CONTRIBUTION OF MULTI-PURPOSE PUMPKIN (*Curcubita moschata* Duch.) TO THE ECONOMY OF KENYAN SMALL-SCALE HOUSEHOLDS

Kiharason, J.W.[1], Isutsa, D.K.[1,2] and Ngoda, P.N.[2]
[1]Chuka University, P.O Box 109-60400, Chuka, P. O. Box 484-60400, Chuka, Kenya
[2]Egerton University, P. O. Box 536-20115, Egerton, Kenya
Correspondence: esijedi@yahoo.com; jkiharason@chuka.ac.ke; disutsa@chuka.ac.ke

Citation:
Kiharason, J. W., Isutsa, D. K.and Ngoda, P. N. (2015). Contribution of Multi-Purpose Pumpkin (*Curcubita Moschata* Duch.) to the Economy of Kenyan Small-Scale Households. In: Isutsa, D. K. (Ed.). *Proceedings of the First International Research Conference held from 29th to 31st October, 2014 in Chuka University, Chuka, Kenya, 7-13 pp.*

ABSTRACT
Kenya's agricultural sector has generally faced a blow with repeated delays in rains causing suppressed farming. Farmers should therefore grow other non-staple crops which can do well with minimal rainfall. Pumpkin is one such crop that is drought-tolerant and requires very little care and labour. Majority of households do not utilize pumpkins regularly, although it is a multi-purpose food crop capable of forming basis for various products including infant weaning foods, snacks and bakery products. The study established socio-economic status of households and extent of cultivation and sale of pumpkin. A cross-sectional survey using a semi-structured questionnaire was used among 385 households in Nyeri County of Kenya. Majority of households earned low income, with 56.3% earning less than KSh. 12,000 monthly. Pumpkin was grown by 71.4% of farmers but contributed to livelihoods of only 4.2% households. There was a high correlation between the number of pumpkin plants cultivated and amount of income received from pumpkin sale, r (16)= 0.510, *P*=0.043. Pumpkin fruit contributes very little to income of the households and is not yet tapped to improve food security and livelihood of people in Kenya. Improving marketability of pumpkin could increase its demand, production level and sale to generate income for many poor rural households.

Key words: *Pumpkin, Fruits, Income, Kenya, Households, Socio-economic*

INTRODUCTION
It is estimated that more than half of Kenya's population, approximately 40 million people, are poor, with 7.5 million of the poor living in extreme poverty (RoK, 2008). For instance, in 2007, the number of poor people in the Kenyan population was estimated at 18.2 million, rising to 19.5 million and later 20.1 million in 2008 and 2010, respectively. Especially rampant is the poverty levels in arid areas which are characterized by harsh weather conditions, which are reported to have poverty levels above 70%. The agriculture sector has been a key driver of economic growth in Kenya for the last four decades and is the main source of livelihood (employment, income and food security needs) for more than 80 per cent of Kenya's population living in rural areas. Agriculture is the single largest sector of the economy contributing to about a quarter of the country's GDP and accounting for 65% of export earnings (KER, 2013). It has been documented that majority of the poor (three out of four poor people) lives in rural zones. Furthermore, most Kenyans live in areas of a medium to high potential for agriculture, which comprise about 18 per cent of the country's territory (Uwechue, 1996). Previous literature shows that low income is one of the most important correlates of poverty

that defines the poor. In terms of the poverty gap, poor people in the rural areas have, on average, much lower incomes compared to the poverty line, and their income distribution does not seem to change much over the years. The fight against poverty remains a top priority on Kenya's development agenda whereby the government commits to eliminate poverty by 2030. Agriculture is the largest employer in the economy and in order to realize the desired annual economic growth rate, there is need to transform smallholder agriculture from subsistence to an innovative, commercially-oriented and modern agricultural sector (KER, 2013).

