

ASSESSMENT OF POSTHARVEST CHALLENGES OF MANGO FRUITS IN UPPER ATHI RIVER BASIN, KENYA

M. K. Korir¹, U. Mutwiwa¹, G. M. Kituu¹ and D. N. Sila²

¹Department of Biomechanical and Environmental Engineering, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya.

²Department of Food Science and Technology, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya.

E-mail: meshkorir2005@yahoo.com

Abstract

Mango (*Mangifera indica* L.) is one of the valuable fruits in Kenya. Mango fruits are potential source of household income for the resource poor farmer, foreign exchange earnings and raw material for mango processing industry. Despite the growing economic importance of mango in Kenya, mango fruits are riddled with many constraints along the postharvest chain. During postharvest handling of mangoes at least 40-45% of the fruits are lost. To ascertain possible postharvest constraints facing mango fruits a baseline survey was conducted in Upper Athi River Basin with 11 Locations in Machakos and Makueni County being selected for the study. The study involved farmers who were over 30 years of age with majority of them having mango farming experience between 6-10 years and secondary level of education (55%). Well-structured questionnaires were used for abstracting information about postharvest challenges in mangoes. The results showed that methods of harvesting ready mangoes included; tree climbing, with 65% farmers practiced this method, 23% used hooks and sticks, 7% by tree shaking and a few (5%) by simply waited for the fruits to fall. 40% of farmers used gunny bags to carry harvested mangoes. Other types of packaging used included; cartoons and boxes (37%), plastic crates (18%), baskets (3%) and sisal bags (2%). 63% of the respondents did not have stores for harvested mangoes, 25% of them stored their produce in their houses, 7% in barns and 5% in stores. 95% of the respondents could not store their produce more than a week while the remaining (5%) could store for 2 weeks. Most of the respondents (40%) reported postharvest losses between 30-40%. In addition, 95% of the respondents require a special storage facility for mangoes. Thus, poor harvesting methods, lack of training, poor packaging, lack of proper storage facilities and marketing are some of the postharvest challenges in mangoes.

Key words: Postharvest chain, questionnaire, harvesting methods, storage, packaging, training

1.0 Introduction

Mango (*Mangifera indica* L.) is one of the high potential fruits in Kenya, suitable for different agro-ecological zones ranging from sub-humid to semi-arid (Griesbach, 2003). It grows best from 0-1500m above sea level in Kenya (Nakasone and Paul, 1998) but can grow in higher elevations. Currently, mango has been listed as the third most important fruit crop after bananas and pineapples (HCDA, 2010). The demand for the fruit is due to the fruits high vitamin, mineral and fiber levels besides the value-added products made from it. In Kenya, the area under mango production is estimated at 14,387 Ha with an output of 280,884Mt (MoA, 2007). Coast and the semi arid districts of Eastern Kenya are the main regions of mango production. 135,000Mt of mangoes are produced annually in Eastern province under an area of 11,250 Ha (MoA, 2007). The leading counties in Mango production were as follows in ascending order by value; Makueni (21%), Machakos (21%), Kilifi (15%) and Kwale (13%), (USAID-KHCP Horticulture Performance, 2010-2012). The local varieties in Upper Athi River region include; Dodo, Kasukari, Katili, Kitui, Mombasa, Ndoto, Sikio la punda while exotic varieties include; Apple, Batawi, Haden, Keitt, Kent, Maya, Ngowe, Nimrod, Sabine, Sensation, Tommy Atkins and Vandyke (Toili *et al.*, 2013). Mango fruits are consumed locally and the rest exported or processed into various products such as chutney, pickles, pulp and dried mango chips. Processing of mango fruits is considered as an extension of storage life or improving the value of raw produce thus reducing postharvest losses. Mango fruits are potential source of household income for the resource poor farmer, foreign exchange and raw material for industry. However, despite the economic importance of mangoes in Kenya, mango fruits are challenged by several constraints along postharvest chain. During post harvest handling of mangoes, 40-45% of mango fruits are lost (KARI, 1994). Mechanical damage (bruises), pests, diseases and immature harvesting are the major causes of postharvest losses. Thus, this study aimed at conducting a baseline survey in Upper Athi River Basin, Kenya, to ascertain possible postharvest constraints in mangoes, hence the intervention of sound scientific approaches and technologies.

