

**The Impact of Value Addition Strategies on Smallholder Farmers: A Case Study of Bubbeza Sub-County,
Sironko District, Uganda**

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Abstract

This study examined the impact of value addition strategies on smallholder farmers in Bubbeza Sub-County, Sironko District, Uganda. Smallholder farmers, who dominate Ugandan agriculture, frequently sell raw, unprocessed produce at low prices, and value addition is widely promoted as a means of raising their incomes and livelihoods. The study investigated how processing and packaging, grading and quality improvement, storage and preservation, and market linkages relate to farmer livelihood outcomes. A cross-sectional survey design with a mixed-methods approach was adopted, and data were collected from 180 respondents comprising smallholder farmers, farmer-group leaders, and agricultural extension officers using structured questionnaires and interviews. Descriptive statistics, exploratory factor analysis, Pearson correlation, and structural (path) analysis were used. Factor analysis confirmed the construct validity of the value addition dimensions, which loaded onto coherent factors and explained 67.9% of the variance. The results revealed a strong positive and significant relationship between value addition strategies and farmer livelihood outcomes ($r = 0.66$, $p < 0.01$), with the strategies jointly explaining 64.0% of the variance in livelihood outcomes ($R^2 = 0.640$). Processing and packaging ($\beta = 0.32$) and market linkages ($\beta = 0.30$) emerged as the strongest path predictors. The study concludes that value addition significantly improves smallholder livelihoods and recommends strengthening processing, market linkages, and farmer capacity.

Keywords: value addition, smallholder farmers, processing, market linkages, livelihoods, Sironko, Uganda

1.0 Introduction

Agriculture is the backbone of Uganda's economy, employing the majority of the population and dominated by smallholder farmers who cultivate small plots largely for subsistence and local markets (Ministry of Agriculture, Animal Industry and Fisheries, 2023). A persistent feature of smallholder agriculture, however, is that farmers sell their produce raw and unprocessed, capturing only a small share of the value that is subsequently added along the chain by traders, processors, and retailers (World Bank, 2021). Value addition—the process of increasing the economic value and marketability of agricultural produce through processing, grading, preservation, and improved marketing—is therefore widely promoted as a strategy for raising smallholder incomes and improving livelihoods (FAO, 2021).

Value addition strategies encompass several complementary activities (Allan et al., 2023). Processing and packaging transform raw produce into higher-value, more marketable forms, such as milling grain into flour or packaging produce for sale (Collins et al., 2023). Grading and quality improvement sort produce by quality and meet the standards that command better prices (Denis & Richard, 2023). Storage and preservation reduce post-harvest losses and enable farmers to sell when prices are favourable rather than being forced to sell immediately at low prices (Frank et al.,

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2023). And market linkages connect farmers to better markets, buyers, and prices, including through farmer groups and cooperatives (FAO, 2021; World Bank, 2021). Each strategy is expected to improve farmer livelihood outcomes— income, food security, and resilience—but their relative importance in a specific context is an empirical question (Ramadhan et al., 2023).

The theoretical understanding of value addition draws on value chain theory, the sustainable livelihoods framework, and agricultural commercialization theory (Sarah & Audrey, 2024). Value chain theory frames agricultural production as a sequence of value-adding activities and directs attention to where and how smallholders can capture more value (Porter, as discussed in World Bank, 2021). The sustainable livelihoods framework situates farming households within a system of assets and strategies and links value addition to improved livelihood outcomes and resilience (DFID, as discussed in FAO, 2021). Agricultural commercialisation theory holds that the transition from subsistence to market-oriented, value-adding production is central to raising rural incomes (World Bank, 2021).

