculture is the backbone of the Ugandan economy. More than 65% of the country's population depends on agriculture as the major source of income. Agriculture contributes about 46% of the total export earnings (MAAIF, 2008). Tomato (*Solanum lycopersicum*) is one of the cash crops grown extensively for its edible fruits (Peralta and Spooner, 2011). Despite all the numerous benefits from the crop, a number of constraints make tomato production unprofitable in most developing countries, especially those in Africa (FAO, 2016). The challenges faced by producers are embedded in the production procedures, post-harvest handling, and marketing and often in a combination of two or more of these factors (Asgedom *et al.*, 2011).

In Uganda, the most ubiquitous and devastating fungal pathogens that infect tomatoes are *Phytophthora infestans* that causes late blight and *Alternaria solani* that causes early blight. Bacterial speck- and bacterial spot-diseases of tomato caused by *Pseudomonas syringae* and *Xanthomonas vesicatoria*, respectively, are also common pathogens (Chen *et al.*, 2019). Other constraints of tomato production include unpredictable weather conditions and the inherent low capacity of most smallholder farmers to handle moisture stress. Apart from insects and disease damages, other problems that deter farmers from achieving substantial yields include unavailability of quality seeds, the use of poor varieties, low soil fertility, postharvest losses and the lack of standard and appropriate cultural practices (Karuku and Verplancke, 2016).

Access to the market is considered one of the key challenges that have plagued tomato production among farmers in Central, Eastern, Northern and Western Uganda. During times of abundance, tomato prices drop significantly low, affecting farmers' morale to remain in production. It must be noted that there are no central markets for the sale of tomatoes and value addition factories are very limited. Furthermore, the long distances farmers travel to access the markets increase post-harvest losses and correspondingly reduce profits (Tusiime, 2019). This study assessed the effects of post-harvest losses in Tomato Market Value Chain in Namasale sub-county in Amolatar district in Northern Uganda.

Materials and method

During the February-April 2020 field attachment, a survey was conducted with the key participants who play a major role in tomato production in Namusale sub-county in Amolatar District. Key participants included smallholder tomato farmers who were interviewed. The target population of this study was 44 tomato farmers who were actively involved in tomato production during the 2019-2020 period, obtained from the records of Namasale Tomato Growers' Association formed in 2016.

Study area

The study was conducted in Namasale sub-county in Amolatar District which is located in Northern Uganda and is bordered by the districts of Dokolo in the North-East, Kaberamaido in the East, Kayunga, Kamuli and Nakasongola in the South, and Apac in the North-West. Physically, the district lies between: Latitudes 1° 21'N, 2° 42"N, Longitudes 32° 51'E, 34° 15'E. Namasale sub county was chosen for this study because it is a sub-county where tomato production has emerged as an important economic activity among the residents. The study population was drawn from smallholder farmers who were actively involved in tomato production in the sub-county.

Data collection. From 50 famers who were actively involved in tomato production, forty four (44) were selected by simple random sampling technique to participate in the study. A semi-structured questionnaire (Pilato, 2009) was administered to the selected respondents to indicate the post-harvest practices and what causes the losses at harvesting, pre-cooling, cleaning and disinfection, storage, packaging, and transportation to the market. Information on the major source of credit and varieties of tomatoes cultivated were also required from them. The participants were grouped according to gender, age, education level, household size, occupation, experience in tomato production and marketing. Data were analyzed by Microsoft Excel for simple frequencies and percentages while qualitative methods were used to analyze in depth information.

Results and Discussion

Table 1 shows that females (70.5, 31%) were the ones largely involved in post-harvesting handling of tomatoes as compared to males (13, 29.5%) in Namasale sub-county in Amolatar district. As shown in Table 2, able-bodied youths and adults (25-45 years) constituting 81.8% were more engaged in tomato production and post-harvest handling than the younger and elderly counterparts, both at 9.1%.

Table 1. Gender of the Respondents

Gender	Frequency (N= 44)	Proportion (%)
Male	13	29.5
Female	31	70.5
Total	44	100

Source: Primary Data (2020)

Table 2. Age of the respondents (N= 44)

Age	Proportion (%)
19-24 years	9.1
25-35 years	56.8
36-45 years	25.0
Over 45 years	9.1

The findings revealed that tomato farmers in Namasale Sub County were employed in multiple activities that largely included farming and fishing. This practice apparently helps to sustain the household needs by filling up shortfalls in the already meagre income and also to support their small-scale investments (Table 3).

Table 3. Occupation of the Respondents

Occupation	Frequency (N=44)	Proportion (%)
Farming	44.0	100
Fishing	23.0	52.3
Business	13.0	29.5
Civil servant	5.0	11.4

Tomato losses along the market value chain. It must be noted that farmers who sold their output at farm gate had their losses computed to the farm-gate stage while those that sold to the market were asked to indicate the losses incurred. Furthermore, the selected farmers were beneficiaries of the tomato-growing project promoted by GIZ. Thus, those involved in tomato production were identified and trained on how to capture data on post-harvest losses. Post-harvest losses were therefore obtained by determining the quantity harvested, minus the quantity lost during harvesting, sorting and grading, transportation, storage and marketing. Farm gate and market prices were obtained to compute the post-harvest losses incurred in monetary terms. These were obtained by generating the descriptive statistics and using a comparative t-test at a 5% significance level. It was noted farmers who sold their produce to the market experienced more post-harvest loss than those who sold at farm gate (Table 4).