2.0 Methodology

A baseline survey was conducted in Upper Athi River Region of Kenya with 11 Locations in Makueni and Machakos County being selected for the study. These targeted Locations included; Kilala, Ikanganya, Kikumbulyu, Kikoko, Nguumo, Kiou, Wote, Kee, Mbiuni, Mwala and Mwani. Purposive sampling was used to select Eastern province. MOA (2007) reported that Eastern province produces the highest volume of mangoes (135,000Mt) and has improved varieties such as Tommy Atkins, Apple among others that are high yielding introduced by KARI-Thika. Amongst the counties in Eastern province, Makueni and Machakos County were selected since the two Counties lead in mango production by value at 21% (USAID-KHCP Horticulture Performance 2010-2012). Both primary and secondary data were used. Well structured questionnaires were used for abstracting information on postharvest challenges in mango fruits in the study area. This was complemented through information obtained from interviews and target group discussions. The information collected during the survey included socio status of the farmers and asking them to provide information on the following areas; mango harvesting method, type of packaging, storage method, postharvest losses, storage period and need for special store for mangoes. Data was analyzed using Microsoft Excel and Statistical Package for Social Science (SPSS) version 16.0.

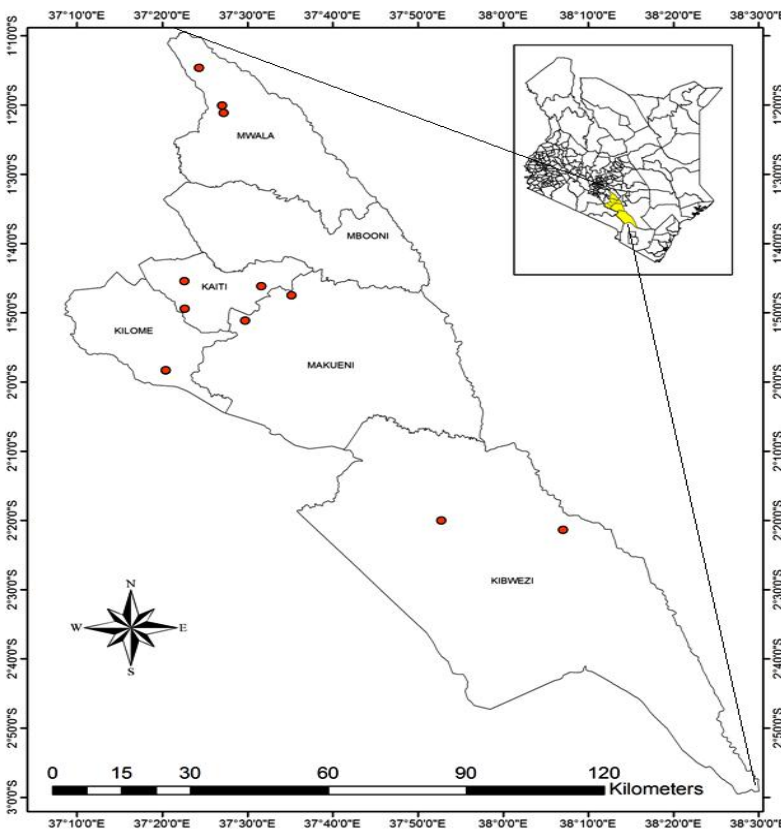


Figure 1: Location of the study area in relation to Kenya, Makueni and Machakos County

3.0 Results and Discussion

3.1 Characteristics of the respondents

A majority of the mango farmers in the study area (53%) were in the age between 50-60 years and a few (5%) between 20-30 years. This shows that the population of the farmers in the area are old thus postharvest handling of mangoes would be a challenge. However, the activity is suitable for the youth and hence should be promoted.

