Market Survey on Adoption and Utilization of Post-Harvest & Agro Processing Technologies in Uasingishu County, Kenya

[1]Ouma, R.O, [2]Mugalavai, V.K & [3]Onkware, A. O

[1]Business Studies Department, Rongo University, Kenya
[2]Department of Family & Consumer Sciences, University of Eldoret, Kenya
[3]Department of Biological Sciences, Rongo University, Kenya

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***Abstract*-** Post-harvest and agro-processing losses in the rural farming communities in Kenya is a major challenge because of the level of knowledge, skills and technologies used by majority of these farmers in many parts of the country. The aim of the survey was to analyze the utilization of post-harvest and agro-processing technologies through market analysis of the existing technologies. The market survey was carried out in Elgeyo Marakwet and Uasin Gishu counties whereby the focus was Iten town and Eldoret town which form the major urban centers of the counties where farmers buy post-harvest and agro processing technologies. For the post-harvest technologies the target establishments included; Agrovets, Farm machinery shops, Jua kali and Supermarkets. Sampling was done using stratified sampling where streets were used to divide the town followed by simple random sampling of the establishments. In some instances cluster sampling was used in scenarios where same establishment were concentrated in one area as in the case of the jua kali. Data collection for this study was purely through questionnaires and observations. Descriptive statistic methods of data analysis were employed. The study found out that most post-harvest technologies were not utilized by farmers therefore there is need for the relevant authorities to do awareness on available methods of post-harvest handling and agro processing of food and feed. At the point of sale too it was noted that those who were in such businesses would also be educated on the existence of other post-harvest technologies so that when farmers visit them then they could educate them. Most of the cheap technologies were locally made in the jua kali as compared to supermarkets which were more expensive. There is need for the jua kali artisans to be trained on how to modernize so as to be able to sell some of their products to the supermarkets and for them to be able to commercialize the production of the post-harvest technologies. There is a need for an exhibition with the stakeholders to create awareness on all post-harvest technologies available in the market place.

I. Introduction

Hunger, malnutrition, and poverty are persistent issues in many developing countries despite recent advances in agriculture productivity. By 2050, the world's population is projected to reach 9 billion, 34 percent higher than today. Nearly all of this increase will occur in developing countries (FAO 2015, IFPRI, 2015). The number of the hungry is 350 million in subs Saharan Africa (FAO, 2015). Yet, one third of the world's available food is lost, spoilt or wasted before it even reaches a plate: and this loss is said to be enough to feed everyone in the world for two months. Food loss is the diminishing quantity of edible food through production, harvest, post-harvest and processing stages of the supply chain, which may be occasioned by spillage, pest and microbial infestations, for example. Such food loss and wastage can be minimized through greater investments, and wider adoption of improved post-harvest and agro-processing (PHAP) technologies. Adoption of these technologies and improving management practices can be of great help in terms of national and global food security (IFPRI, 2015), and in support of the Right to Food for all (GoK, 2013).

Studies carried out in various parts of Kenya established that the major cereal grains, such as sorghum and maize undergo significant post- harvest losses at threshing, storage and processing (Nyambo, 2013). It has also been argued that food availability can be significantly increased without having to increase production by curbing the postharvest losses (Hodges et al, 2011). In the smallholder farm units the postharvest losses affect women the most because they are responsible for drying, storage and processing of grain for household use. Improvement in shelling/threshing, drying, storage, exclusion of larger pests such as mice; and processing techniques, such as fermentation are some of the practices that can be used to cut down on postharvest losses and contamination. Most of the farmers in these countries have not adopted improved technologies in postharvest handling. Consequently they need exposure and training on the use of these technologies as well as access to inputs, materials and markets (Suvedi et al., 2016). Thus the aim of the survey was to analyze the utilization of post-harvest and agro-processing technologies through market analysis of the existing technologies.