he frequent food insecurity in most parts of Keya is due to over reliance on a few staple foods like maize and potatoes, and arises from repeated cultivation of the same crops at the same areas (RoK, 2001). The recent erratic weather pattern characterized by shortage of rainfall in some ecological zones especially grain growing regions have caused a deceleration in agricultural sector, which saw a drop from 4.2% in 2012 to 2.9% GDP in 2013. There was depressed production of maize, beans, coffee among other export crops (RoK, 2014). On the other hand, traditional crops including the pumpkins, which are rich in nutrients, are so far not highly regarded by the small holder farmers. Pumpkin (*Curcubita moschata* Duchesne) is among the most important crops with high potential to overcome undernourishment and food poverty (Ondigi et al., 2008). It is a drought-tolerant fruit and leafy vegetable that thrives well in most parts of Kenya (Muendo and Tschirley, 2004). Previous studies have indicated a vast potential of pumpkin production and utilization in food poverty reduction in some regions of Kenya. A 2008 study by Ondigi and colleagues recorded pumpkin as being neither a priority food crop cultivated used to generate income among the communities around Kenya's L. Victoria Basin. There is existence of favorable ecological conditions necessary for cultivation of the pumpkin yet only small portions of land are devoted to pumpkin cultivation and these are mainly cultivated as a marginal crop often on the edges of field crops or scantly scattered between staple crops such as maize or sorghum. Furthermore, research done on the crop is inadequate compared to most mainstream and exotic crops (Hamisy et al, 2002). The utilization and improvement of productivity through cultivation under-utilized crops such as pumpkin would help reduce genetic erosion of the crops (Chweya, 1997).

Pumpkin fruit has been found to be rich in carbohydrate, protein and antioxidant activities. Antioxidants are required to boost the human body immunity against cancer and other deadly human diseases. They are also rich sources of sources of vitamin A present as beta-carotene, unsaturated fatty acids and high amounts of amino acids arginine, aspartate and glutamic acid (Usha et al., 2010). They have an abundance of vitamins B1, B2, B12, C, E and minerals (zinc, niacin, iron, magnesium, phosphorus, potassium, folate, calcium). This potential is unequalled to any other single crop (Encyclopedia of foods, 2004). Pumpkin is not as bulky as other tubers such as the yam, and can be used as breakfast. It matures in only four months, can grow in any part of East Africa and can be kept for as long as 8 months without going bad (Hamisy et al, 2002). Moreover, the production is less labour intensive and more profitable compared to yam and many other staples (Oloyede et al., 2013).

MATERIALS AND METHODS

A cross-sectional survey was carried out among sample households in Nyeri County of Kenya between 11th and 22nd February 2014. The study aimed at determining contribution of pumpkin to the economy of Kenyan households. A sample size representative of study population was determined using published tables with criteria of ±5% Precision Level (e), Confidence Level of 95% and Degree of Variability at P=0.5 (Israel, 1992). Using records from agricultural offices in the county, a population of 10,000 farmers in the study population gave a sample size of 385 farmers. Purposive sampling was done to select Nyeri County for this particular study due to the presence of a farmer's support project on the ground. The County has six Constituencies, 12 Divisions and 24 Locations. Multi-stage random sampling was applied to determine the areas to be visited, whereby the six constituencies were written down on papers, folded and any two constituencies were randomly picked. The same was done for the 12 divisions, to end up with two divisions (one division per Constituency) and two locations (one location per division). All sub-locations in each location were listed and households in the villages in each sub-location visited until the required number of households for the sub-location was attained; the number of households per sub-location was determined by Population Proportionate to Size (PPS) method, this was after population sizes being obtained from offices of the local authority (Chief). The study population involved farmers in the study area and respondents were mothers as it was assumed that they have information on both the farming activities and sale of farm produce. The mothers were therefore better placed to provide reliable information on production and marketing of pumpkin fruits.