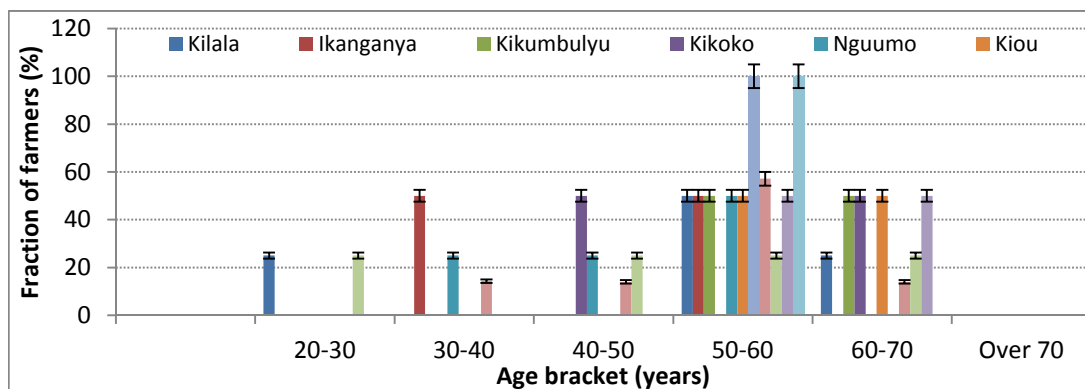


Figure 2: Age distribution amongst farmers in various Locations, Machakos and Makueni County

Mango farming is dominated by males (73%) with majority of the farmers (55%) owning 2-4 acres of land. Thus, mango farming is appropriate for males who are they are the majority. Most of the farmers (55%) had secondary education with majority (48%) having mango farming experience between 6-10 years. In addition, most of the farmers (60%) had not received any form of training on mango farming.

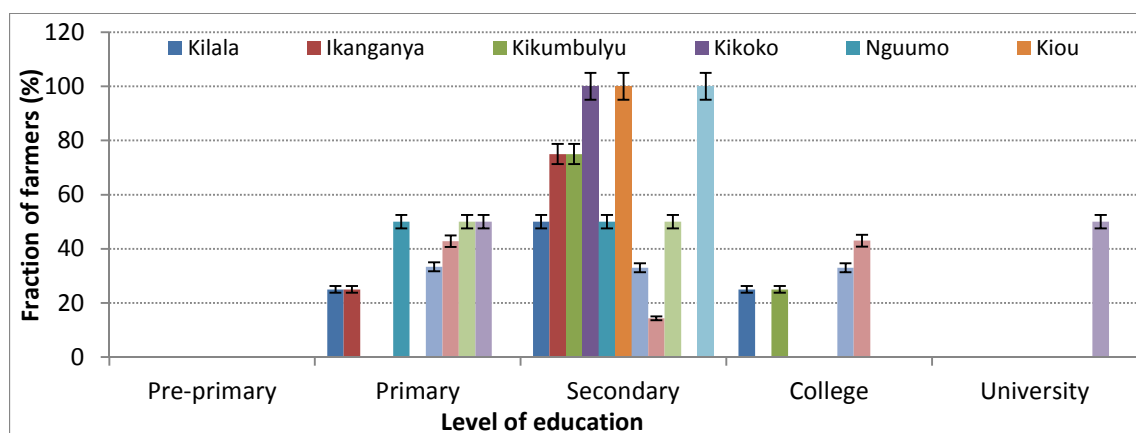


Figure 3: Level of education amongst mango farmers in various Locations, Machakos and Makueni County

3.2 Postharvest Handling of Mangoes

3.2.1 Method of Harvesting Ready Mangoes

The study showed that harvesting methods for mangoes depends on the mango variety. Indigenous varieties were harvested by shaking the tree for ready mangoes to fall. 7% of the farmers employed this method. Exotic varieties were harvested by climbing on the tree, with majority of the farmers (65%) practiced this method. Further, 23% of the farmers used hooks and sticks while a few (5%) simply waited for the fruits to fall. Gathambiri *et al* (2009) reported that postharvest losses occur as a result of harvesting method which causes mechanical damage to the fruits thus lowering their quality and shelf life. Moreover, according to Gathambiri *et al* (2009) the use of untreated hooks or sticks exposes the fruit to disease infections. Therefore, farmers need to use treated hooks to harvest their produce, Gathambiri *et al.*, (2009).