II. Data Presentation, Interpretation and Discussion

Normalcy of Data

The most important thing was to know if the data used was normal. The normality was assessed using measures of skewness and kurtosis (Tabachnick and Fidell, 2007). From the results of skewness (-1.25) and kurtsosis (1.647) the values lie within the

range +/- 2 The distribution was considered normal if skewness and kurtosis values fell within the interval -2.0 to 2.0. As shown in Table 1.1, the skewness and kurtosis values for all variables were within the acceptable interval. Normality assumptions were therefore met.

Table 1.1: Descriptives on Normalcy of data

	Awareness of the existence of the Technology		Statistic	Std. Error
Farmers knowledge on how to use the technology	Mean		4.22	0.132
	95% Confidence Interval for Mean	Lower Bound	3.96	
		Upper Bound	4.48	
	5% Trimmed Mean		4.31	
	Median		4	
	Variance		0.869	
	Std. Deviation		0.932	
	Minimum		1	
	Maximum		5	
	Range		4	
	Interquartile Range		1	
	Skewness		-1.25	0.337
	Kurtosis		1.647	0.662

Background Characteristics of the Study Population

The study established the demographic characteristics of the respondents, including their gender, age, highest academic qualification, business ownership, how the business was started up and the amount of the initial capital.

Demographic Characteristics of Respondents.

Respondents were asked to indicate their demographic data in the questionnaire, Results in Figure 1.1 indicated a majority 66.7 percent were male while 33.3 percent were female majorly aged between 21-40 (80.6%) years with 16.7% aged 41-60 years and only 2.8 % aged less than 20 years, furthermore from the study it was established that 94.4% were married with only slightly more than 5% who were single. On examining their academic levels majority were of secondary school level at 58.3%, 38.9% had primary and 2.8% had tertiary level of education. All the respondents interviewed held different posts in the establishment ranging from managerial to the support staff who had different skills in line with their jobs.

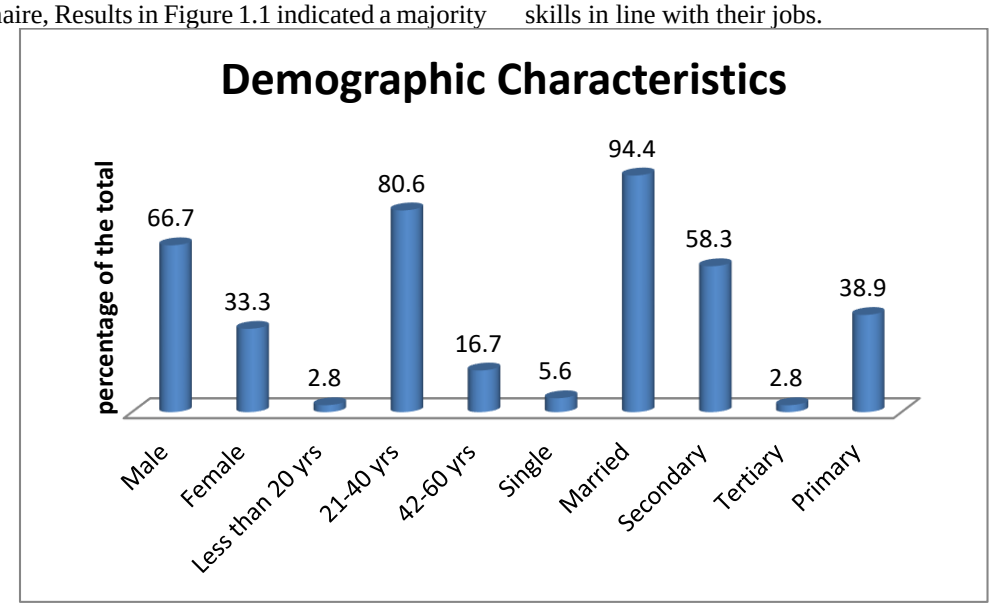

Figure 1.1: Demographic characteristics of respondents

Ownership of the Business

As shown in Figure 1.2, results of this study indicated that for those interviewed, 44.4% owned the businesses while slightly more than half (55.6%) were employees in various capacities of the establishments visited