Respondents were interviewed using a semi-structured questionnaire to establish demographic characteristics of households, cultivation levels of pumpkin and to find out pumpkin contribution to household income. A Research Assistant well conversant with the language of the natives was trained for one day on research ethics, interviewing

techniques and data collection, as well as proper translation the questionnaire. Then one-day pilot survey was done in a sample other than in the study area, among 19 households (5% of the study sample size). The data was then entered and the tool tested for reliability. The pre-testing also helped the Research Assistant get enough familiarization with the tool, understand the process of interviewing and clearly understand the research objectives. Before receiving the day's questionnaires, they were checked for completeness and any inconsistency confirmed while disregarding the incomplete ones. The questionnaire was coded and data entry and analysis done using SPSS version 17. The data was analyzed using descriptive statistics by applying percentages or frequencies of the responses and presented as graphs and tables. Chi-square analyses were performed to determine the significant relationship between monthly income levels and a number of demographic characteristics including education level of household head. Pearson's correlation was used to determine association level between the extent of pumpkin cultivation and income from sale of pumpkin fruits.

RESULTS

Demographic Characteristics

Prior to collecting information on agriculture and income from farming, a number of household characteristics were established, including household size, sex of household head, occupation of household head, main livelihood source, among others; these would help in inferences and data interpretation.

A total of 385 households were sampled and the mean household size was found to be 3.9 (SD 1.77). Majority of the households (76.4%) were male headed, the rest being female headed. In terms of literacy levels of household heads, table 1 shows that majority either did not complete secondary education or dropped from upper primary school. It is also notable that majority of the households earned a livelihood through mixed farming followed by crop sale, at 30.1% and 28.3% respectively.

Table 1: Demographic characteristics of households in study area

Characteristics	Percent	Characteristics	Percent (n=385)
Education level of household head		**Source of livelihood**	
None	12.5%	Crop sale	28.6%
Class 1-4	9.9%	Mixed farming	30.1%
Class 5-7	27.3%	Formal employment	9.4%
Completed primary	7.5%	Casual labor	10.9%
Secondary incomplete	28.3%	Business	11.7%
Completed secondary	5.5%	Sale of milk	4.9%
Tertiary	9.1%	Pension benefits	1.0%
		Children assistance	3.1%
		Begging	0.3%

Socio-economic status

An assessment of household income indicated that majority of the households (29.1%) had a monthly income of between K Sh. 1000 and K Sh. 6000, and only 1.9% earned sh. 100,000 and above (figure 1). There was a significant relationship between education level of the household head and the amount of monthly income earned from all sources in the household, χ^2 (N=380) =168.05, p=0.000.

Results indicated that households with the highest income levels were male-headed. None of the female headed households earned an income of more than K Sh. 80,000 (figure 2). There was a significant relationship between the sex of household head and the category of income earned in the household, χ^2 (N=380) =28.48, p=0.001.