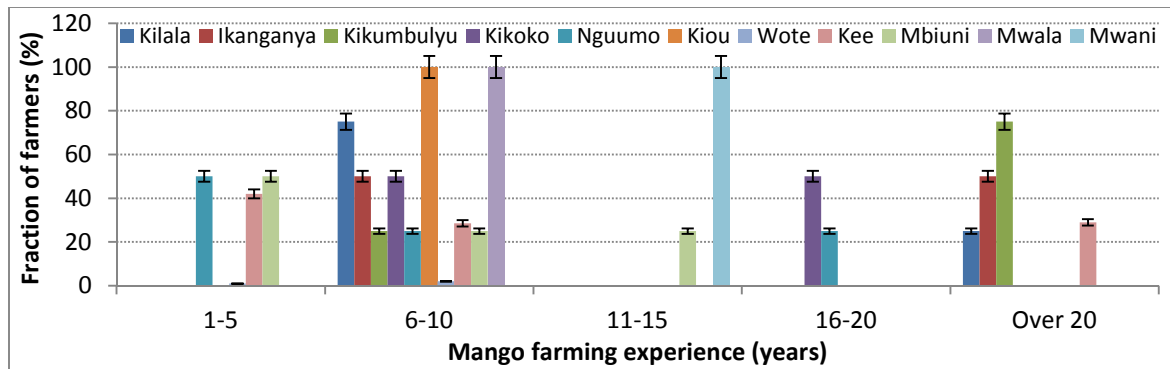


Figure 4: Distribution of mango farming experience amongst farmers in various Locations, Machakos and Makeni County

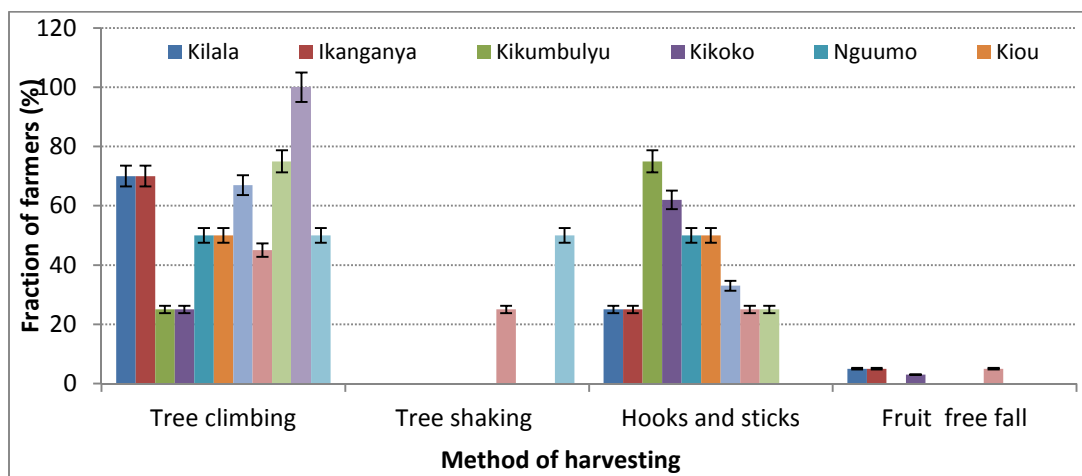


Figure 5: Distribution of harvesting methods for mangoes amongst farmers in various Locations, Machakos and Makeni County

3.2.2 Types of Packaging for Mangoes

The study revealed that most of the farmers (40%) use gunny bags to pack their produce, cartons and boxes (37%), plastic crates (18%), baskets (3%) and sisal bags (2%). Other types of packaging involved the use of According to Transport Information Service (TIS) from the German Insurance Association (GDV e.V.) mangoes should be packed in single layer in fruit crates and cartons. Due to their great sensitivity to pressure, the fruit sometimes be wrapped in paper or padded with wood wool, bast, straw or hay. Further, a study by Gathambiri *et al* (2009) in eastern province established that lack of proper packaging materials is one of the challenges faced by farmers.