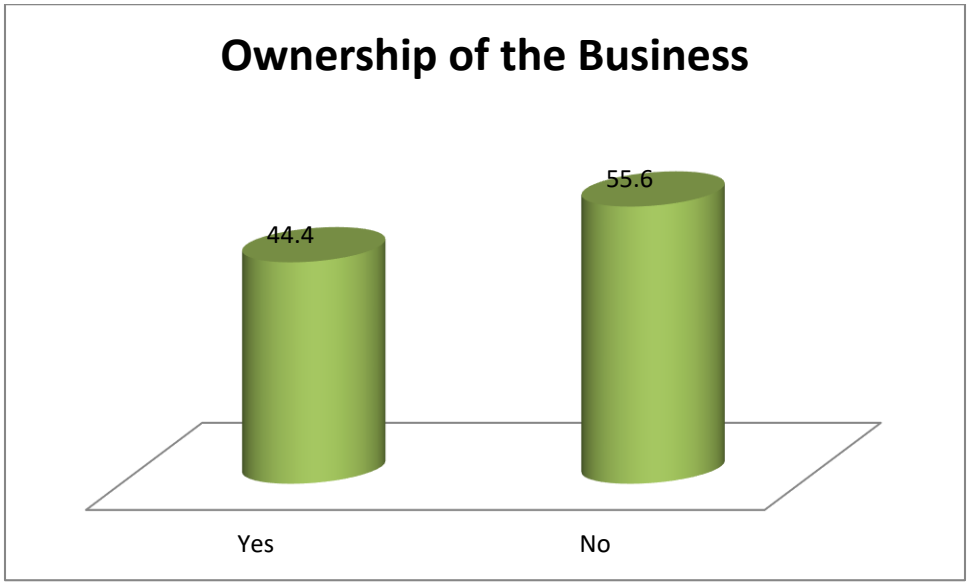

Figure 1.2: Ownership of Business

Number of Years involved in the Business

The respondents were asked to disclose the number of years they have been involved in the business, the Table below shows that majority of the respondents (63.9 %) have been involved for less than ten years while (30.6 %) have been in the business for between 11 and 19 years, Only a small percentage (5.6%) have been in the business for 20 years or more this is shown in Table 1.2 below

Table 1.2: Number of years involved in the business

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 10	23	63.9	63.9	63.9
	11-19 yrs.	11	30.6	30.6	94.4
	21-30 yrs.	2	5.6	5.6	100.0
	Total	36	100.0	100.0	

Source of capital and the initial capital

Source of capital

When respondents were asked about how the business was started up 30.6 % did not know how the business was started up because they were either just employees or they were not there when the business was started up, for those respondents who knew how the business was started majority of the businesses had own initial capital from savings at 38.9 % while 13.9 % were started up by family contributions and 13.9 % were started by using loans from the financial institutions while 2.8% were started by both loans and own savings as shown in fig 1.3 below

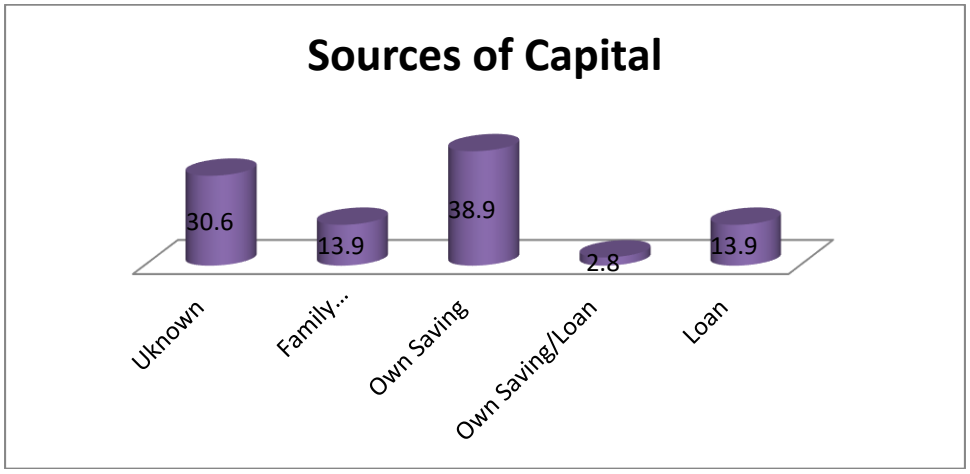

Figure 1.3: Source of Capital

Initial capital

When respondents were asked about the business initial capital 33.3% did not know the amount of the initial capital because they were just but employees, for those respondents who knew the initial capital majority of the businesses had an initial capital of less than KES 50000/- at 44.4% while 8.3 % had an initial capital of more than between KES 50000/- and 100000/-, while only 13.9 % had an initial capital of more than KES 100000/- as indicated in Table 1.3

