International Journal of Agriculture, Environment and Bioresearch

Vol. 08, No. 01; 2023

ISSN: 2456-8643

ASSESSMENT OF CAUSES AND EXTENT OF POST-HARVEST LOSSES OF WHITE SWEET POTATO ROOTS DURING STORAGE IN MOROGORO REGION, TANZANIA

Kimako Joseph Richard*, Valerian. C. K. Silayo and Geoffrey C. Mrema
Department of Food and the Agro-processing Sokoine University of Agriculture, P. O. Box 3005, Chuo Kikuu, MOROGORO, TANZANIA

https://doi.org/10.35410/IJAEB.2023.5798

ABSTRACT

Many studies have revealed that losses of sweet potatoes occur due to mechanical injury, high moisture content of the roots, attack by rodents, physiological spoilage and weevil. This study was conducted to assess the causes and extent of post-harvest losses of white-coloured sweet potato roots during storage in Gairo district and Morogoro municipality in Morogoro region, Tanzania. The assessment was conducted in eight (8) wards of the two areas by using a questionnaire to capture data on bio-data of farmers' and traders', awareness of white-coloured sweet potato root losses and storage practices. The collected data were analyzed using Statistical Package for Social Science (SPSS) version 25. According to the findings, the most major cause of post-harvest losses was rodent attack, which was reported by 26.53% and 25% of farmers and traders in Gairo and Morogoro municipalities, respectively, and the extent of white-coloured sweet potato root losses observed was 18.36% of farmers and traders in Gairo and 79% of farmers and traders in Morogoro municipality have reported to suffer from moderate post-harvest losses. The study results indicate that there is a need to improve post-harvest loss awareness among white-colored sweet potato farmers and traders in order to reduce loss and thus begin producing profitably. Controlling rodents, avoiding injury, building a proper storage facility and inspecting the stores on a regular basis are the most important aspects to consider when preventing losses.

Keywords: Awareness, Post-harvest Losses, White-colored Sweet Potatoes Root, Storage.

1. INTRODUCTION

Sweet potato (Ipomoea batatas L.Lam.) is a dicotyledonous plant which originated from tropical America (Coop, 2010). In Tanzania, sweet potatoes are widely cultivated mainly around the Lake zone, Eastern zone, Southern highlands and Northern parts (URT,2016). Grown by 771,257 households during short rainy and long rainy seasons, annual production is estimated at 504,346 tonnes (NBS, 2012). Sweet potato roots contribute to food security and income generation (Ahmad *et al*., 2014). There are several varieties of sweet potatoes, including white-coloured flesh, cream-coloured flesh, yellow, red and purple colored (Rahman *et al.*, 2003). White-coloured sweet potato roots are a great source of nutrients including Calories, Fat, Carbohydrates, Protein, Fiber and Vitamins (De Albuquerque *et al*., 2019). Consuming white-coloured sweet potato roots enhance healthier eyes, reproductive system, and heart and kidney functions (Johnson and Pace, 2010).

Vol. 08, No. 01; 2023

ISSN: 2456-8643

Despite its importance, the production of white-coloured sweet potato roots in Tanzania is still facing some challenges. Post-harvest losses are among the challenges faced by the suppliers and users of white-coloured sweet potato roots. Improper storage facilities have contributed to considerable post-harvest losses of white-coloured sweet potato roots (Jones *et al*., 2012). Proper post-harvest handling practices, including packaging and good storage practices, are inevitable to reduce these losses.

This paper assesses the causes and extent of post-harvest losses of white-coloured sweet potato roots during storage in Gairo district and Morogoro municipality in Tanzania. Questionnaires were used to collect information on practices that farmers and traders in Gairo and Morogoro municipalities use to abate the causes and extent of post-harvest losses of white-coloured sweet potato roots during storage. The results will be used to assist farmers and traders to device good management approaches for reducing losses.