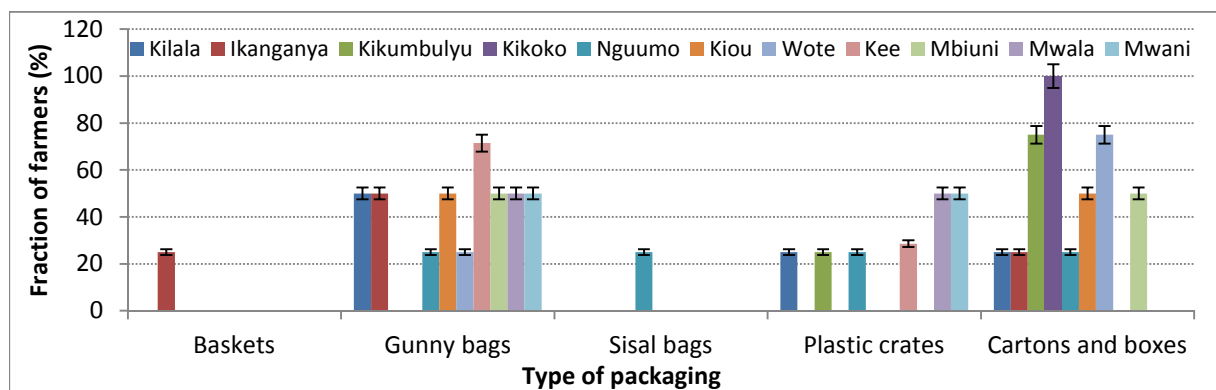


Figure 6: Types of packaging for mangoes amongst farmers in various Locations, Machakos and Makeni County

3.2.3 Storage Methods for Mangoes

63% of the farmers did not have stores for harvested mangoes, 25% of them store their produce in their houses, 7% in barns and 5% in stores. These results showed that storage of mangoes in the study areas is one of the challenges faced by farmers. Further, according to Kenya's LAPSET Corridor Mango Production Investment Opportunity, Investor presentation (May, 2012) revealed that poor post-harvesting techniques and lack of storage facilities are some of the challenges facing mango enterprise. Therefore, there is a need for proper storage structures which will prolong the shelf-life of the produce since mangoes are perishable and lose quality within a short time after harvest. In addition, the farmers will be able to supply fresh produce to the market when the price stabilizes thus high income earnings.

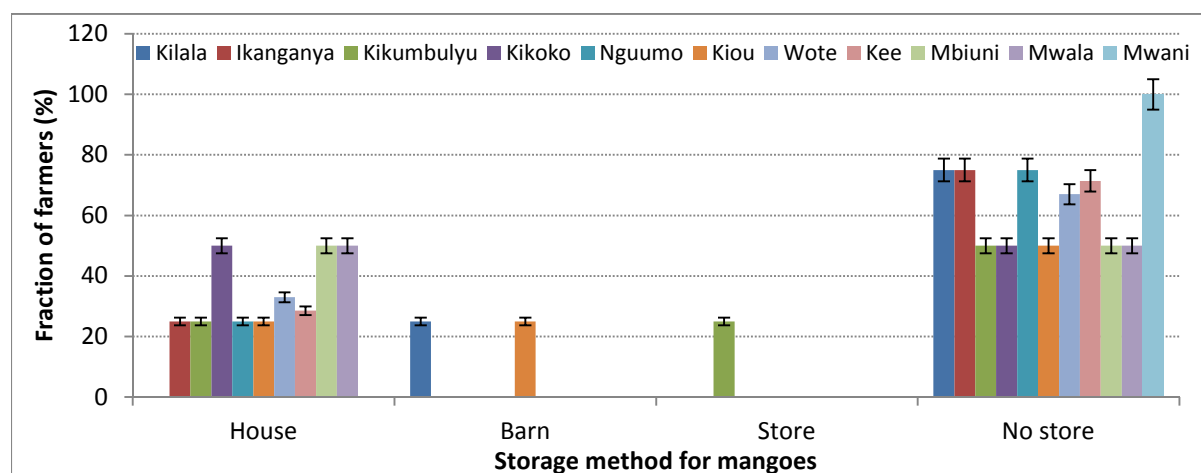


Figure 7: Methods of storage for mangoes amongst farmers in various Locations, Machakos and Makeni County

3.2.4 Storage period for Mangoes

95% of the farmers in the study areas could not store mangoes over a period of a week while the remaining 5% could store mangoes for 2 weeks. A short storage period for mangoes showed that majority of the farmers lack effective storage facilities.