Table 1.3: Initial Capital

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than KES 50000/-	16	44.4	66.7	66.7
	Between KES 50000/- & 100000	3	8.3	12.5	79.2
	More than 100000/-	5	13.9	20.8	100.0
	Total	24	66.7	100.0	
Missing	System	12	33.3		
Total		36	100.0		

Availability of Post-harvest Handling and Agro processing Technologies

We sought to find out the availability of post-harvest handling technologies in Agro vets, Machinery shops, Open air markets or jua kali and supermarkets for all the supermarkets that were visited they did not have any of the listed post-harvest handling and agro processing technologies.

Agrovets

From the Agrovets it was found out that they had two technologies which were available this included; dehulling and storage technologies.

Dehulling

For Dehulling we found out that they available items were Actellic ,Skana and Nova supplied by Twiga industries, Nova industries and Osho Chemicals, for the sizes it ran from 50g to 25kg for Actellic and Nova and 100g to 2kg for Skana ranging from 70/- to 17500/- and 100/- to 450/- for Skana. Quantities sold per annum ranged from 746kgs to a maximum of 3 tonnes for all the three products and their customers were local farmers all this information is shown in the Table (1.4) below.

Case summaries on Dehulling technology

Storage

For the storage technology it was found out that the available items were pic Bags, Agroz and Elite Bags which were mostly supplied by elite companies and sold at between 200 & 250/- per either 90kgs, 100kgs or 105kgs bag. Quantities sold per annum ranged from 100 to 5000 pieces to mostly local farmers as shown on the Table (1.5) below.

Table 1.5 Case summaries on storage technologies

Item	use of technology	model/brand	available size	supplier	price	quantities sold P.A	Customers buying
Hermatic Bag	Storage	Elite Bags	100kgs	Elite Company	250	152	Local farmers
Elite Bags	Storage	Elite	105kgs	Elite Company	200	5000	Local farmers
Elite Bags	Storage	Pics	90kgs	Elite Company	250	100	Local farmers
Elite Bags	Storage	Elite	105kgs	Elite Inovation	250	500	Local farmers
Pics	Storage	Pics	100kgs	Pics	250	500	Local farmers
Agroz/Elite	Storage	Treated Bags	100kgs	Agroz/Elite	200-250/250	50000&10000	Local farmers
Pics	Storage	Perdue University	100ks	Bell Industries	250	5000	Local farmers
Elite/pics	Storage		105/100kgs	Elite/bell	200	1000	Local farmers
Pics	Storage	Bell Industries	100kgs	Bell Industries	250	2tonnes	Local farmers
Elite/pics	Storage	Nylon	100kgs	Bell Industries	250	10000	Local farmers

Machinery shop

Item	use of technology	model/brand	available size	supplier	price	quantities sold P.A	Customers buying
Actellic	Dehulling	Twiga	1-25kg	Twiga	80-11360	2tonne	Local farmers
Actellic/skana	Dehulling	Pesticide	50g-25kg & 100g-2kg	Twiga/osho	100-12000 & 100-450		Local farmers
Actellic	Dehulling	Sygenta	50g-25kg	Twiga	70-100	746kgs	Local farmers
Actellic	Dehulling	Twiga	50g-25kg	Twiga	100-17500	1tonne	Local farmers
Actellic/Nova	Dehulling	Powder	50g-25kg	Twiga/Nova	80-13000	3tonnes	Local farmers