2. METHODOLOGY

2.1 Study area

The study was conducted in two districts in Morogoro region: Gairo district (located between latitude 6° and 91´ South and between longitude 36° and 08´ East) and Morogoro District in which Morogoro municipality (located between latitude 6° and 49′ South, and longitude 37° and 39′ East) is situated.These locations were purposefully selected due to their different agro-ecological zones and previous reports on postharvest losses of white-coloured sweet potato roots (Ngailo *et al.*, 2016). These agro-ecological zones were different in terms of rainfall pattern, growing seasons, temperature, production practices and socioeconomic status.

Vol. 08, No. 01; 2023

ISSN: 2456-8643

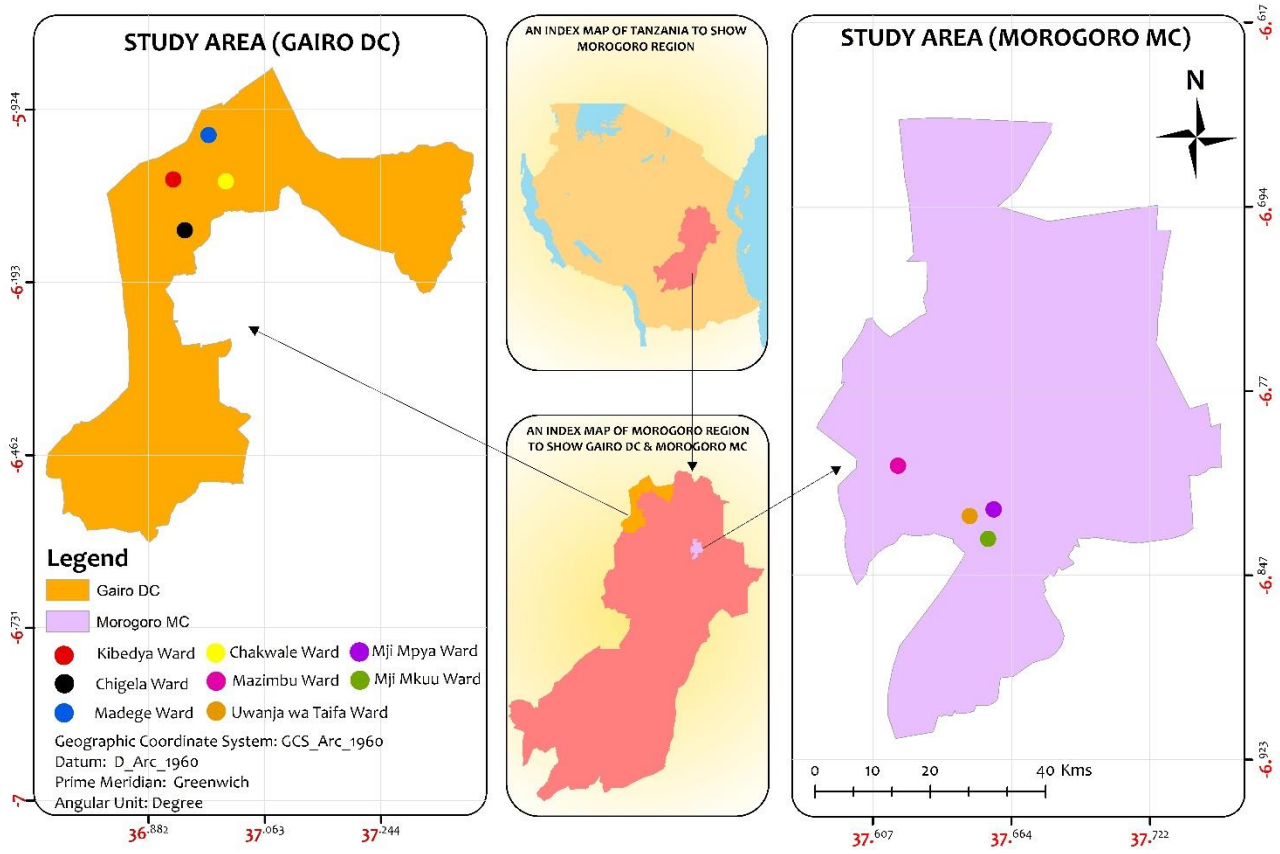

Fig. 1; Morogoro region map showing Morogoro municipality and Gairo District

2.2 Survey and data collection

A survey of farmers' and traders' post-harvest handling and storage practices of white-coloured sweet potato roots was conducted in Chakwale,Chigela,Kibedya and Madege wards in Gairo district and Mazimbu,Mji mkuu,Mji mpya and Uwanja wa Taifa wards in Morogoro municfipality. A total sample size of 396, comprising 198 farmers and 198 traders was involved in the survey. Information on bio-data and farmer's and trader's awareness on causes of white-coloured sweet potato roots losses and storage were collected through interviews using an electronic questionnaire mounted in the Kobo Collect Application and saved on the Kobo Toolbox platform.Specific information was sourced using the following questions: What are the main causes of postharvest losses of white-coloured sweet potato roots? How long it takes to store white-coloured sweet potato roots? Where do the major losses of white-coloured sweet potato roots occur? What is the level of awareness of postharvest losses of white-coloured sweet potato roots? What is the level of farmers and traders awareness of storage technologies? How do the farmers and traders sort/grade white-colored sweet potatoes before storage? Is there any preventive measure against white-coloured sweet potato roots losses?.

Vol. 08, No. 01; 2023

ISSN: 2456-8643

2.3 Data analysis

Statistical analyses were performed using Statistical Package for Social Science (SPSS) version 25 to obtain frequency and percentage for the selected variables.

3. RESULTS

3.1 Demographic characteristics of farmers and traders in Morogoro municipality and Gairo District