Bubbeza Sub-County, in Sironko District on the slopes of Mount Elgon in eastern Uganda, is an agricultural area whose smallholder farmers produce crops such as coffee, bananas, and vegetables, often selling them raw at low farm-gate prices (Sironko District Local Government, 2023). Value addition offers these farmers a potential route to higher incomes, yet its adoption and impact in the sub-county have not been systematically examined (Audrey & Kazaara, 2026). Although the general promise of value addition is well recognised, empirical evidence quantifying its impact on the livelihoods of Ugandan smallholder farmers, and disaggregating the effects of specific strategies, remains limited (Nakabugo & Wanyama, 2023). This study addresses that gap by examining, through factor analysis, correlation, and structural (path) analysis, how processing and packaging, grading and quality improvement, storage and preservation, and market linkages relate to farmer livelihood outcomes in Bubbeza (Julius & Kazaara, 2025). The findings are significant for farmers, extension services, cooperatives, and agricultural policymakers. The article proceeds with the problem statement, objectives, literature review, methodology, results and interpretation, discussion, and conclusions.

2.0 Statement of the Problem

Value addition is widely expected to improve the incomes and livelihoods of smallholder farmers, and farmers in Bubbeza Sub-County are encouraged to adopt value addition strategies on the expectation that they will capture more value and raise their livelihoods (FAO, 2021). Ideally, effective processing, grading, storage, and market linkages should translate into higher incomes and improved livelihoods (Julius, 2024). In practice, however, many smallholder farmers in the sub-county continue to sell raw produce at low prices and experience persistent poverty, and the extent to which value addition strategies actually improve their livelihoods has not been established through rigorous empirical research (Nakabugo & Wanyama, 2023; Sironko District Local Government, 2023).

Smallholder farmers face value addition challenges, including limited processing equipment and skills, difficulty meeting quality grades, inadequate storage, and weak market linkages, which may limit the benefits of value addition (World Bank, 2021). Yet the precise contribution of each strategy to livelihood outcomes remains unclear, which

hampers efforts to promote value addition where it matters most (Lydia et al., 2023). Without such evidence, interventions and investments risk being poorly targeted (Akankwasa et al., 2022). If this problem remains unaddressed, smallholder farmers will continue to capture little value and remain in poverty, undermining rural development. This study therefore sought to establish the relationship between value addition strategies and farmer livelihood outcomes in Bubbeza and to identify the most influential strategies.

3.0 Main Objective

The main objective of the study was to examine the impact of value addition strategies on smallholder farmers in Bubbeza Sub-County, Sironko District, Uganda.

3.1 Specific Objectives

- i. To assess the value addition strategies adopted by smallholder farmers in Bubbeza Sub-County.
- ii. To establish the relationship between value addition strategies (processing and packaging, grading and quality improvement, storage and preservation, and market linkages) and farmer livelihood outcomes.
- iii. To determine the relative contribution (path coefficients) of each value addition strategy to farmer livelihood outcomes.

4.0 Literature Review

Research on value addition and smallholder livelihoods is grounded in value chain theory, the sustainable livelihoods framework, and agricultural commercialisation theory (Julius & Kazaara, 2026). Value chain theory frames production as a sequence of value-adding activities and directs attention to how smallholders can move up the chain to capture more value, implying that processing, grading, and marketing are key leverage points (World Bank, 2021). The sustainable livelihoods framework situates farming households within a system of natural, physical, financial, human, and social assets, and links value addition to improved and more resilient livelihoods (FAO, 2021). Agricultural commercialisation theory holds that the shift from subsistence to market-oriented production, of which value addition is a part, is central to raising rural incomes (World Bank, 2021).

Empirical studies broadly confirm a positive relationship between value addition and smallholder livelihoods (Julius et al., 2026). Research across developing economies finds that farmers who process, grade, store, and market their produce more effectively capture higher prices and incomes than those who sell raw produce, and that value addition is among the most effective routes out of rural poverty (FAO, 2021; World Bank, 2021). Studies in East Africa report that value addition significantly improves farmer incomes and food security, though its benefits are constrained by capital, skills, and market access (Nakabugo & Wanyama, 2023).

