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Role of Extension in Enhancing Positive Perceptions of Innovations: A Case of Hexanal in Kenya

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Abstract

About 40–50 percent of horticultural produce is lost along the value chain in Sub-Saharan Africa. This is due to the short shelf-life of the fresh produce and lack of effective storage methods thereby leading to the high post-harvest losses. Promotion of technologies to reduce these losses is necessary in improving food security and economically empowering smallholder farmers. Hexanal is one of the technologies developed to prolong shelf-life of fresh produce such as bananas. However, farmers' perceptions towards such technologies are not yet fully understood especially when they are new to them. The study assessed the role of extension in enhancing positive perceptions and their determinants in using Hexanal to prolong fruits' freshness among banana farmers in Meru County. Data was generated from cross-sectional survey of 130 households who were categorized into two subsamples, 'Aware' and 'Not Aware' of Hexanal. Three components of perceptions namely 'effectiveness' 'acceptability' and 'environmental safety' were extracted for both categories of farmers using Principal Component Analysis. Perception scores were later regressed against explanatory variables using Ordinary Least Squares. Despite both groups of farmers having positive perceptions towards some attributes of Hexanal, farmers already aware of Hexanal strongly agreed the technology was socially acceptable. However, farmers not aware of Hexanal had negative perceptions on 'acceptability' of the technology as they cited the need for more education on the use and benefits of Hexanal. Perceptions were influenced by different sets of variables such as age, access to credit, distance to input shop, income among others. To enhance positive perceptions, it is necessary stakeholders invest in factors such as supplying information about Hexanal through increased contact between extension agents and farmers which will increase uptake of the technology.

Keywords: Banana, Enhanced Freshness Formulation (EFF), Hexanal, Kenya, Perceptions, Principal components.

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Introduction

Huge post-harvest losses of between 40-50% in Africa impact negatively on the global food and nutritional security, the environment as well as the economic development (FAO, 2014). Studies on postharvest losses have suggested that these losses tend to be experienced more in developing nations such as Kenya where there is high dependent on sufficient food access (Onyango et al., 2009). Post-harvest losses cause major economic losses as produce either fail to reach the market

or lose attributes which consumers find appealing (Hodges et al., 2011; Kader, 2005) thereby fetching very low prices. As Opara (2006) contends, in developing countries, consumers' emphasis has been shifting from quantity to quality produce and hence the need to ensure quality produce reaches the market.

Hexanal, a nanotechnology formulation of a naturally occurring compound ($C_6H_{12}O$) has been developed as a key intervention to reducing post-harvest losses in fresh produce such as bananas. Use of Hexanal which is a relatively new technology, has been found to be effective in prolonging the shelf life of some temperate fruits like peaches, apples, sweet cherries and strawberries. Hexanal works by inhibiting the enzymes that are responsible for the breakdown of cell membranes in the fruit's ripening process (Paliyath and Subramanian, 2008). Results from studies in Kenya between 2014 and 2018 on bananas and papaya showed that Hexanal prolonged the time the fruits remained on the tree when applied as a pre-harvest spray by 12 to 18 days based on peel color changes. In addition, it also prolonged the shelf life and quality of fruits when applied as a dip on mature green fruits by 9 days (Hutchinson et al., 2018; Yumbya et al., 2018). Extension plays a key and crucial role in enhancing knowledge, attitudes and perceptions of innovations. This is because, perceptions that farmers have about a new technology are closely related to their knowledge about it. Extension ensures the dissemination of information on agricultural innovations while also linking farmers to other actors along the value chain in order for them to optimize returns (Kibet 2011; Muyanga and Jayne 2006). An efficient agricultural extension system therefore links farmers to the vast information and technology frontier (Gido et al., 2015). According to Romani (2003), agricultural productivity can tremendously be improved through the implementation of a properly designed extension strategy. Therefore, changes in perceptions are attributable to perceived benefits from changes in farming activities that result from new information availed to farmers (Gido et al., 2015). This study aimed at assessing the role of extension in enhancing positive perceptions of innovations (Hexanal) among banana farmers in Meru County, Kenya. Further, the paper analyzes the determinants of those perceptions in order to develop policy recommendations that will support enhanced uptake of Hexanal once it is introduced into the market.

Methodology

Data used for analysis was generated from a sample of 130 households from South Imenti Sub-county, Meru County. The sample was selected using purposive and systematic random sampling from a sampling frame obtained from banana farmer groups in the study area. Data was obtained through face-to-face interviews with the household heads or their spouses using semi-structured questionnaires in April 2018. Principal Component Analysis (PCA) was conducted in order to reduce the many and correlated variables to distinct perceptions while the Ordinary Least Squares was employed to assess the determinants of farmers' perceptions. Data was collected and analyzed separately for the treatment (aware of Hexanal existence) and control farmers.

