

The Effect of Post Harvest Handling Technology on Maize Income in Rwanda: A Case Study of PASP in Kayonza District

Sylvestre Ntabareshya¹, Dr. Patrick Mulyungi²

¹Student at Jomo Kenyatta University of Agriculture and Technology, Kigali, Rwanda

²Lecturers at Jomo Kenyatta University of Agriculture and Technology, Kigali, Rwanda

Abstract: *The purpose of this research was to assess the contribution of post-harvest handling technology on maize income in the Climate Resilient Post-harvest and Agribusiness Support Project (PASP) of Ministry of Agriculture and Animal Resources (MINAGRI) in Kayonza district with the following objectives; to identify the contribution of storage technology on maize income in Kayonza district, to assess the effect of drying technology on maize income in Kayonza district and to examine the influence of packaging technology on maize income in Kayonza district. The researcher reviewed both theoretical and empirical literature related to post harvest handling technology and maize income, a critical review of existing literature was done to identify the gap to be filled by the research. The research design used was descriptive and analytical while the population was 80 including 20 employees of PASP project and 60 communities from Kayonza district and the sample size was 44 respondents. Data collection tools were questionnaires and interviews while the collected data was presented using tables and analyzed based on percentages and frequencies. The researcher found out that packaging technology in maize is able to be kept and lead to improvements in quality. When maize is well packed packages lead to improvements in value leading to increased income. Packaging increased the appearance which is attributed to quality and this makes customers buy more of packaged maize since it is considered to be safe and leading to increased income. The researcher concluded that thorough drying and packaging, maize value is improved as well as than physical appearances which are all attributes of improved values and justification for selling at higher or reasonable prices. The researcher recommended that farmers in Kayonza district should continue using improved post-harvest handling technology so as to improve quality and increase maize income.*

Keywords: Harvest, Post-harvest handling, Income

1. Research Methodology

1.1 Research design

In carrying out this research, the researcher will use both descriptive and analytical design where by issues related to the contribution of post-harvest handling technology were analyzed and interpreted. Both quantitative and qualitative data was used. The research design refers to the overall strategy that you choose to integrate the different components of the study in a coherent and logical way, thereby, ensuring effectively addressing the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data.

The population of the study targeted was 80 respondents who involve 20 employees of PASP project and 60 communities from Kayonza district. The sample size was determined by use of Slovic's formula. As stipulated herein,

The sample size used the formula $n = \frac{N}{1+N(e)^2}$ where n is the sample size, N is the total population and e is the sampling error (0.1)

$$n = \frac{80}{1+80(0.1)^2} = \frac{80}{1+80(0.01)} = \frac{80}{1+0.8} = \frac{80}{1.8} = 44$$

The sample size of the study was 44 including 11 employees of the project and 33 communities from Kayonza district. The research used simple random sampling technique on local communities and for employees the researcher used purposive sampling techniques. The Data collection instruments used include, questionnaires, interviews and documentary review.

2. Result Presentation and Discussion

Table 4: The period respondents have worked in PASP project

Period (Years)	Frequency	Percent
Less than 2	4	30
2 – 4	3	27
5 – 7	1	16
Above 7	3	27
Total	11	100.0

Source: Primary Data, 2018

According to Table 4, respondents contacted 23% revealed that they had worked in PASP project for the period less than 2 years while 25% said for the period between 2 – 4 years and 45% had worked in PASP for the period between 5 – 7 years. 7% had worked in PASP for the period above 7 years. This led the researcher to the understanding that they had worked with PASP for the period long enough to make them have enough information regarding the contribution of post harvest handling technology and maize income.

Table 1: The period respondents have lived in Kayonza district

Period (Years)	Frequency	Percent
Less than 2	11	32
2-4	8	25
5-7	5	16
Above 7	9	27
Total	33	100.0

Source: Primary Data, 2018

According to Table 4, respondents contacted 23% revealed that they had worked in PASP project for the period less than 2 years while 25% said for the period between 2 – 4 years and 45% had worked in PASP for the period between 5 – 7 years. 7% had worked in PASP for the period above 7 years. This led the researcher to the understanding that they had worked with PASP for the period long enough to make them have enough information regarding the contribution of post harvest handling technology and maize income.

