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Impacts of Harvest Process on the Onions Chain Management in Singida Urban District

[1]Mwita Tubeti Waise
Tanzania Institute of Accountancy (TIA)
Corresponding Email: waisemwita6@gmail.com

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Abstract

The agriculture sector is a key player in Tanzania's economic growth, which contributes to 45% of Gross Domestic Product (GDP), creating 80% employment opportunities (Putter et al., 2007). In Tanzania, the supply chain of fresh vegetables does not yet have an identity to stand alone as a horticulture sector, despite there is support from Government and non-government to empower the sector so that it can be able to make the products on an international commercial basis. This study targeted warehouse operators, farmers, retailers, distributors, consumers, and key information personnel involved in onion production within the study area of Singida Urban District. The study used a sample size of 100 respondents less than the targeted sample size of 138 obtained from the estimated population larger than 1000. The data was to be collected from a sample of 138 respondent who is stakeholders, in the onions business however, due to different reasons such as time limit, schedule conflicts, and financial constraints data was collected from 100 respondents. Data analysis for both descriptive statistics and inferential statistics was made possible with the help of Statistical Package for Social Science (SPSS-21 version) software. In the study, the research objective was to assess the impact of the harvesting process of onions in supply chain in Singida Urban District. Whereby, about 34.8% of farmers experience a loss of less than 5 kilograms during harvesting, while about 32.6% of onion farmers experience a loss of between 6 – 10 kilograms. This indicates that a lot of farmers start to experience loss even before their yields reach the market and one of the reasons for this could be the using of poor harvesting techniques and equipment.

Keywords: *Supply Chain Management, Onions Harvest Process, Tanzania*

1.0 Introduction

The agriculture sector is a key player in Tanzania's economic growth, which contributes to 45% of the Gross Domestic Product (GDP), creating 80% of employment opportunities (Putter et al., 2007). It is a source of food and highly contributes critical raw materials for industrial operations. Moreover, the agricultural sector of the country generates income in foreign currencies from around 70-80% with the export of traditional crops like tea, coffee, cashew nuts, and sisal, (Porter, 2010; Peterson, 2003) to mention a few. Indeed, the agricultural sector is presently exceeded by the minerals and tourism sectors in earning foreign currencies (Masare, 2015). The agriculture sector especially the horticultural sub-sector is still behind because it is dominated by small-scale farmers having less than 2 hectares, as justified by Tanzania Horticultural Association (TAHA, 2011). Based on the use of traditional farming technology, it leads farmers to harvest low produce for local consumption and insufficient quantity to meet commercial purposes.

In Tanzania, supply chain of fresh vegetables does not yet have an identity to stand alone as a horticulture sector, despite there is support from Government and non-government to empower the sector so that it can be able to make the products on an international commercial basis. Nonetheless, vegetable cultivation is dominated by small farmers, making it rely on local markets, which are also restricted by inadequate storage facilities and transportation cumbersome, moving the perishable crops to distant markets (check-in Mwagike and Mdoe 2015; Weinberger and Msuya, 2004). Farmers are reported to be in losses to win negotiations with traders. Vegetable markets do not perform externally because has are dominated by women who are in low financial status and need to cultivate high-value market vegetables. Also, most farmers are from households with low levels of education, making it difficult for them to understand the adaptation of new technological changes in agriculture, and harvesting function (Mbembela and Nyamanisa, 2018).

1.1 Problem Statement

United States Agency for International Developments (USAID) (2013) re-counted that, most vegetables have a short shelf life to maintain their quality in SC. However, Kilimo Trust (2017), advocated that onions from western regions of Tanzania are proposed to be of higher quality and longer life span than those of neighborly countries. Nonetheless, still need effective and efficient SC to reduce losses and costs along the supply journey. Other studies (by Bray et al., 2000 and Kader 1992) justified that it is inevitable to stop losses of fresh vegetables in supply chin due to the uncontrollable environment where plants grow, but gradually organizations and individuals are struggling to minimize losses to some extent. Kader (1992) proposed that, if the supply chain needs to be improved the loss of onions can be reduced when farmers possess biological knowledge and learn to be careful in handling onion crops practices. Gustavsson et al. (2011), argued that normally the losses of fresh vegetables obtained from post-harvesting activities such as, at the time of harvest, storing, and moving the crops to distant areas. Also, many studies conducted in Tanzania, revealed that SC is affected by transaction costs from the production stage to transportation activities (Mkenda and Campenhout, 2011; and Mwasha and Leijdens, 2013). There is insufficient storage capacity, most supply chain actors fail to own it, and hiring it is costly. Due to costs appearing high, storage of onions is done traditionally and causes moisture and shrinkage (Agri Pro Focus, 2016). SC activities lack collaterals to support financial accessibility, disorganized chain activities, and poor road and market infrastructures, (HODECT, 2010).