Table 1 summarizes the findings of the farmers and traders survey conducted in Morogoro municipality and Gairo district. It is shown that the respondents in this study were 68.69% females and 31.31% males. Irrespective of their sex, majority of them had completed primary school education (85.6%), and the rest had attained secondary school (9.85%) and tertiary (4.5%) education levels. Furthermore, the compostion of traders and farmers were 53.03% and 46.97%, respectively. Based on the position in the household, findings show that most households were headed by mothers (61.10%) and the rest were headed by fathers (32.80%) and children (6.10%). Based on Pearson Product-moment Correlation analysis, demographic factors such as sex,education level, occupation and house hold size had a significant relationship with farmers' and traders awareness of losses at 1% level of significance.

Table 1:Proportional awareness of demographic factors of farmers and traders in Morogoro municipality and Gairo district

Variable	Description	Frequency	Percent (%)	Cumm. Freq (%)
Sex	Male	124	31.31	31.31
	Female	272	68.69	100
Education	Primary education	339	85.6	85.6
	Secondary education	39	9.85	95.45
	Tertiary education	18	4.55	100
Occupation	Traders	210	53.03	53.03
	Farmer	186	46.97	100
Position in the household	Children	24	6.1	6.1
	Father	130	32.8	38.9
	Mother	242	61.1	100

Table 1: Relationship between the selected demographic variables with farmer's awareness on white-coloured sweet potato roots losses using Pearson product-moment correlation

Variable	coef. corr (r)	Sign.
Sex	0.0713	0.1566
Educ	0.3730	0.0000
HH size	-0.0343	0.4967
Occupation	-0.0381	0.4493

correlation is significant at 1% level

Vol. 08, No. 01; 2023

ISSN: 2456-8643

3.2 Farmer's and traders' awareness of white-coloured sweet potato roots losses in Morogoro municipality and Gairo district

In this study, farmers' and traders' awareness of white-coloured sweet potato losses is described in Table 3, indicating that 53.2% of the farmers and traders in Morogoro Municipality and 46.7% of farmers and traders in Gairo were aware of white coloured sweet potato roots losses.Furthermore, 72.09% of farmers and traders in Gairo districts and 27.9 % of farmers and traders in the Morogoro municipality were not aware of white coloured sweet potato roots losses.

Table 3: Farmer's and traders' awareness of white-coloured sweet potato roots losses in Morogoro municipality and Gairo district

District	Status				Obs	Mean	Std. Dev	Min	Max	Chi-square	P-value
	Aware	Percent (%)	Not aware	Percent (%)							
Gairo	165	46.7	31	72.09	196	2.97	0.74	1	4	23.06	0
Morogoro	188	53.2	12	27.9	200	3	0.49	1	4		
Total	353		43		396	2.98	0.63	1	4		

Based on Chi-square (Pearson value) statistical analysis, there was a significant differences between farmer's and traders' awareness of white-coloured sweet potato roots losses at 1% level.