2.1 The contribution of storage technology on maize income in Kayonza district

The researcher made a presentation, analysis and interpretation of the views given by respondents concerning the contribution of storage technology on maize income in Kayonza district so that relevant study conclusions can be made.

Table 2: The extent to which respondents agree that post-harvest handling technology affects maize income

Extent	Frequency	Percentage
Strongly agree	18	40
Agree	13	30
Neither agree nor disagree	9	20
Disagree	2	5
Strongly disagree	2	5
Total	44	100

Source: Primary data, 2018

According to table 5, respondents contacted strongly agreed that post harvest handling technology affect maize income (40%) while 30% of respondents said they agree and 20% of respondents said they neither agree nor disagree. 5% of respondents said they disagree and 5% of respondents said they strongly disagree. On reasons for the answers give, respondents post harvest handling technology preserves maize quality and increases its demand hence leading to increased income. This led the researcher to the realization that post harvest handling technology increases maize income through the preserved quality and nature of maize results from better keeping and preservation.

Table 3: The extent to which respondents agree that storage technology affects maize income

Extent	Frequency	Percentage
Strongly agree	20	45
Agree	11	25
Neither agree nor disagree	11	25
Disagree	2	5
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 6, respondents contacted strongly agreed that storage technology affect maize income (45%) while 25% of respondents said they agree and 25% of respondents said they neither agree nor disagree. 5% of respondents said they disagree. When asked to give reasons for their answers, respondents said storage facilities protect maize from damage by pests and provides it with opportunity to last for long and meet periods of scarcity hence leading to increased income. This led the researcher to the realization that storage technology in maize leads to increased maize income through matching the needs of customers in the market.

Table 4: The extent to which respondents agree that Aerial Storage technology affects maize income

Extent	Frequency	Percentage
Strongly agree	22	50
Agree	16	36
Neither agree nor disagree	4	10
Disagree	2	4
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 7, respondents contacted strongly agreed that aerial Storage technology affect maize income (50%) while 36% of respondents said they agree and 10% of respondents said they neither agree nor disagree. 4% of respondents said they disagree. When asked to give reasons for their answers, respondents said aerial Storage technology protect maize from damage by pests and losing its quality through improved aeration through maize which keeps it in its original form. This led the researcher to the realization that aerial storage technology in maize leads to increased maize income through enabling it to retain its original form.

Table 5: The extent to which respondents agree that storage on the ground, or on drying floors affects maize income

Extent	Frequency	Percentage
Strongly agree	23	52
Agree	15	34
Neither agree nor disagree	4	10
Disagree	2	4
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 8, respondents contacted strongly agreed that storage on the ground, or on drying floors affect maize income (52%) while 34% of respondents said they agree and 10% of respondents said they neither agree nor disagree. 4% of respondents said they disagree. When asked to give reasons for their answers, respondents said storage on the ground, or on drying floors help farmers to reduce expenses that would be spent on expensive technology hence leading to minimization of losses and maximization of revenues. This led the researcher to the realization that storage on the ground, or on drying floors in maize leads to increased maize income through reduction in costs.

Table 6: The extent to which respondents that opens Timber Platforms affects maize income

Extent	Frequency	Percentage
Strongly agree	26	60
Agree	15	34
Neither agree nor disagree	2	4
Disagree	1	2
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 9, respondents contacted strongly agreed that open timber platforms affect maize income (60%) while 34% of respondents said they agree and 4% of respondents said they neither agree nor disagree. 2% of respondents said they disagree. When asked to give reasons for their answers, respondents said open timber platforms help farmers to reduce expenses because the methods is cheap compared to other methods hence leading to reduction in costs and increase in revenues. This led the researcher to the realization that open timber platforms in maize leads to increased maize income through increased revenues.

Table 7: The extent to which respondents agree that solid wall bins affects maize income

Extent	Frequency	Percentage
Strongly agree	28	64
Agree	13	30
Neither agree nor disagree	2	5
Disagree	1	1
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 10, respondents contacted strongly agreed that solid wall bins affect maize income (64%) while 30% of respondents said they agree and 5% of respondents said they neither agree nor disagree. 1% of respondents said they disagree. When asked to give reasons for their answers, respondents said solid wall bins help farmers to reduce are considered to be more convenient in maize drying due to the fact that they facilitate drying without reduction in size and weight This led the researcher to the realization that solid wall binsin maize leads to increased maize income.