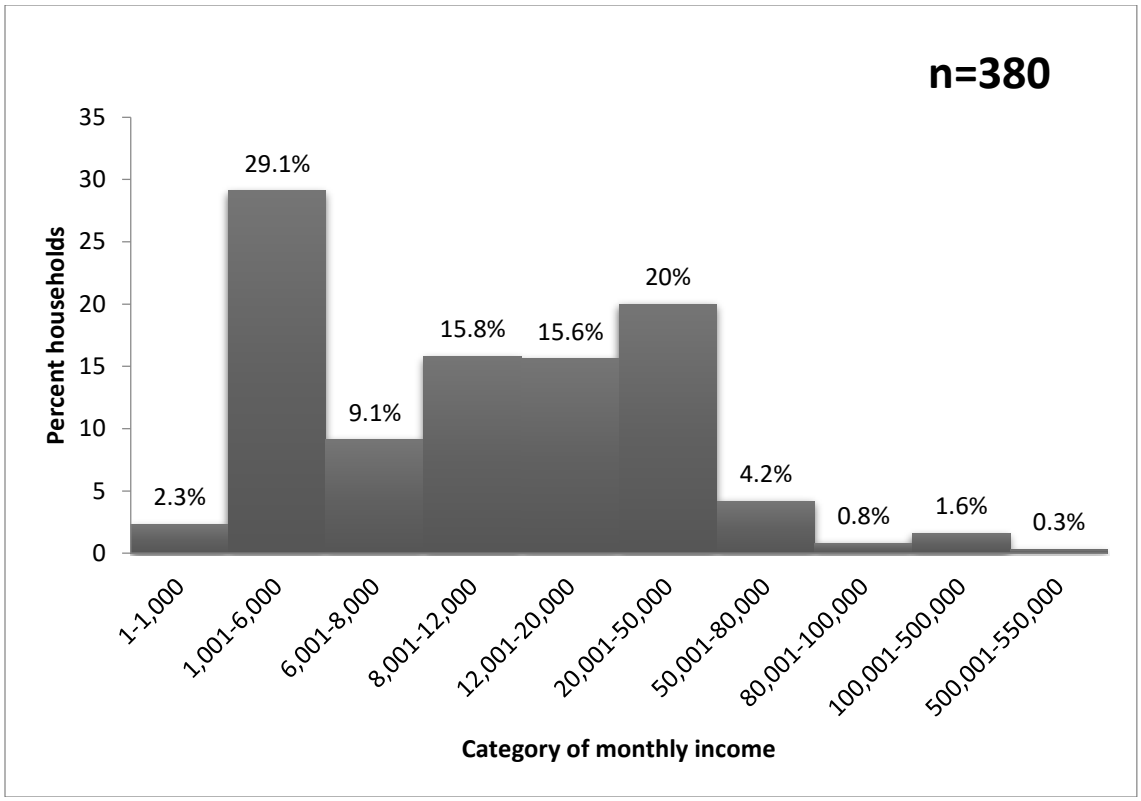

Figure 1: Category of household monthly income (K Sh)