3.3 Major causes of losses of white-coloured sweet potatoes roots during storage

To reduce losses, proper post-harvest management is essential in the value chains of white-coloured sweet potato roots. During the baseline survey, it was observed that farmers and traders in Morogoro municipality and Gairo district were constrained by post-harvest losses due to a variety of factors. Results indicate that farmers and traders incurred losses due to mechanical injury during handling, estimated at 8.16% and 12.5% in Gairo district and Morogoro municipality, respectively. Moisture content of storage was among the cause of losses, which was 12.24% and 3% in Gairo and Morogoro municipality, respectively. Sweet potato roots losses estimated at 26.53% and 25% in Gairo and Morogoro municipality respectively were due to attack by rodents. Furthermore, farmers and traders in Gairo and Morogoro municipality incurred losses due to root spoilage during storage, estimated at 14.28% and 19%, respectively. Sweet potato weevil also caused losses of the roots, as reported by 17.34% and 13% of farmers and traders in Gairo and Morogoro municipality, respectively. Temperature was reported to be among the causes of losses, which were assessed at 2.5.% and 13% in Gairo and Morogoro municipality, respectively. Also farmers and traders incurred losses due to weight loss at 18.87% and 14% in Gairo and Morogoro municipality respectively (Table 4).

Pearson product-moment correlation was conducted to analysis the relationship between the causes of losses with farmers' and traders awareness on white-coloured sweet potato roots losses. The results in Table 4 show that causes of losses such as mechanical injury,moisture content,rodents,spoilage and sweet potato weevil had a significant relationship with farmers' and traders awareness of losses at 5% level of significance.

Vol. 08, No. 01; 2023

ISSN: 2456-8643

Table 4: Frequency percentages on major cause of losses of White-coloured sweet potatoes roots storage

Source	District				Total	chi-square	p-value
	Gairo	Percent (%)	Morogoro	Percent (%)			
Mechanical injury	16	8.16	25	12.5	41	2.0058	0.157
Moisture content of storage	24	12.24	6	3	30	12.0832	0.001
Rodents	52	26.53	50	25	102	0.1213	0.728
Spoilage	28	14.28	38	19	66	1.584	0.208
Sweet potato weevil	34	17.34	26	13	60	1.455	0.228
Temperature	5	2.55	27	13.5	32	15.9763	0
weight loss	37	18.87	28	14	65	1.7165	0.19

From Chi-square (Pearson value) statistical analysis, Table 4 above shows there were significant differences ($p<0.05$) between cause of losses of White-coloured sweet potatoes roots storage (Moisture content of storage, Temperature) on losses level. Finally, results show no significant difference shown in the use of rodents,mechanical injury,spoilage,sweet potato weevil and weight loss

Table 5: Relationship between causes of losses with farmers' and traders awareness on white-coloured sweet potato roots losses using Pearson product-moment correlation

Variable	coef. corr (r)	Sign.
Mechanical injury	-0.0036	0.9423
Moisture content	0.1302	0.0095
Rodents	0.0166	0.7412
Spoilage	-0.1282	0.0107
Sweet potato weevil	0.0908	0.0712
Temperature	0.0528	0.2943
weight loss	-0.1074	0.0326

correlation is significant at 5% level

3.4 Extent of white-coloured sweet potato roots losses during storage

Post-harvest losses occur at every stage of the value chain, from field production to consumption. Farmers and traders in Morogoro municipality and Gairo district experienced varying levels of post-harvest losses as a result of a range of variety of factors. Significant post-harvest losses

Vol. 08, No. 01; 2023

ISSN: 2456-8643

were experienced by 63.26% and 12% of farmers and traders in Gairo district and Morogoro municipality, respectively. Moreover, 18.36% of farmers and traders in Gairo and 79% of farmers and traders in Morogoro municipality reported to suffer from moderate post-harvest losses.,. Furthermore, 18.36% of farmers and traders in Gairo and 9% of Morogoro farmers and traders experienced low level of post-harvest losses(Table 6)