For machinery shops technologies for drying, decortication and Milling were found. For seed drying, storage and decortication it was found in only one shop. The seed drier had an available size of 3 tonne sold to Locals at a price of 280000/-, A decortication machine ranging 6.5-7.5 horse power supplied by wonder machinery at a price of 40000 was sold to Locals, a storage bin was also available at Eldoret farm machinery at a price of 220000 its size was 2tonnne and four pieces were sold to local famers. For the Milling technologies Milling machines having different sizes and sold between 24000/- and 140000/- were sold to local farmers also various quantities were sold as shown in the Table (1.6) below

Table1.6: Available post-harvest technologies

Item	Use of technology	Model/brand	Available size	Supplier	Price	Quantities sold P.A	Customers buying
Seed dryer	Drying	EEfm	3tonne	Efm	280000	3	Locals
Sheller	Decorticatio n	japan-girasol	6.5-7.5HP	Wonder Machinery	40000	10	Locals
Bin	Storage	Efm	2tonne	Efm	220000	4	Locals
Poshomill	Milling	Shakti	22 & 25	BMG	120000	10	Business men
Poshomill	Milling	Natasha	10&16HP	World machinery/Tasha	60000 & 95000	12	Locals
Feed mill	Milling	Efm	DPM04	Efm	150000	10	Locals
Fodder mill	Milling	Komacs	GM 22 mill	Spring valley	95000	15	Locals
Poshomill	Milling	721325-4(uk)	7.5hp	CIGMA-UK	75000	5	Locals
Poshomill	Milling	Natasha/local	Electricity/diesel	Tasha	75000&14000	30	Locals
Poshomill	Milling	GM 20	7hp	local	24000	7	Locals
Poshomill	Milling	Natasha/power force	5&10hp/3&5 phase	Tasha	80000-140000	200&150/150&250	Locals

Jua kali or open Air markets

From the Table above technologies for postharvest and agro processing included technologies for cleaning, drying, storage and mixing as shown on the Table, for cleaning metal sieves of various size were available and retailing at a price of 300 to 3000, for drying there was a locally made “tandarua” from bags used for drying its prices was between 100-1800 depending on the size and mostly sold to local farmers, for mixing a mixer was available which was used for mixing and sold at a price of 15000 to local farmers finally for storage there were various items for storage ranging from plastic to metallic retailing at a price ranging from 30 to 12000/- from various suppliers and sold to the local farmers, for cooking technologies there were ovens, Improved jikos and baking tins available for sale to local farmers, for the ovens it had various sizes ranging from small to large or 2.5ft to 5ft and sold between KES6000/- to 48000/- , for the improved jikos sizes ranged from 9” to 24” in diameter sold between KES 120- to 340 0/- , baking tins which were available in size ranging from 200g to 2kg were sold between KES70 to 350 as show on the Table (1.7) below.

Table1.7: Available Post-harvest Technologies in Jua Kali

Item	Use of technology	Model/Brand	Available size	Supplier	Price	Quantities sold P.A	Customers buying
Metal sieve	Cleaning	Jua kali	1m and 36 ft	Jua kali	2500/3000	15	Local famers
Metal sieve	Cleaning	Jua kali	varied	Jua kali	300-1000	213	Local farmers
Tandarua	Drying	Jua kali	20/30/50/100 bags	Jua kali	100-1800	100	Local farmers
Gala	Storage	Jua kali	900kgs	Jua kali	15000	4	Local farmers
Metal drum	Storage	Jua kali	3ft 5m	Jua kali	7500	15	Local farmers
	Storage	Jua kali	6&12	Jua kali	7000&12000	30&2	Local farmers
Bags	Storage	Jua kali	90kgs	Unga	30	5000	Local farmers
Drum	Storage	Jua kali	135/180kg	Raiply	1300/2200	55	Local farmers
Super Drum	Storage	Jua kali	200$250l	Vitafoam	1000&2500	1000	Local farmers
Plastic Drum	Storage	Jua kali	250kgs	Business man	3500		Local farmers
Plastic container	Storage	Jua kali	250l	Jua kali	3000	500	Local farmers
Mixer	Mixing	Jua kali	Small to Large	Jua kali	15000	4	Local farmers
Oven/Baking tin	Cooking	Jua kali	small-large/200g-2kg	Jua kali	8000-30000/70-350	8/1000	Locals
Improved Jiko	Cooking	Jua kali	9_22	Jua kali	180-3500	600	Locals
Oven/ Improved Jiko	Cooking	Jua kali	2ft-4ft/8"-22"	Jua kali	6000-48000/120-3000	40/2500	Locals
Oven/improved Jiko	Cooking	Jua kali	smal-large/9-24	Jua kali	8000-28000	23/100	Locals
Oven	Cooking	Jua kali	2.5ft-5ft	Jua kali	12000-45000	15	Locals