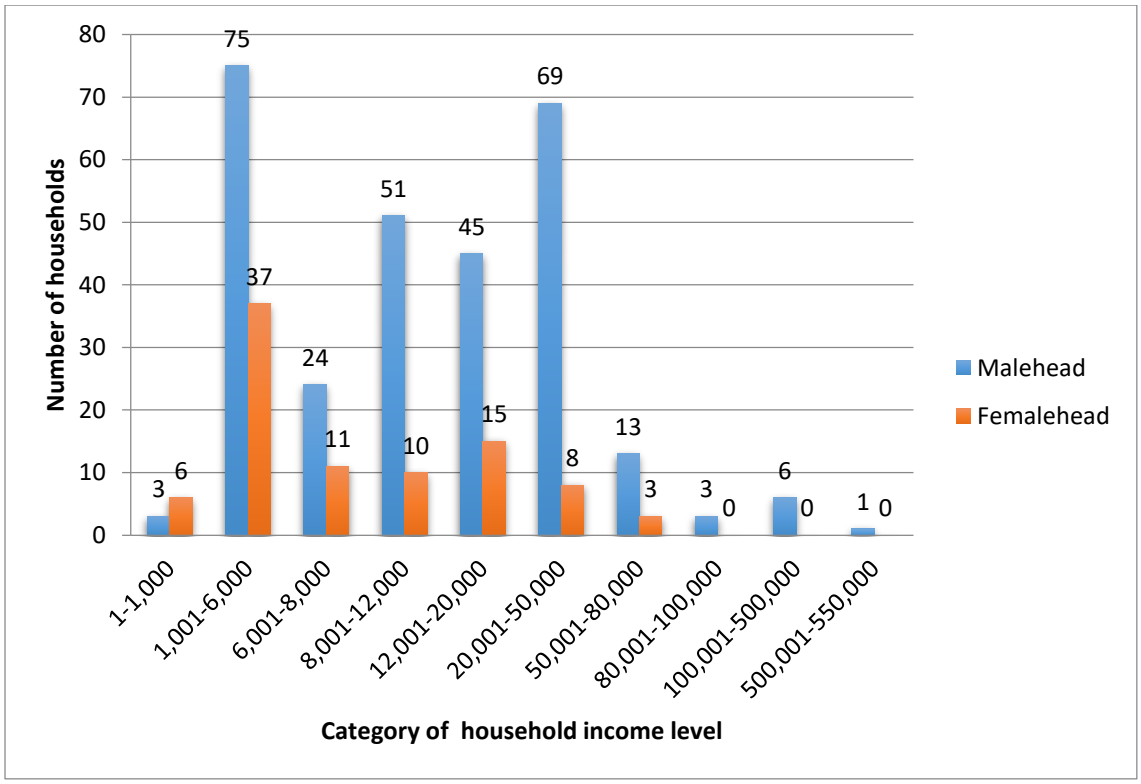

Figure 2: Category of household income level (K Sh) given the household head

Contribution of pumpkin to livelihood

This study aimed at finding out the level at which crops contributed to the income of the households. A total of 44.7% households did not get any income from crops. Majority of those who sold some crop earned quite a small amount of money; figure 3 shows that 39% of the farmers earned between K Sh. 2,000 and 5,000 and only a negligible proportion earned above K Sh. 50,000 from sale of crops.

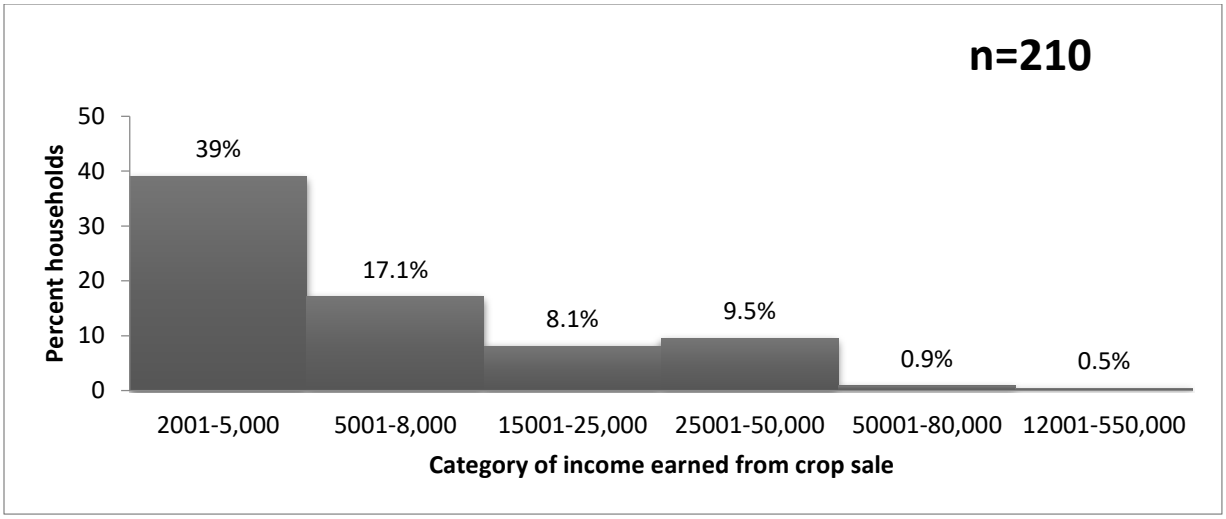

Figure 3: Category of income earned (K Sh) from crop sale by households

It is also notable that pumpkin was not among major crops cultivated for income earning in the study area, given that out of 275 (71.4%) farmers who reported growing pumpkin, only 4.2% were growing for sale. In figure 4, it is evident that the major crops grown for sale included maize, beans, tea, potatoes, cabbage, carrots, spices (tomato, dhania, onions, courgette) and french beans.