Table 6: Farmer percentages on how lossess of white-coloured sweet potato roots occured during storage

Response	District				Total	chi-square	p-value
	Gairo	Percent (%)	Morogoro	Percent (%)			
Low	36	18.36	18	9	54	7.3756	0.007
Moderate	36	18.36	158	79	194	145.6268	0
High	124	63.26	24	12	148	111.1514	0

From Chi-square (Pearson value) statistical analysis, Table 6 above shows there were significant differences between extent of white-coloured sweet potato roots losses and root storage

3.5 Storage capacity of white-coloured sweet potato roots

By using suitable storage conditions, white-coloured sweet potato roots may be preserved adequately. During the survey, farmers and traders in Morogoro municipality and Gairo district indicated that they stored white-coloured sweet potato roots after harvesting. Based on the findings, 51.5% and 29.5% of farmers and traders in Gairo and Morogoro municipality repectively stored 0.5 kg to 100 kg of white-colored sweet potato roots. Also 34.1% and 67.5% of farmers and traders in Gairo and Morogoro municipality respectively stored 100 kg to 500 kg of white-colored sweet potato roots.Farmers and traders who stored 500 kg to 1000 kg of white-colored sweet potato roots were 9.1% in Gairo and none in Morogoro municipality, respectively.Furthermore, results show that storage of white-colored sweet potato roots of 1000 kg and above was 5.1% and 3% of farmers and traders in Gairo district and Morogoro municipality, respectively.

Table 7: Proportion of storage capacity of white-coloured sweet potato roots

Capacity	District				Total	chi-square	p-value
	Gairo	Percent (%)	Morogoro	Percent (%)			
0.5-100kg	101	51.5	59	29.5	160	19.9527	0
100 -500kg	67	34.1	135	67.5	202	43.9686	0
500-1000kg	18	9.1	0	0	18	19.242	0
More than 1000kg	10	5.1	6	3	16	1.1281	0.288

Vol. 08, No. 01; 2023

ISSN: 2456-8643

From Chi-square (Pearson value) statistical analysis, Table 7 above shows there were significant differences ($p<0.01$) on storage capacity of White-coloured sweet potatoes roots (0.5-100kg,100 -500kg,500-1000kg,).Also result show there were no significant difference on case of case of More than 1000kg storage capacity

3.6 White-coloured sweet potato roots storage methods

Proper food storage preserves the quality and nutritional content of sweet potato roots. White coloured sweet potato root storage facilities differed between farmers and traders in Gairo and Morogoro municipality, with 42.9% of farmers and traders in Gairo and 37.6% Morogoro municipality respectively using the bamboo basket. Furthermore, the results show that the Clamp method was also used by 4.8%% and 2.09% of farmers and traders in Gairo and Morogoro municipality, respectively. Accordingly, 30.2% of all farmers and traders in Gairo and none in Morogoro Municipality used inground storage, whereas 13.6% and 56.02% of farmers and traders in Gairo and Morogoro Municipality respectively used polypropylene bags. Furthermore, 5.8% and 3.14% of farmers and traders in Gairo and Morogoro municipality respectively used improved technology. However, the pit technique was used by 2.4% of farmers and traders in Gairo and 1.04% in Morogoro municipality (table 8).

Pearson product-moment correlation was conducted to analysis the relationship between white-coloured sweet potato roots storage methods with farmers' and traders awareness on white-coloured sweet potato roots losses. The results in Table 9 show that white-coloured sweet potato roots storage methods such as bamboo basket,clamp method, inground, improved technologies,pit and polypropylene bags had a significant relationship with farmers' and traders awareness of losses at 1% level of significance.