Based on the above-stated statement of problems, this shows there is a need for further study on supply chain practices such as processes of harvesting, operational of warehouses, and distribution activities for exploring more information on the issues affecting the effectiveness of supply chain management of fresh vegetables on onions in Singida Urban District. The information will assist on to improve horticultural productivity, reducing costs, and post-harvesting losses, and improving the quality level of onion crops in the supply chain and livelihoods.

1.2 Objectives of the Study

To assess the impacts of the harvest process on the onion supply chain management in Singida Urban District

2.0 Literature Review

2.1 Onion Harvesting Process

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Rawat and Ansari (2009) advocated that the harvesting stage plays an important role in determining the shelf life of onions regarding their maturity. Harvesting refers to the process of pulling up the onion roots from the ground when the onion plant indicates its maturity level. This process is emphasized to be done when it is hot rather than in cool weather to enable the onion steam to be well dry. The pulled onions should be cleaned with the soil surrounding them before being taken to the storage area for drying purposes. Farmers are placed in the field area or off the field to be cured by the shed or window ventilation. The process is all completed manually.

2.2 Theories and Concepts of the Study

2.2.1 Resource Based Theory

Resource-based theory had been proposed by Barney (1991). This theory refers to the investment of resources that are valuable, scarce, un-substitutable, and inimitable, which leads a firm to gain competitive advantages and sustain itself in a changing environment of complex competition. This theory was formulated to establish the strategic resources essential to deliver advantages over competitors' firms. These resources can be exploited by the firm to achieve sustainable competitive advantages. All essential resources should be acquired and maintained to remain sustainable to the competitive advantage over a rivalry. This theory is relevant to the study of the supply chain of fresh vegetables because, the actors in the supply chain of fresh vegetables are required to possess critical resources such as harvesting equipment, storage facilities, labor force, handling equipment, packages, transportation handling, and storage equipment.

2.3 Conceptual Framework Model

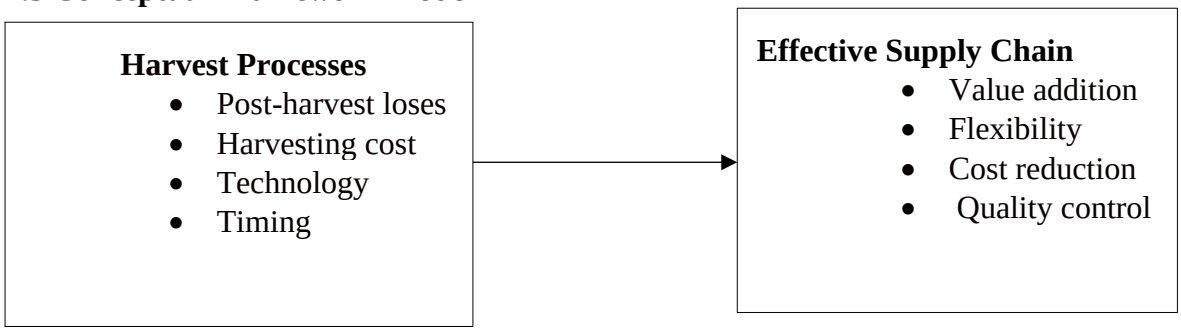

Figure 1: Conceptual Framework

3.0 Methodology

3.1 Research Design and Approach

The researcher used a cross-section survey design to collect all data from one point at the same time in April 2019 from farmers and onion traders in Singida Urban District. A cross-sectional research design is a technique that involves looking at data from a population at one specific point in time (Mazengo and Mwaifyusi, 2021). The study utilized both quantitative and qualitative research approaches. Both approaches were used to increase the reliability of the findings, moreover, the researcher applied interviews and questionnaires to obtain clusters of different data. The data was collected from wholesalers, farmers, retailers, customers, and key informants such as cooperative union officers, agricultural officers, and trade officers.