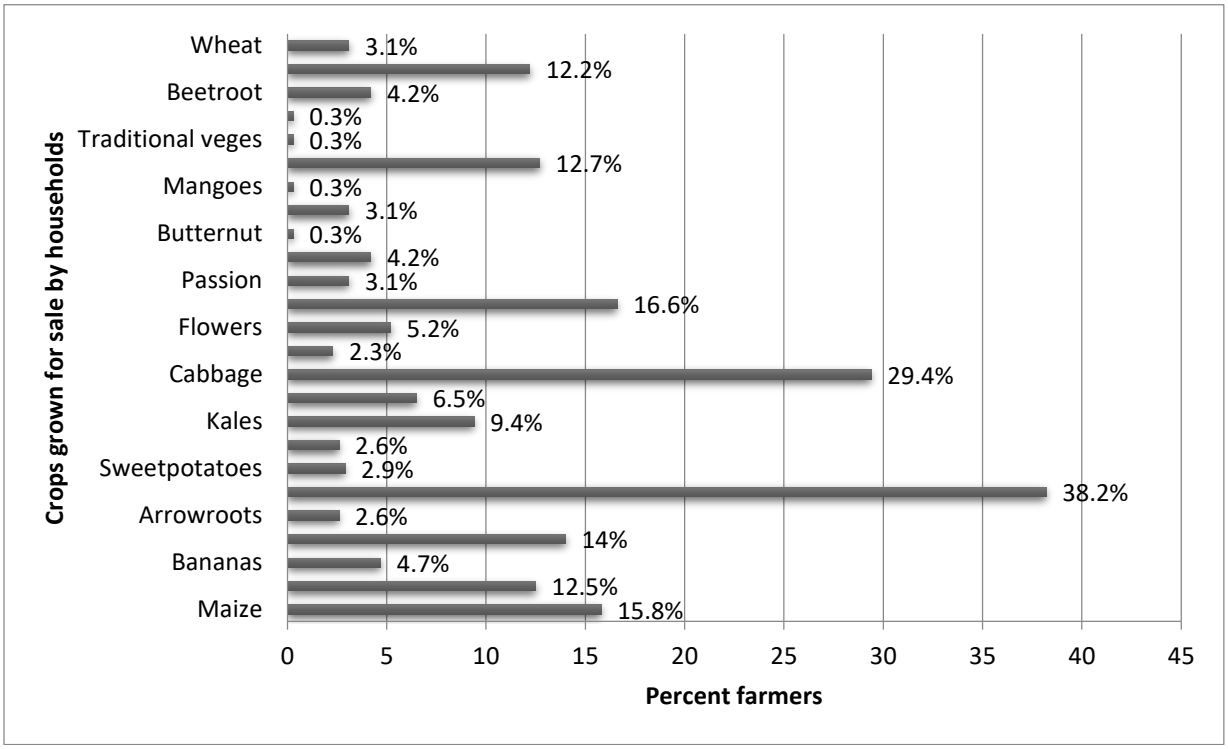

Figure 4: Crops grown for sale by farmers

Monthly income from sale of pumpkin fruits ranged from K Sh. 150 to K Sh. 12,000. Figure 5 shows that majority of farmers earned between K Sh. 200-500. Whether a household sold pumpkin fruits or not was significantly related to the amount of money earned from sale of crops, χ^2 (N=382) = 35.82, p=0.000. In addition, the number of pumpkin fruits harvested highly correlated with the monthly income from sale of pumpkin fruits: r (15)=.650, p=.009. As well there was a high correlation between the number of pumpkin plants cultivated by the farmer and the monthly income received from sale of fruits: r (16)=.510, p=.043.