Table 4. Tomato losses along the market chain in Namasale, Northern Uganda

Causes	N	Minimum Acres/ (kgs)/rate	Maximum Acres/ (kgs)/rate	Mean	Std. Deviation
Land size (acres)	44	0.5	3.5	1.67	0.7846
Total quality harvested	44	1150	18,900	8301.60	437.45
Quantity lost during harvesting	44	110	1,890.00	830.20	437.45
Quantity lost during transportation	44	60	950.00	415.10	218.73
Quantity lost during storage	44	20	280.00	124.50	65.62
Quantity lost during marketing	44	00	220.00	28.60	44.82
Total post-harvest losses	44	210	3120.00	1,398.30	710.89
Loss rate (%)	44	16.5	18.02	17.08	0.74011

Source: Primary data (2020)

Analysis of acreage and tomato losses along the value chain. The results in Table 4 show that an average active participant in this study cultivated 1.67 acres of tomato while the least active cultivated 0.5 acres and the most cultivated 3.5 acres. This translated to an average quantity of 8,301.6 kg of tomatoes harvested while the least harvested 1,150 kg and the most active harvested 18,900 kg.

At harvesting, the average participant lost 830.2 kg of tomato fruits, with the least losing 119 kg and the highest 1,890 kg. During transportation, average participants lost 415.1 kg with the least losing 60 kg and the highest losing 950 kg. During storage, an average participant lost 124.5 kg with the least losing 20 kg and the highest losing 280 kg. During marketing, an average participant lost 28.6 kg with the highest losing 220 kg. Overall, the study found out that an average tomato farmer to have lost 1,398.3 kg with the least losing 210 kg and the highest losing 3,120 kg along the post-harvest stages. This translated to 17.08% of the total harvest lost by an average tomato farmer and 16.5% and 18.02% for the least and highest-producing farmers respectively. These findings demonstrate that the tomato farmers in Namasale sub-county lost a significant amount of tomatoes during the marketing chain stages.