3.2 Study Area

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This study was carried out in Singida Urban District which is one of the famous places in Tanzania practicing onion farming however, there are other regions such as Arusha, Mbeya, Kilimanjaro, Manyara, and Njombe where the onions are produced.

3.3 Targeted Population

The population is a set of all members who exist or a set of objects that needs to be studied by a researcher. A population can be finite or infinite (Kothari, 2014). 27 Population is set of a wide group from which, the sample is drawn for generalized opinions of many by small numbers of representatives. This study targeted warehouse operators, farmers, retailers, distributors, consumers, and key informative personnel involved in onion production within the study area of Singida Urban District

3.4 Sample and Sample Size

A sample is a group of a few participants selected to represent the whole population. The sampling methods can be categorized as probability or non-probability sampling, whereby within probability sampling every member within an identified population may be selected to represent others while in non-probability sampling a certain member has the possibility of being selected to represent others while others are not due to various factors such as costs, availability, and willingness. Sekaran (2006) said that sample size is defined as the subset containing several members or objects drawn from a population to conclude the universe. The sample size calculation was based on a proportion of stakeholders engaged in onion farming within the agriculture sector in the Singida Urban District.

The study used a sample size of 100 respondents less than the targeted sample size of 138 obtained from the estimated population larger than 1000. Based on studies in Ethiopia, the onion supply chain took about 0.44% of the entire agriculture participant's dominant crop for commercial purposes. The sample size of respondents was determined by the application of the formula by Israel (1992).

$$n = \left\lfloor \frac{Z^2 p(1-p)}{e^2} \right\rfloor$$

Where Z is the confidence level at 95%

p is the proportional population involved in the onions supply chain in agriculture 0.44.

ε is the margin of error, of which 6% was chosen.

n is the sample size

3.5 Sampling Techniques

The technique used to select the study respondents is probability sampling. The Probability technique provides each member, object, or item, an equal chance to be selected to be a sample to represent the entire population, (Kothari, 2004). This study used a probability technique that gave each member of supply chain stakeholders an equal chance to be chosen to represent the population of the Singida Urban District cluster. The study selected a probability method to draw the number of respondents to answer the study objectives from the study area. Due to the large sample size of the study researcher divided the respondents into their relatively cluster groups of farmers, distributors, retailer wholesaler's customers, and informative personnel. By using simple random sampling selection, the researcher selected samples from the stated clusters.

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4.0 Results and Discussion

4.1 Introduction

This chapter gives comprehensive details of the data collected in the study, together with the analysis performed to answer the research questions. Most of all it discussed the findings from the analysis and interpretation of the data obtained to provide a meaningful justification of the study objectives conceived earlier in the study. The study involved the examination of how harvest, distribution, and storage processes impact the onion supply chain in the Singida Urban District. The data was to be collected from a sample of 138 respondents who are stakeholders, in the onions business however, due to different reasons such as time limits, schedule conflicts, and financial constraints data was collected from 100 respondents. The respondents included farmers, sellers (retailers and whole sellers) consumers of onions within the region, and key informative personnel in supply chain activities. Therefore, 100 respondents were considered as 100% of the sample size. Data analysis for both descriptive statistics and inferential statistics was made possible with the help of Statistical Package for Social Science (SPSS-21 version) software.

4.2 Demographic Characteristics

This part described the key characteristics of respondents involved in the study. It described the gender, age, educational status, and occupation of respondents from whom the data was collected. These characteristics are described in detail below;

4.2.1 Gender

In the study, about 52% of respondents were male while the remaining 48% were females. The higher percentage of male respondents was explained by the fact that during data collection most men were more positive in responding to the study questions in comparison to the counterpart "s female respondents. In addition, having more concentration of male respondents suggests that, the onions farming is male.