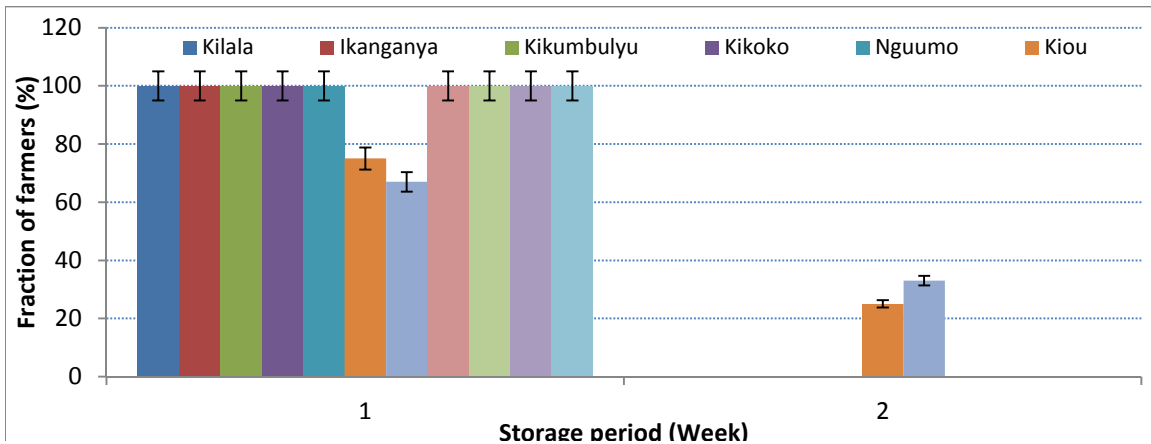


Figure 8: Storage period for mangoes amongst farmers in various Locations, Machakos and Makueni

3.2.5 Postharvest losses in Mangoes

The study found out that most of the farmers (40%) lost 30-40% their produce after harvest. During postharvest handling, at least 40-45% of the fruit is lost (KARI, 2004). Mechanical damage, pests and diseases, excess fruits in the market and immature harvesting are the major causes of postharvest losses (Gathambiri *et al.*, 2009).

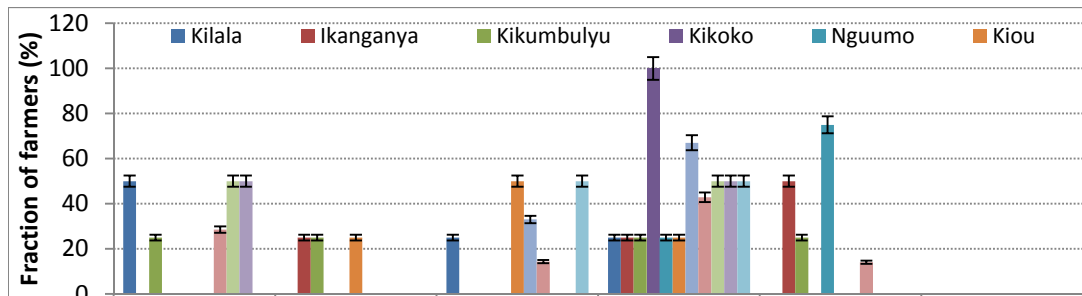
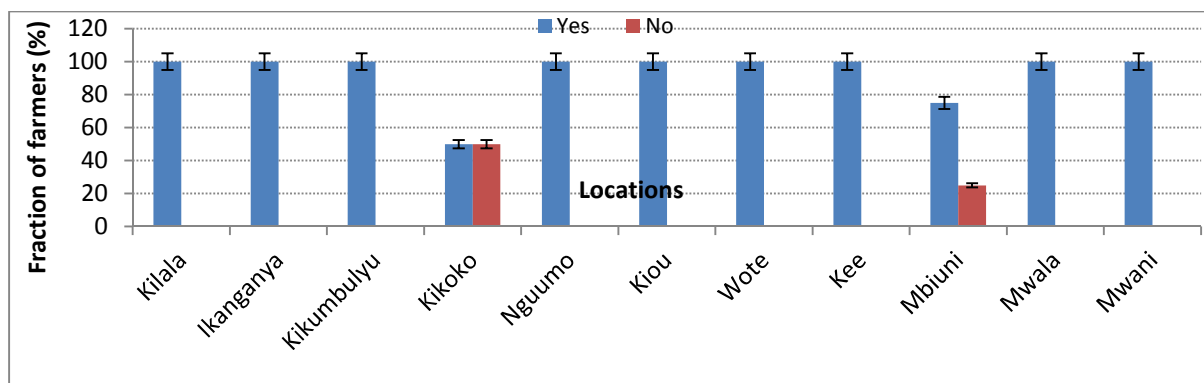