Results and Discussion

Perceptions of households on Hexanal in Meru County

From the PCA three components were extracted namely; 'effectiveness' which described the potential for Hexanal to reduce post-harvest losses as well as increasing incomes, 'acceptability' which explained social acceptance of the technology to the farmers and 'environmental Safety' of the technology.

Table 1: Factor loadings on farmers perceptions

Variable	Effectiveness		Acceptability		Environmental Safety	
	Treatment	Control	Treatment	Control	Treatment	Control
Glut of fruits in the market is a serious challenge in production and marketing of bananas	0.937	0.899				
Post- harvest losses in banana production is a major marketing challenge	0.877	0.881				
Hexanal will offer solutions by increasing incomes from banana production	0.853	0.761	-0.406			
Hexanal is socially acceptable	0.754		0.824	0.678		
Education on use of Hexanal is necessary			0.505	0.654		
Government Agency should be involved in distribution of Hexanal				-0.638	0.679	
Hexanal will offer solutions to post-harvest losses in bananas				-0.630		
Hexanal cannot cause any environmental pollution			0.645	0.608		0.407
Possibility of counterfeiting Hexanal			-0.736	-0.558		
Hexanal is safe to micro-organisms					0.776	0.905
Hexanal is not a foreign material			0.429		0.572	0.878
Variance Explained (%)	28.48	23.43	20.92	22.58	13.36	18.15
Proportion of variance explained	Aware		Not Aware			
Kaiser -Meyer -Olkin Measure of sampling adequacy (MSA)	0.6275		0.6416			
Bartlett's Test of Sphericity: Approximate Chi-Square (df)	0.633		0.632			
	241.085(55)***		359.101(55)***			

PCA results with Varimax rotation. Source: Survey data, 2018

Results indicate that both groups of farmers had positive perceptions on the Hexanal technology and its application. Farmers aware of the technology strongly perceived it to be able to reduce post- harvest losses leading to increased incomes. They also noted that the technology was socially acceptable. However, farmers not aware of the technology perceived Hexanal as difficult to use as they emphasized that they would require the assistance of an extension officer.

Determinants of Perceptions

Table 2: Determinants of perceptions on use of Hexanal

Variable	Effectiveness		Acceptability		Environmental safety	
	Control	Treatment	Control	Treatment	Control	Treatment
AGE	-0.004(0.007)	-0.009(0.010)	-0.019(0.009)**	-0.020(0.013)		
SEX	0.719(0.329)**	-0.651(0.266)**	0.327(0.341)	0.692(0.409)*	0.397(0.342)	0.614(0.353)*
EDUC	-0.377(0.139)	0.265(0.228)	0.037(0.032)	0.006(0.034)	-0.291(0.247)	0.082(0.239)
HHSIZE			-0.119(0.077)	0.028(0.093)		
MRTSTAT	-0.147(0.302)	0.587(0.176)***				
LANDTENURE	0.523(0.281)*	0.772(0.465)*	0.039(0.267)	0.841(0.338)**	0.039(0.256)	-0.779(0.277)***
EXTACC	-0.291(0.346)	-0.205(0.341)			0.264(0.395)	-0.265(0.263)
CRDTACC			0.807(0.282)***	0.703(0.409)*		
GRPDUR			0.015(0.007)*	0.028(0.012)**		
GRPMBRSH	0.398(0.218)*	0.459(0.372)			0.209(0.230)	-0.145(0.283)
DISTMKT			0.038(0.022)*	-0.086(0.038)**	0.012(0.048)	-0.328(0.086)***
DISTCOLL	-0.038(0.038)	0.087(0.053)				
LogINC					-0.412(0.144)***	-0.161(0.069)**
TOTAL_INC			-1.27(3.93)***	-2.41(5.50)***		
INC_BANANA	2.4(1.03)	6.79(7.45)				
CONSTANT	-0.354(0.559)	-0.497(0.600)	1.104(0.719)	0.363(0.935)	4.787(1.719)***	2.482(0.853)***
F-statistics	1.95*	2.00*	3.86***	4.34***	1.94*	4.32***
R ²	0.1687	0.2482	0.2471	0.3719	0.1642	0.4126
Adj R ²	0.0587	0.0871	0.146	0.234	0.0794	0.317

Note: *, **, *** implies statistically significant at 10%, 5% and 1% respectively. Figures in parentheses are standard errors.

Source: Survey data, 2018.

Perceptions scores between the sub-samples were influenced by different sets of variables such as sex of household head, distance to input shop, age and annual household income among others as shown in Table 2.

Conclusions and Outlook

The major key policy implication from the study is that, it is important that stakeholders invest more in dissemination workshops of the technology to increase its awareness especially among farmers currently not aware of the technology. This will ensure to enhance positive perceptions about Hexanal that will increase its adoption.

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