4.2.2 Onions Lost During Harvesting Process

Due to the inadequate infrastructure supply chain existing among farmers in Singida urban district. Farmers experience losses of their yields during the harvesting process. In the study, 34.8% of farmers experienced a loss during harvesting of less than 5 kilograms, while 32.6% of onion farmers experienced a loss of between 6 –

10 kilograms. This indicates that a lot of farmers start to experience loss even before their yields reach the market and one of the reasons for this could be the using of poor harvesting techniques and equipment.

Table 1: Onions Lost During Harvesting

Onions lost in Kgs	Frequency	Percentage
Less than 5.0	40	40
6 – 10	30	30
11 – 15	15	15
16 – 20	10	10
Above 20	5	5
Total	**100**	**100**

Source: Researcher (2019)

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Furthermore, 15% of farmers‟ experience loss of between 11 – 15 kilograms in their yields, while 10% experience a loss of between 16 – 20 kilograms, and lastly 5% experience loss of above 20 kilograms to which these are large scale farmers who invest heavily in the onion farming sector and practice onion farming at a large scale. Results are shown in Table 4.8. In addition, results from the key informants especially trade officers with 20 years‟ experience, suggested that another reason that onions are lost during harvesting is that farmers are not ready to change into advanced harvesting techniques.

4.2.3 Harvesting Technology Influence on Level of Quality in Onions Products

Literature suggests that different harvesting technologies used by onion farmers in one way or another influence the quality of the product, in this study it was investigated among farmers on whether the harvesting technologies that farmers use have an impact on the level of quality of onion products. Results suggested that a total of 80% of respondents disagreed which includes about 58% disagreed and 25% strongly disagreed. In addition, only 7% agreed. This suggests that harvest technology does not add value to supply chain onions from the farmers‟ standpoint. On top of that, about 10% of respondents agreed to not being sure whether harvesting technologies influence on level of quality of onion products or not. Results are shown in Table 2.

Table 2: Harvesting Technology Influence on Level of Quality Onions

	Frequency	Percentage
Agree	7	7
Not sure	10	10
Disagree	58	58
Strongly disagree	25	25
Total	100	100

Source: Researcher (2019).

4.2.4 Two-Way ANOVA Analysis of Assess the Impact of Harvest Processes in Onions Supply Chain

The total score for the indicators of supply chain in onion farming was obtained from farmers regarding supply chain indicators. This includes value addition, flexibility, cost reduction, and quality control. Before the analysis, the internal consistency of variables used to obtain scores was investigated using Cronbach alpha test to see how well the variables hang on together. Results indicate a 0.9 value for Cronbach alpha which is above the threshold of 0.7, suggesting we can proceed with the analysis since the variables do agree with one another (Pallant, 2003).

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Table 3: ANOVA Analysis Table for Harvest Processes in Onions Supply Chain

	Df	Sum of squares	Mean Squares	F value	p-value
Experience in Post-harvest losses	1	59.32	114.30	0.518	0.56
Harvesting costs is a challenge	1	12.12	0.07	4.28	0.03
Technology application as a challenge	1	5.80	3.42	1.71	0.01
Harvesting occurs within a time frame	1	5.71	10.51	0.54	0.97

Source: Researcher (2019).

The two-way ANOVA between groups was conducted to check how the variability of a supply chain is influenced by the different levels of harvest processes such as experience in post-harvest losses, challenges of harvesting, technology application, and timely harvest. Results, which are shown in Table 3 suggest that experience in post-harvest loss was not statistically significant [F (1, 100) =0.518, p=0.56] for farmers who experienced post-harvest loss and those who did not experience loss. This suggests that experiencing loss or not after harvest does not affect the variability of the supply chain. In addition, harvesting costs were revealed to be statistically significant [F (1, 100) =4.28, p=0.03] for those who agreed it was a challenge and for those who did disagree. Similarly, technology application was revealed to be statistically significant [F (1, 100) =1.71, p=0.01] in comparison to farmers who agreed to those who disagreed. Lastly, results suggest there was no statistical evidence as to harvesting time influencing the supply chain [F (1, 100) = 0.54, p=0.97]. This suggests that only harvesting costs and technological application challenges are the major factors that influence the variability of the supply chain supported by statistical evidence.