Supermarkets

In supermarkets the technologies that were available included sorting, cooking and storage all these were sold to the locals. Technologies included the modern cookers made by several companies with sizes ranging from 50*60 to 56*60 for cookers and 10L to 25L microwaves and sold between KES 23995/- to 75995/- for cookers and KES5000/- to 15000/- for microwaves . For storage technologies fridges were available in different sizes ranging from 183L-535L costing between KES30995-85995 all the these information is captured in the Table1.8 below. Prices in supermarkets were however higher than in Jua Kali.

Table1.8 Case summaries for Post-harvest technologies in Supermarkets

tem	use of technology	model/brand	available size	supplier	price	quantities sold P.A	Customers buying
Sieve	Sorting	plastic	small-Large	Kenpoly	10-500	2000	Locals
Sieve	Sorting	plastic/Metal	8-18321	Minimax	15-75	18000	Locals
Sieve	Sorting	Kenpoly	1-7	Kenpoly	12_60	1000	Locals
Cookers	Cooking	Armco	50*60-56*60	Armco	23995-75995	500	Locals
Fridges	Storage	Samsung	183L-535L	Samsutech	30995-85995	500	Locals
Microwave	Cooking	Rn551	10L-25L	Ramtons	5000-15000	100	Locals

Farmer's knowledge on the post-harvest harvest technologies

We tried to find out if farmers were aware of the existence of the technology and the response was a strong yes (1 indicated a yes) from all those interviewed that farmers were aware, further tried to find out the ability of farmers to use the post-harvest technologies from the Table below we can see that most farmers knew how to use the technologies well, all the machines from the various technologies were effective and sellers knew well how to use the machines it was rated on a scale of 1 to 5 and most showed a rate of 4 and 5 giving an average of more than 4 this was analyzed at 95% confidence interval as shown in Table 1.9 below.

Table 1.9: Farmers Knowledge on the existence of the Technologies

	Minimum	Maximum	Mean	Std. Deviation
Awareness of the existence of the technology	1	1	1.00	.000
Framers Knowledge on how to use the technology	2	5	4.33	.816
Effectiveness of the technology	3	5	4.69	.592
Ability of sellers to use the technology	3	5	4.77	.497
Valid N (listwise)				

Reliability Statistics

From the Table below (1.10) the Cronbach's alpha value is **0.181** which indicates a fairly high level of internal consistency for our scale with this sample.

Table 1.10 :Reliability Statistics

Cronbach's Alpha	N of Items
.181	11

III. CONCLUSION

It was noted that most post-harvest technologies were not utilized by farmers therefore there is need for the relevant authorities to do awareness on available methods of post-harvest handling and agro processing of food and feed. At the point of sale too it was noted that those who were in such businesses would also be educated on the existence of other post-harvest technologies so that when farmers visit them then they could educate them. Most of the cheap technologies were locally made in the jua kali as compared to supermarkets which were more expensive. There is need for the jua kali artisans to be trained on how to modernize so as to be able to sell some of their products to the supermarkets and for them to be able to commercialize the production of the post-harvest technologies. There is a need for an exhibition with the stakeholders to create awareness on all post-harvest technologies available in the market place.

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AUTHORS

First Author – Ouma, R.O, Masters, Rongo University, robouma@yahoo.com
Second Author – Mugalavai, V.K, PhD, University of Eldoret, violet.mugalavai@gmail.com
Third Author – Onkware, A. O PhD, Rongo University, aonkware@yahoo.com