Table 8: Proportion of White-coloured sweet potato roots storage methods

Method	District				Total	chi-square	p-value
	Gairo	Percent (%)	Morogoro	Percent (%)			
Bamboo basket	88	42.9	72	37.6	160	3.2548	0.071
Clamp method	10	4.8	4	2.09	14	2.5418	0.111
Inground	62	30.2	0	0	62	75.0092	0
Using improved technologies	12	5.8	6	3.14	18	2.2244	0.136
Using pit method	5	2.4	2	1.04	7	1.248	0.264
Polypropylene bags	28	13.6	107	56.02	135	67.7479	0

From the Chi-Square Test, the results show that there were significant differences ($P<0.01$) between storage methods (bamboo basket,inground,polypropylene bags) and White-coloured sweet potatoes roots. For the case of Clamp method, improved technologies, pit method results shows there were no significant difference showed. (Table 8)

Vol. 08, No. 01; 2023

ISSN: 2456-8643

Table 9: Relationship between storage methods with farmers' and traders awareness on white-coloured sweet potato roots losses using Pearson product-moment correlation

variable	coef. corr (r)	Sign.
Bamboo basket	-0.2894	0.0000
Clamp method	0.1585	0.0016
Inground	-0.1212	0.0158
Using improved technologies	0.3551	0.0000
Using pit method	0.0038	0.9400
Polypropylene bags	0.1737	0.0005

correlation is significant at 1% level

4. DISCUSSION

4.1 Demographic characteristics of farmers and traders in Morogoro municipality and Gairo District

Majority of the farmers and traders who participated in this research were females.This indicates that women appear more frequently in surveys than men, with nearly twice as many in Morogoro municipality and the Gairo district.This finding is analogous to that of Holder and Farmers (2021) which revealed that female farmers in Nigeria participated in the sweet potato agriculture more than their male counterparts. In this study, majority of the farmers and traders who participated in the survey in Morogoro municipality and Gairo district had primary education. This is in line with the observation of the National Bureau of Statistics (NBS) in Tanzania that over 80% of the people in the Tanzania mainland acquired primary education (NBS, 2013). The general low level of education generally generates unawareness of sweet potato losses that influences food insecurity in the society. This compares well with the survey performed by Mutisya et al., (2016) in Kenya, which demonstrated that the effect of education leads to food insecurity.

4.2 Farmers' and traders' awareness of white-coloured sweet potato roots losses in Morogoro municipality and Gairo District

Table 3 describes farmers' and traders' awareness of white-coloured sweet potato losses in the study areas. Based on the findings that majority of the farmers and traders were aware of white-coloured sweet potato root losses, the level of awareness is more apparent in females compared with their male counterparts.Loss awareness facilitates excellent loss-reduction practices, which in the case of post-harvest losses, can reduce food insecurity.This is consistent with the findings of Blight *et al*., (2015), which indicated that female farmers in Uganda were more aware of white-coloured sweet potato root losses than male farmers.

4.3 Causes and extent of white-coloured sweet potato roots losses during storage

Post-harvest losses occur along the value chain, from field production to consumption. Farmers and traders in Morogoro municipality and Gairo district encountered varying degrees of post-harvest losses as a consequence of several causes based on a variety of factors. The major cause of post-harvest losses was rodents followed by spoilage and sweet potato weevils. This is consistent with the findings of Abrham *et al*.,(2021) and Shee *et al*., (2019), who found that the

Vol. 08, No. 01; 2023

ISSN: 2456-8643

primary constraints of sweet potato production were rodents. To prevent these, ecologically-based rodent management was created based on two fundamental approaches: community action and early intervention (Jackson, 2015). In this study majority of the farmers and traders in Morogoro municipality and Gairo district experienced moderate levels of sweet potato losses.This is similar with the finding of Pankomera, (2015) in New zealand and Van Oirschot *et al.*, (2007) in Tanzania which indicated that farmers and traders experienced moderate weight loss during storage. Efforts to minimize extent of losses of sweet potato roots must consider carefully selecting the range of suitable storage techniques(Kiaya, 2014).