4.3 Discussion of the Findings

4.3.1 Assessment of the Impact of Harvest Processes on the Onions Supply Chain

In general, results revealed that the harvest of a supply chain in the Singida Urban District still faces many challenges. Onions are lost during harvest and storage which reduces yields expected. In addition, the harvest time determines the quality of onions due to weather conditions affecting onions during harvest. This study is congruent with the study by Daniels & Fors, (2015) on the Onion supply chain in Ethiopia which also revealed that post-harvest loss due to a poor supply chain is highly attributed to the poor storage facilities and harvesting approaches used.

In addition, the study by Sidhu, Kumar, Vatta, & Singh, (2010), in Punjab India suggested that the harvesting time is crucial for reducing the post-harvest loss for onions within the region. In addition, respondents did not believe harvesting technology also affects the supply chain such that the majority of the farmers do not see any impact on harvesting technology. In African countries, especially in rural areas, farmers believe more in traditional ways of harvesting rather than modern techniques. Studies in Pakistan of vegetable farmers by Kazmi, & Khan, (2014) revealed that most farmers believed that the traditional methods are the most sustainable than new and modern approaches.

Lastly, the final results for this objective where two-way ANOVA was done to check the variability of the onion supply chain due to the harvest process suggest that harvesting costs

and the application of harvesting technology are key challenges that reduce supply chain performance. The two factors were found to be statistically significant, there is statistical evidence that the harvesting costs and technology adoption reduce the capability of SC performance. Findings like this have also been reported in Ethiopia by Daniels, H &n Fors, S. (2015), who agreed that more than 87% of farmers did not know how to handle harvesting crops onions. In most African countries, although vegetable farming is subsidized, farmers sometimes face cash shortages to manage their farming properly.

In the study, the research objective was to assess the impact of the harvesting process of onions in supply chain in Singida Urban District. Whereby, about 34.8% of farmers experience a loss of less than 5 kilograms during harvesting, while about 32.6% of onion farmers experience a loss of between 6 – 10 kilograms. This indicates that a lot of farmers start to experience loss even before their yields reach the market and one of the reasons for this could be the using of poor harvesting techniques and equipment. Similarly, during harvesting other portions of onions are lost during storage whereby in study about 68.4% of onion farmers respondents in the study agree that losing less than 5 kilograms of onions during storage after harvest. This is usually farmers who grow onions for their consumption and for subsistence to gain income out of it. Results suggested that in the supply chain, there is little to small value addition when in the storage of onions after harvest.

5.0 Conclusion

In the study, the research objective was to assess the impact of the harvesting process of onions in supply chain in Singida Urban District. Whereby, about 34.8% of farmers experience a loss of less than 5 kilograms during harvesting, while about 32.6% of onion farmers experience a loss of between 6 – 10 kilograms. This indicates that a lot of farmers start to experience loss even before their yields reach the market and one of the reasons for this could be the using of poor harvesting techniques and equipment. Similarly, during harvesting other portions of onions are lost during storage whereby in study about 68.4% of onion farmers respondents in the study agree that losing less than 5 kilograms of onions during storage after harvest. This is usually farmers who grew onions for their consumption and 56 for subsistence to gain income out of it. Results suggested that in the supply chain, there is little to small value addition when in the storage of onions after harvest.

6.0 Recommendations

6.1 To Assessing the impact of the Harvesting Process of Onions in the Supply chain

This study recommends that the Government should review and revise measures that are currently employed to control the costs associated with the harvesting and distribution of onions in the supply chain. This can be done by providing substantial financial incentives to farmers through financial providers and institutions to facilitate onion farming activities among the farmers within the region. In addition, this should be accompanied by considering onion farming as a cash crop rather than just a food crop as it is currently recognized. This will eliminate the stigma, connotations, and unfairness in all stakeholders who are actively engaged with the crop within the supply chain in the region. The government should establish different association groups to provide effective post-harvesting programs and training to supply chain stakeholders on how to improve processes and reduce costs and losses in supply chain activities.

It is also recommended that the government review the policies and regulations that provide a framework for agricultural farming among small-scale farmers to identify loopholes in the

implementations of the policy that restrict farmers from making profits as compared to wholesalers or middlemen. Lastly, it is recommended that farmers adopt and use modern farming technologies to improve efficiency in their farming and ultimately provide easy navigation and connection of their harvest to the onion SC in the region.

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