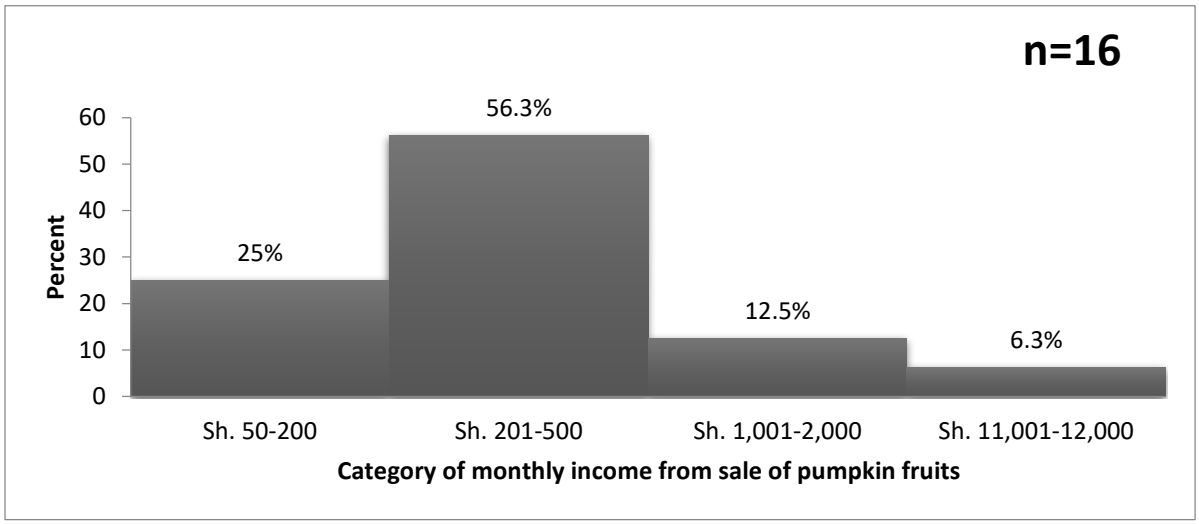

Figure 5: monthly income from sale of pumpkin fruits by farmers

DISCUSSION

The sampled households show a mean household size slightly lower than the Kenyan mean of 4.2 indicated in 2008/09 KDHS report, which was a reduction from 4.4 found in the 2003 KDHS. This concurs with the fertility report in the same survey which indicated an average of 4.6 births per woman, and projected a decline due to the trend of declining fertility rates over the decades, down from 8.1 births per woman in the late 70s. Same report is found in Kenya's 2013 Economic report which indicates falling fertility rates (KER, 2013). Regarding literacy levels of household heads, a significant number are regarded illiterate in that they have never had any formal education. Education level has a great impact on the socio-economic status of an individual or household. This study shows, as expected, a significant relationship between education level of household head and amount of monthly income. Normally a higher education level translates into better career opportunities hence better income levels.

Households in the study area appear to be mainly of low socio-economic class, with more than half (56.3%) of the households earning KSh. 12,000 and below. Whether a household is male-headed or female-headed has an impact on issues such as socio-economic status, which in turn determine accessibility of basic needs such as food, education, health and other wellbeing of family members. Even though majority of the households are male-headed, it is notable that none of the female-headed households (which consist of almost a quarter of the study households) are in the highest socio-economic status earning KSh. 80,000 and above. Some male-headed households earn as much as KSh. 550,000 per month while none of female-headed households earn any amount close to that.

Among agricultural zones, sale of crops plays a major role in enhancing economic status of most households, especially because majority of the population in such zones rely on farming and not on white collar jobs. In addition, whether a farmer plants just a few or a large number of plants of a given crop would have some impact, for example when considering the benefits accrued from the crop. Such benefits would include health and nutrition benefits due to adequate consumption of fresh produce from the farm, as well as economic benefits, for instance a farmer who grows just a few stems of a given cash crop would only get meager returns while one who has a large plantation will earn much more from the sale. As well, a food crop would benefit a farmer much more if they have planted many crops as opposed to planting just a few stems of the crop. The latter would not even harvest enough for the family to have adequate food to eat. Majority of farmers in the study area (30.1%) rely on mixed farming for a livelihood, while another considerable proportion (28.6%) relies on crop sale alone. It is obvious that the population in study area is largely dependent on agriculture for economic sustenance, given the small

proportion of households (9.4%) who rely on formal employment. This study aimed at determining the role of agriculture, especially pumpkin farming, in promoting the economic status. Generally, almost half of the farmers do not rely on sale of any farm produce to earn a living. A good number of those who sell some crop produce earn an insignificant amount of between KSh. 2,000 and 5,000 per month. Specifically, pumpkin fruit contributes very little to households' income whereby out of the 4.2% growing and selling pumpkin fruit, more than half of them received between Sh. 201 and Sh. 500 monthly and only one farmer reported earning Sh. 12,000 monthly from sale of pumpkin fruit. A significant relationship between the amount of income from sale of crops and if a household was selling pumpkin fruits means that pumpkin was a common crop for sale among farmers who were earning more from agricultural produce.