Table 8: The extent to which respondents agree that storage techniques improve maize quality

Extent	Frequency	Percentage
Strongly agree	26	60
Agree	13	30
Neither agree nor disagree	4	9
Disagree	1	1
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 11, most of the contacted respondents strongly agreed that storage technology improves maize quality (60%) while 30% of respondents said they agree and 9% of respondents said they neither agree nor disagree. 1% of respondents said they disagree. When asked to give reasons for their answers, respondents said storage technology preserves maize or keeps it safely and avoids any possible damage that would affect maize quality This led the researcher to the realization that storage technology is vital in improves maize quality which in the end an attribute for quality improvement.

Table 9: The extent to which respondents agree that storage techniques match market demand

Extent	Frequency	Percentage
Strongly agree	28	63
Agree	13	30
Neither agree nor disagree	2	5
Disagree	1	2
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 12, most of the contacted respondents strongly agreed that storage techniques match market demand (63%) while 30% of respondents said they agree and 5% of respondents said they neither agree nor disagree. 2% of respondents said they disagree. When asked to give reasons for their answers, respondents said storage techniques match market demand because the maize that is safely kept will match the market demand. This led the researcher to the understanding that by matching the market needs storage services lead to increased sales and income.

Table 10: The extent to which respondents agree that storage techniques protect maize quality

Extent	Frequency	Percentage
Strongly agree	30	70
Agree	11	25
Neither agree nor disagree	2	3
Disagree	1	1
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 13, most of the contacted respondents strongly agreed that Storage techniques protect maize quality (63%) while 30% of respondents said they agree

and 5% of respondents said they neither agree nor disagree. 2% of respondents said they disagree. When asked to give reasons for their answers, respondents said Storage techniques protect maize quality because the maize that is safely kept will match retain its quality. This led the researcher to the understanding that by storage techniques protect maize quality lead to increased sales and income.

Table 11: The extent to which respondents agree that Storage improve maize appearance

Extent	Frequency	Percentage
Strongly agree	29	66
Agree	11	24
Neither agree nor disagree	2	10
Disagree	2	5
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 14, most of the contacted respondents strongly agreed that storage improve maize appearance (66%) while 24% of respondents said they agree and 10% of respondents said they neither agree nor disagree. 5% of respondents said they disagree. When asked to give reasons for their answers, respondents said storage improves maize appearance because the maize that is safely kept will look nice in front of customers hence a lot of it will buy. This led the researcher to the understanding that by storage improve maize appearance lead to increased sales and income.

Table 12: The extent to which respondents agree that expectations from storage technology have been met

Extent	Frequency	Percentage
Strongly agree	30	70
Agree	10	24
Neither agree nor disagree	2	3
Disagree	2	2
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 14, most of the contacted respondents strongly agreed that expectations from storage technology has been met (70%) while 24% of respondents said they agree and 10% of respondents said they neither agree nor disagree. 5% of respondents said they disagree. When asked to give reasons for their answers, respondents said through improved storage they have been able to store and sell their maize at the right period. And this has helped them to improve and increase income.

2.2 The effect of drying technology on maize income in Kayonza district

The researcher made a presentation, analysis and interpretation of the views that respondents gave concerning effect of drying technology on maize income in Kayonza district so that relevant study conclusions can be made.

Table 13: The extent to which respondents rated the effect of drying technology on maize income

Extent	Frequency	Percentage
Very good	33	76
Good	7	16
Neither good nor poor	4	8
Poor	0	0
Very poor	0	0
Total	44	100

Source: Primary data, 2018

According to table 16, most of the contacted respondents rated the effect of drying technology on maize income as very good (76%) while 16% of respondents said they good and 8% of respondents said they neither good nor poor. When asked to give reasons for their answers, respondents said drying technology facilitates maize to stay for long so that farmers can sell it when prices are favourable. This led the researcher to the realization that drying technology leads to improvements on maize income.

Table 14: The extent to which respondents agree that sun drying contributes to increase in maize income

Extent	Frequency	Percentage
Strongly agree	30	72
Agree	10	26
Neither agree nor disagree	2	1
Disagree	2	1
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 17, most of the contacted respondents strongly agreed sun drying affects maize income (72%) while 26% of respondents said they agree and 1% of respondents said they neither agree nor disagree. 1% of respondents said they disagree. When asked to give reasons for their answers, respondents said through thorough drying maize is able to be kept and sold at the right time when prices are favorable hence leading to increased income. This led the researcher to the understanding that maize drying is relevant in improving quality and leading to increased income.