4.4 White-coloured sweet potato roots storage

To maintain the quality and shelf-life of white coloured sweet potato roots proper storage is suggested as a critical way to reduce losses during storage (Sugri *et al*., 2017). In the study by Gopala Rao, (2015), it was found that proper control of white-coloured sweet potato roots from losses during storage means controlling both temperature and relative humidity of the storage area. In the current study, it has been shown that farmers and traders in Morogoro and Gairo district used various storage facilities for white-coloured sweet potato roots, in capacity ranging between 100 and 500 kg. A substantial number of farmers and traders stored their white-colored sweet potato roots in bamboo baskets as a traditional practice in less than 15 days duration period. In a similar study, farmers and traders in India used bamboo baskets to store white-coloured sweet potato roots (Ayam *et al*., 2021).Morever, results in these surveys have show that farmers and traders used polypropylene bags, similar to the findings of Tomlins *et al*.,(2000) in Tanzania, that farmers and traders used polypropylene bags for transportation and storage of roots to the markets. Accordingly, in this study results have shown that farmers and traders used inground storage corresponding to the findings of Robert *et al.*, (2014) in Uganda, that farmers and traders stored roots inground for delayed harvesting for better market prices and access to food at a later period.Furthermore, farmers and traders in Gairo and Morogoro municipality used improved technology to store white cololured sweet potato roots.This is simiral to the findings of Teye, (2010) in Ghana, that improved technology was used for sweet potatoes storage because it reduces general deterioration. Also, surveys have shown that the clamp method was used by all farmers and traders in Gairo and Morogoro. This compares well with the survey performed by Siregar, (2022) in Kenya which found that farmers and traders used the clamp method to store sweet potatoes and the method was usually better since it had a stronger sensory attribute.The minority of farmers and traders employed the pit method to store roots, probably due to reasons mentioned in the study by Mpagalile *et al.,* (2007) in Tanzania that Sweet potatoes stored using the pit storage method were heavily infested, damaged and rotten.

5 CONCLUSION AND RECOMMENDATION

This study summarized the causes and extent of post-harvest losses of white-coloured sweet potato roots during storage in the Gairo district and Morogoro municipality where practicable procedures to prevent losses of white-coloured sweet potato roots were identified. The main aspects to consider in preventing losses are controlling rodents, avoiding injury, constructing proper storage facility, and inspecting the stores regularly. Also, the results suggest that there is need to Improve post-harvest loss awareness among the white-colored sweet potato farmers and traders to minimize and so produce profitably is required. Any intervention to increase awareness

Vol. 08, No. 01; 2023

ISSN: 2456-8643

on sweet potato post-harvest losses should be prioritized for male farmers as they are less aware of such losses. Furthermore, additional research studies should be conducted to develop awareness and methods for reducing sweet potato losses to impact on food security in the society.

REFERENCE

Abrham, T., Beshir, H. M., & Haile, A. (2021). Sweetpotato production practices, constraints, and variety evaluation under different storage types. *Food and Energy Security*, *10*(1), 1–12.

Ahmad, I. ., S. A, M., Kiresur, V. ., & B. S., A. (2014). Efficiency of Sweet Potato Farmers in Nigeria: Potentials for Food Security and Poverty Alleviation. *IOSR Journal of Agriculture and Veterinary Science*, *7*(9), 01–06.

Ayam, V., Soibam, H., & Pradesh, A. (2021). *Traditional Storage : A Possible Post Harvest Management at Village Level*. *June*. https://www.researchgate.net/publication/351069701_Traditional_Storage_A_Possible_Post_Harvest_Management_at_Village_Level

Blight, S., Preferred, T., & Traits, S. (2015). Farmers Awareness and Perceptions of Alternaria Leaf Petiole and. *Journal of Plant Breeding and Genetics*, *03*(02), 25–37.

Coop, T. L. (2010). What is a Sweetpotato? *UCCE Merced County*.

Holder, S., & Farmers, S. (2021). *Gender Differences in Market Participation among Small Holder Sweetpotato Farmers in South East Nigeria*. *5852*.

Jackson, G. (2015). Rats and mole rats of sweet potato. *Pest Factsheet*. http://africasoilhealth.cabi.org/wpcms/wp-content/uploads/2015/02/16-mole-rats-of-sweet-potato.pdf

Johnson, M., & Pace, R. D. (2010). Sweet potato leaves: Properties and synergistic interactions that promote health and prevent disease. *Nutrition Reviews*, *68*(10), 604–615.