Figure 9: Postharvest losses in mangoes amongst the farmers in various Locations, Machakos and Makueni

3.2.6 Special Storage Facility for Mangoes

95% of the farmers reported that there was a need to have a special storage facility for mangoes. This showed that majority of the farmers in the study area had no proper storage facilities to enable them store their produce safely. Thus, there is a need for effective storage facilities to be developed for mangoes. This will reduce postharvest losses due to lack of storage facilities for mangoes during the peak season.



4.0 Conclusion and Recommendation

This study showed that methods of mango harvesting included; climbing on the tree, with 65% of the farmers practiced this method. 23% of the farmers used hooks and sticks, 7% by tree shaking while a few (5%) simply waited for the fruits to fall. A majority of the respondents (60%) had not received any kind of training on mango postharvest handling techniques. Further, the study revealed that 40% of farmers used gunny bags to carry harvested mangoes. Other types of packaging being used included; cartoons and boxes (37%), plastic crates (18%), baskets (3%) and sisal bags (2%). In terms of storage methods for mangoes it was found that 63% of the respondents did not have stores for harvested mangoes, 25% of them stored their produce in their houses, 7% in barns and 5% in stores. 95% of the respondents were unable to store their produce for a period exceeding a week while some of them (5%) could their produce for 2 weeks. A majority of the respondents (40%) reported postharvest losses in mangoes between 30-40%. In addition, 95% of the respondents require a special storage facility for mangoes. Thus, there is a need for an effective storage facility to be developed for the fruits quality preservation and hence postharvest losses reduction. Postharvest challenges in mangoes were found to be; poor harvesting methods, lack of training, poor packaging, lack of proper storage facilities and poor market for the fruits during the peak harvesting seasons.

Acknowledgement

The authors would like to acknowledge Jomo Kenyatta University of Agriculture and Technology (JKUAT) for funding the work and respondents for the overwhelming support in this study.

References

- Gathambiri, C. W., Gitonga, J.G., Kamau, M., Njuguna, J. K., Kiiru, S. N., Muchui, M. N., Gatambia, E. K. and Muchira, D. K. (2009). Assessment of potential and limitation of postharvest value addition of mango fruits in eastern province: A case study in Mbeere and Embu districts
- Griesbach J., (2003). Mango Growing in Kenya. ICRAF, Nairobi, Kenya.
- Horticultural Crops Development Authority (HCDA), 2010. Export statistics.
- Kenya Agricultural Research Institute (KARI), 1994. Annual Report.
- Kenya Agricultural Research Institute (KARI) - Thika (2004) Centre Annual Report.
- Kenya's LAPSET Corridor Mango Production Investment Opportunity, Investor Presentation, May 2012.
- Ministry of Agriculture (MOA), 2007. Annual Report.
- Nakasone, H. Y. and Paul R. E., (1998). Crop Production Science in Horticulture.
- USAID-KHCP Horticulture Performance 2010-2012. July 2013. Prepared by Fintrac Inc. 2.
- Toili, M. E. M., Rimberia, F. K., Nyende, A. B., Mutwiwa, U., Kaluli, J. and Sila, D. (2013). Assessing morphological diversity of mango germplasm from the Upper Athi River (UAR) region of Eastern Kenya.
- Transport Information Service (TIS) from the German Insurance Association (GDV e.V.)