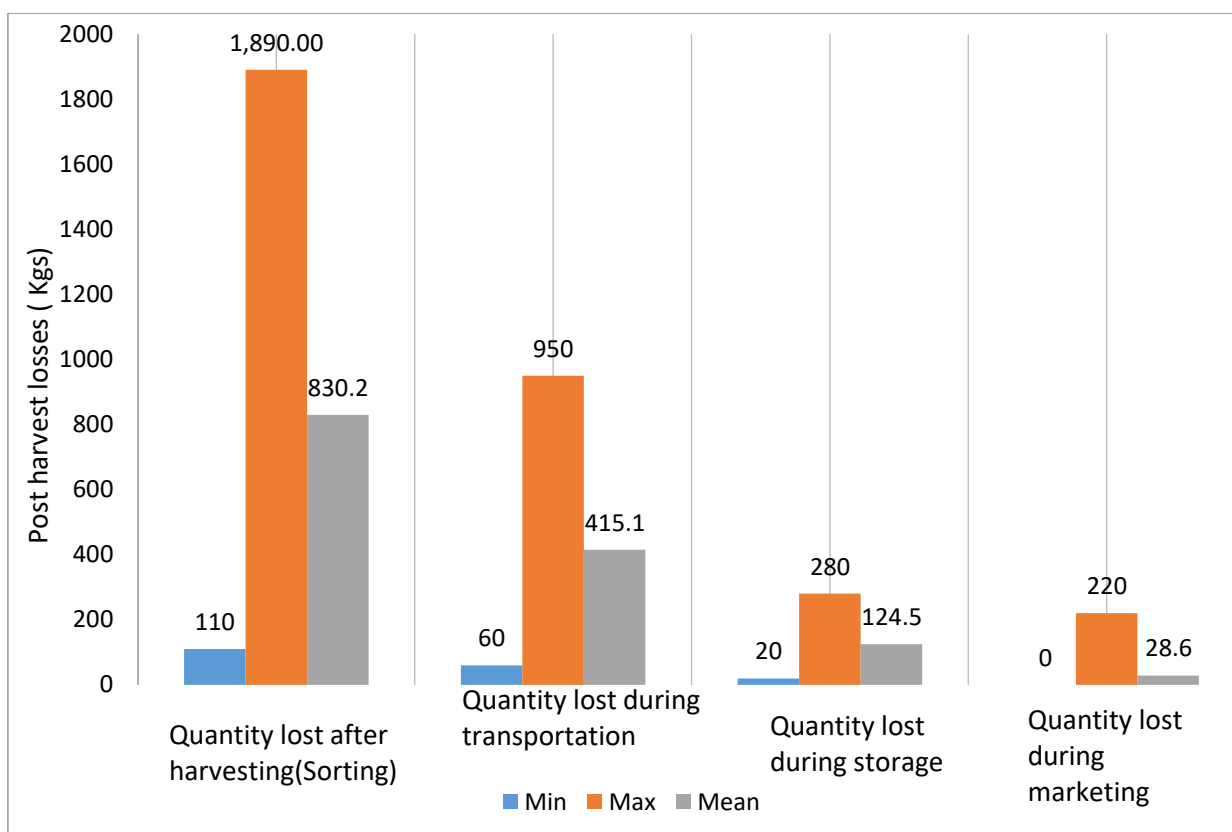


Figure 1. Tomato losses along the Market Chain at Namasale Subcounty
 Source: Primary Data (2020)

Causes of post-harvest losses along the market chain. Table 5 shows the major source of post harvests losses that tomato farmers incurred along the market chain in Namasale Sub-county. The major cause of post-harvest losses was lack of a tomato-processing factory. These findings demonstrate that any surplus fruits produced cannot be absorbed in the domestic consumer market

due to the rapid perishability of the fruits and hence the losses. Over 97.7% of the participants indicated the use of inappropriate transport system, such as use of bicycles and motorcycles and the use of crates which increase tomato damages as a result of mechanical injuries in the fruits. Poor roads networks similarly contributed to post-harvest losses (Table 5).

The majority (90.9%) of the participants of this study stated that improper packing materials such as crates, nylon bags, polythene bags also contribute to post-harvest losses. These packing materials were associated with causing scratches, breakages, and crushing tomatoes due to a lack of standardized packaging materials with appropriate weights. Polythene bags further enhanced temperature increase that hasten ripening due to lack of aeration. These findings therefore indicate that tomato farmers in Namasale sub-county largely used inappropriate packaging materials and transport methods that increased the risk of tomato damage (Table 5).

The majority (88.6%) of the participants of this study linked the poor storage facilities to the huge post-harvest losses of tomatoes. Eighty-six (86.4%) percent of the participants of this study linked the post-harvest losses to poor field sanitation. Often it was observed that the tomato farmers after harvest, dumped their tomatoes on the bare ground which increase the microbial load and further increases the risk of infestation of tomatoes leading to rotting (Table 5). The results further show that 79.5% of the participants in this study practiced poor sorting methods in the garden and during storage. It was observed that during the selection process, farmers tended to remove tomatoes that were extremely damaged and took along those that were partially damaged, increasing the risk of spoilage due to contamination of healthy by damaged tomatoes. To some degree, most of the tomatoes showed pest infestation but due to the need to have high output, most farmers ignored removing them out (Table 5).

A good proportion of the respondents (79.5%) also incriminated poor temperature management. It was observed that harvested tomatoes were merely placed under a tree shade that had exposure to heat and others covered the tomatoes with plant leaves. In doing so, tomatoes shrunk, got discoloured, and were exposed to a potential increase in a microbial activity affecting the quantity and quality of tomatoes. In addition, 75 % of the farmers indicated that lack of a ready market for the tomatoes caused the delay for farmers in selling off the perishable fruits leading to losses. The study results also showed that up to 59.1% of the participants of this study used improper

Table 5. Causes of post-harvest losses along the market chain in Namasale Sub-county

Causes	Frequencies	Proportion	Rank
Lack of processing factories	44	100.0	1st
Inappropriate transport system	43	97.7	2nd
Improper parking materials	40	90.9	3rd
Poor storage facilities	39	88.6	4th
Poor sanitation	38	86.4	5th
Poor sorting	35	79.5	6th
Poor temperature management	35	79.5	6th
Lack of reliable markets	33	75.0	7th
Improper harvesting containers	26	59.1	8th
Improper harvesting periods	19	43.2	9th

Source: Primary Data (2020)

harvesting containers. Wooden crates, basins, and woven baskets were largely used and this created hard and sharp surfaces that caused mechanical injuries to the harvested fruits. Subsequently, overloading during harvesting was associated with the build-up of compressive stresses that resulted in the crushing of tomatoes that increased the losses (Table 5).

Lastly, 43.2% of the farmers that participated in tomato production took note of improper harvesting stages. It was important to note that, although the majority of the farmers were aware that mature green was the appropriate stage of harvesting tomatoes, some farmers were still found harvesting when the fruit was partially ripe and when fully ripe too. This was associated with poor monitoring and lack of knowledge on when it was appropriate to harvest the tomatoes. These farmers thus linked their post-harvest losses to high mechanical injuries attributed to the poor harvesting stage.

Conclusion

The study findings reveal that post-harvest losses were generally high during harvesting, sorting, grading, transporting and storage stages. This was as a result of lack of proper cleaning, inappropriate packaging, and use of wooden and nylon packaging material that caused mechanical damage. Poor road network, lack of proper ventilation system in storage facility, poor temperature management load and lack of market and processing factory contributed to post-harvest loss. Post-harvest losses were high in Namasale subcounty.

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