Table 15: The extent to which respondents agree that crib drying contributes to increase in maize income

Extent	Frequency	Percentage
Strongly agree	26	60
Agree	14	30
Neither agree nor disagree	2	5
Disagree	2	5
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 18, most of the contacted respondents strongly agreed crib drying affects maize income (60%) while 30% of respondents said they agree and 5% of respondents said they neither agree nor disagree. 5% of respondents said they disagree. When asked to give reasons for their answers, respondents said through crib drying in maize is able to be kept and lead to

improvements in quality. This led the researcher to the understanding that maize drying is by crib drying is relevant in improving quality and leading to increased income.

Table 16: The extent to which respondents agree that solar dryers contributes to increase in maize income

Extent	Frequency	Percentage
Strongly agree	26	60
Agree	14	30
Neither agree nor disagree	2	5
Disagree	2	5
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 18, most of the contacted respondents strongly agreed that solar drying affects maize income (60%) while 30% of respondents said they agree and 5% of respondents said they neither agree nor disagree. 5% of respondents said they disagree. When asked to give reasons for their answers, a respondent said through solar drying in maize is able to be kept and lead to improvements in quality. This led the researcher to the understanding that maize drying is by solar drying is relevant in improving quality and leading to increased income and leading to improvements revenues.

2.3 The influence of packaging technology on maize income in Kayonza district

The researcher made a presentation, analysis and interpretation of the views given by respondents concerning influence of packaging technology on maize income in Kayonza district in order to make relevant study conclusions.

Table 17: The extent to which respondents agree that packaging technology affects maize income affect maize income

Extent	Frequency	Percentage
Strongly agree	26	61
Agree	17	38
Neither agree nor disagree	1	1
Disagree	0	0
Strongly disagree	0	0
Total	44	100

Source: Primary data, 2018

According to table 21, most of the contacted respondents strongly agreed that packaging technology affects maize income (61%) while 38% of respondents said they agree and 1% of respondents said they neither agree nor disagree. When asked to give reasons for their answers, a respondent said through packaging technology in maize is able to be kept and lead to improvements in quality. This led the researcher to the understanding that when maize is well packed packages lead to improvements in value leading to increased income.

References

- [1] Alene, A. (2009) The economic and poverty impacts of maize research in West and Central Africa. *Agricultural Economics* 40: 535-550.
- [2] Baudron, E. (2015). Re-examining appropriate mechanization in Eastern and Southern Africa: two-wheel tractors, conservation agriculture, and private sector involvement, *Food Security*, May 2015
- [3] Bouis, H. and Pfeiffer, W. (2011) Biofortification: a new tool to reduce micronutrient malnutrition. *Food Nutrition. Bulletin* 32: S31-40.
- [4] FAO (2011). The state of food and agriculture. Women in Agriculture. Closing the Gender gap for Development. FAO 7. FAOSTAT (2010).
- [5] Fisher, M.(2015) Drought tolerant maize for farmer adaptation to drought in sub Saharan Africa: Determinants of adoption in eastern and southern Africa. *Climatic Change* (DOI 10.1007/s10584-015-1459-2).
- [6] Grings, E, and Blümmel, M.(2013) Special Issue: Dual-purpose maize. *Field Crops Research* 153: 1-112. 13.
- [7] Thornton, P. & Giller, K. (2014). Analysis of trade-offs in agricultural systems: current status and way forward. *Current Opinion in Environmental Sustainability*, 6(0), 110-115.
- [8] Kostandini, G.and Zhe, G. (2015) Ex-ante welfare analysis of technological change: the case of nitrogen efficient maize for African soils.
- [9] Mahuku, G. (2015) Maize Lethal Necrosis (MLN), an emerging threat to maize-based food security in sub-Saharan Africa. *Phytopathology* 105: 956-965.
- [10] Masih, I.and Trambauer P (2014) A review of droughts on the African continent: a geospatial and long-term perspective *Hydrol. EarthSyst. Sci.* 18: 3635-3649.