Jones, D., Gugerty, M. K., & Anderson, C. L. (2012). Evans school of public affairs. *Sweet Potato Value Chain: Tanzania*, *211*.

Kiaya, V. (2014). Post-Harvest Losses and Strategies To. *The Journal of Agricultural Science*, *149*(3–4), 49–57.

Mpagalile, J. J., Silayo, V. C. K., Laswai, H. S., Ballegu, W. R., & Kikuu, C. (2007). Effect of different storage methods on the shelf-life of fresh sweetpotatoes in Gairo, Tanzania. *Tropical Root and Tuber Crops: Opportunities for Poverty Alleviation and Sustainable Livelihoods in Developing Countries: Proceedings of the Thirteenth Triennial Symposium of the International Society for Tropical Root Crops (ISTRC)*, 500–505.

NBS. (2012). *National Sample Census of Agriculture 2007/2008. Volume II: Crop Sector - National Report*. *II*, i–507. http://www.agriculture.go.tz/publications/english docs/Crops National Report (2008).pdf%5Cnhttp://catalog.ihsn.org/index.php/catalog/3794%5Cnhttp://catalog.ihsn.org/index.php/catalog/3794/download/52493

Ngailo, S., Shimelis, H. A., Sibiya, J., & Mtunda, K. (2016). Assessment of sweetpotato farming systems, production constraints and breeding priorities in eastern Tanzania. *South African Journal of Plant and Soil*, *33*(2), 105–112.

Effects of postharvest treatments on sweetpotato (Ipomoea batatas) storage quality. 1–156.

Rahman, S. M. M., Wheatley, C., & Rakshit, S. K. (2003). Selection of Sweet Potato Variety for

Vol. 08, No. 01; 2023

ISSN: 2456-8643

High Starch Extraction. *International Journal of Food Properties*, *6*(3), 419–430.

Robert Mwanga, Gerald Kyalo, Sam Namanda, Norman Kwikiriza, A. N. (2014). *Expanding utilization of RTB crops and reducing their post-harvest losses - Improving the shelf life of harvested sweetpotato roots in the market and household level*. 1–14.

Shee, A., Mayanja, S., Simba, E., Stathers, T., Bechoff, A., & Bennett, B. (2019). Determinants of postharvest losses along smallholder producers maize and Sweetpotato value chains: an ordered Probit analysis. *Food Security*, *11*(5), 1101–1120.

Siregar. (2022). No Titleהכי קשה לראות את מה שבאמת לנגד העינים. *הארץ*, *8.5.2017*, 2003–2005.

Sugri, I., Maalekuu, B. K., Kusi, F., & Gaveh, E. (2017). Quality and Shelf-life of Sweet Potato as Influenced by Storage and Postharvest Treatments. *Trends in Horticultural Research*, *7*(1), 1–10.

Teye, E. (2010). *Developing Appropriate Storage Technology for Sweet Potatoes (Ipomoea Batatas Lam) in the Coastal Savannah Zone of Ghana*. 1–159.

Tomlins, K. I., Ndunguru, G. T., Rwiza, E., & Westby, A. (2000). Postharvest handling, transport and quality of sweet potato in Tanzania. *Journal of Horticultural Science and Biotechnology*, *75*(5), 586–590.

URT 2016. (2017). *2016/17 Annual Agriculture Sample Survey*. 88. https://nbs.go.tz/nbs/takwimu/Agriculture/2016_17_AASS_ report.pdf

van Oirschot, Q., Ngendello, T., Rwiza, E., Amour, R., Tomlins, K., Rees, D., & Westby, A. (2007). The potential for storage of fresh sweetpotato under tropical conditions: Evaluation of physiological changes and quality aspects. *Tropical Root and Tuber Crops, Opportunities for Poverty Alleviation and Sustainable Livelihoods in Developing Countries: Proceedings of the Thirteenth Triennial Symposium of the International Society for Tropical Root Crops (ISTRC)* , 423–434.