CONCLUSION AND RECOMMENDATION

This study concludes that pumpkin farming in the study area is not intensive because although majority of farmers (71.4%) in the study area grow pumpkins, most of them (73.1%) cultivate about 5 plants or less per year, with the highest proportion harvesting between 1 to 53 fruits. It also appears that pumpkin growing is not at all a commercial crop, considering that only 4.2% of farmers grow it for sale. It can therefore be concluded that pumpkin is neither a major crop in the study area, nor does it have any significant contribution to household income. The study found that the amount of income from sale of pumpkin fruit is highly reflected by level of pumpkin cultivation by the farmer. Improving marketability of pumpkin fruit will increase its demand hence increase the level of cultivation. Pumpkin is a drought-resistant crop which can be tapped as means of improving food security as well as creating an income source through selling the vegetable, the fruit and pumpkin fruit products. This way it will contribute to improvement of people's nutrition and health status, as well as the economy of Kenyan households.

REFERENCES

Chweya, A.J. 1997. Genetic Enhancement of Indigenous Vegetables in Kenya, p.90-99. L. Guarino (Ed). Proceedings of IPGRI, International Workshop on Genetic Resources of Traditional Vegetables in Africa: Conservation and Use, 29-31st August, 1995, ICRAF Headquarters, Nairobi, Kenya. Institute of Plant Genetic and Crop Plant Research. Gatesleen/IPGRI, Rome: Italy.

Encyclopedia of Foods and Their Healing Power. 2004. Education and Health Library Editorial Team (Eds.). Volume 1. ISBN-10:8472081842.

Hamisy, W.C., Makundi, A.H., Marandu, D., Nkya, M.J. 2002. Evaluation of five accessions of *Curcubita maxima* collected from different ecological zones in Tanzania. The Second International Workshop on Plant Genetic Resources and Biotechnology Report, Arusha, Tanzania, p. 6-10.

Israel, G.D. 1992. Sampling the Evidence of *Extension Program Impact.* Program evaluation and Organizational Development, IFAS, University of Florida. PEOD-5.

KER. 2013. Kenya Economic Report: Creating an Enabling Environment for Stimulating Investment for Competitive and Sustainable Counties. Kenya Institute for Public Policy Research and Analysis (KIPPRA). Nairobi, Kenya.

Muendo, K.M. and Tschirley, D. 2004. Improving Kenya's Domestic Horticultural Production and Marketing System: Current Competitiveness, Forces of Change, and Challenges for the Future. Vol. I: Horticultural Production. Working Paper No. 08A/2004.

Oloyede, F.M., Agbaje, G.O. and Obisesan, I.O. 2013. Effect of NPK fertilizer on fruit yield and yield components of pumpkin (*Cucurbita pepo* Linn.). *Afr. J. Food Agri. Nutr Devt.*, 13:1684-5374.

Ondigi, A.N., Toili, W.W., Afisihi, S.M. and Stanley, O.O. 2008. Comparative analysis of production practices and utilization of pumpkins (*Curcubita pepo* and *Curcubita maxima*) by smallholder farmers in the Lake Victoria Basin, East Africa. *Afr. J. Environ. Sci. Technol.*, 2:296-304.

RoK. 2001. Poverty Reduction Strategy Paper for Period 2001-2004. Nairobi, Ministry of Finance.

RoK. 2008. Republic of Kenya: The Constituency Development Fund: An Examination of Legal Structural Management and Corruption Issues in Kenya. Report by The National Anti-Corruption Campaign Steering Team.

RoK. 2014. Economic Survey Report Highlights. Published by Cabinet Secretary, Ministry of Devolution and Planning.

Usha, R., Lakshmi, M. and Ranjani, M. 2010. Nutritional, sensory and physical analysis of pumpkin flour incorporated into weaning mix. *Malaysian Journal of Nutrition* 16(3):379-387.

Uwechue, R. 1996. Re-Inventing Government, 4th Global Forum held in Marrakech, December, 2002. Historically, Africa Today (3rd ed.). Nairobi: African Books.

******