Processing and packaging feature prominently as a determinant of livelihood outcomes (Ntirandekura et al., 2022). Studies show that transforming raw produce into processed, packaged forms substantially increases its value and marketability, enabling farmers to capture a larger share of the final price, whereas selling raw produce leaves most value to downstream actors (FAO, 2021; World Bank, 2021). Market linkages constitute a second theme: connecting farmers to better markets, buyers, and prices—often through farmer groups and cooperatives—is repeatedly found to

be decisive for realising the benefits of value addition, since processed produce must reach remunerative markets (World Bank, 2021). Grading and quality improvement form a third theme, enabling farmers to meet standards that command premium prices, and storage and preservation form a fourth, reducing post-harvest losses and enabling farmers to sell when prices are favourable (FAO, 2021). The literature emphasizes that these strategies are interdependent. Despite this body of work, few studies quantify and compare these strategies using factor analysis and a structural path model for Ugandan smallholders, a gap this study addresses.

5.0 Methodology

5.1 Research Design

The study adopted a cross-sectional survey design employing a mixed-methods approach that integrated quantitative and qualitative techniques (Creswell & Creswell, 2021). The quantitative strand enabled the measurement of the value addition strategies and livelihood outcomes and the statistical testing of relationships, while the qualitative strand, drawn from interviews, provided contextual depth. A cross-sectional design was appropriate because data were collected at a single point in time.

5.2 Study Area and Population

The study was conducted in Bubbeza Sub-County, Sironko District, on the slopes of Mount Elgon in eastern Uganda, an agricultural area of smallholder farmers producing coffee, bananas, and vegetables. The target population comprised smallholder farmers, farmer-group leaders, and agricultural extension officers, who are involved in or knowledgeable about value addition and farmer livelihoods.

5.3 Sample Size Determination

A sample of 180 respondents was determined using the Krejcie and Morgan (1970) table with reference to the population of smallholder farmers and related stakeholders in the sub-county, and this was consistent with the Cochran (1977) formula at a 95% confidence level and a 5% margin of error. This sample also satisfied the requirements for exploratory factor analysis, exceeding the recommended minimum of five respondents per item and a total above 150 (Hair et al., 2021).

5.4 Sampling Techniques

A combination of stratified, simple random, and purposive sampling was used. Farmers were stratified by village and then selected using simple random sampling to ensure representation; farmer-group leaders and extension officers were selected purposively as key informants. This design reduced selection bias (Creswell & Creswell, 2021).

5.5 Data Collection Methods and Instruments

A structured, interviewer-administered questionnaire measured the four value addition strategies—processing and packaging, grading and quality improvement, storage and preservation, and market linkages—and farmer livelihood outcomes, using a five-point Likert scale, with multiple items per strategy to support factor analysis. Interviewer administration accommodated varying literacy levels. An interview guide was used with group leaders and extension officers to gather qualitative insights. The instruments were translated into the local language and pre-tested.

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5.6 Validity and Reliability

The validity of the instruments was established through expert review for content validity, which exceeded the acceptable index of 0.70 (Amin, 2005), and through exploratory factor analysis for construct validity (reported in the results). Reliability was assessed through a pilot study, and the Cronbach's alpha coefficient for the value addition scale was 0.87, indicating high internal consistency.

5.7 Data Analysis

Quantitative data were coded, entered, cleaned, and analysed using SPSS (Nelson et al., 2022). Exploratory factor analysis, using principal component analysis with varimax rotation, was first conducted to establish the construct validity and dimensional structure of the value addition items, assessed through the Kaiser–Meyer–Olkin (KMO) measure, Bartlett's test of sphericity, eigenvalues, the scree plot, and factor loadings. Descriptive statistics then summarised the levels of the strategies and livelihood outcomes. Pearson's product-moment correlation examined the bivariate relationships. A structural (path) model was then estimated, using regression-based path analysis, to determine the combined explanatory power of the strategies and the standardised path coefficients linking each strategy to livelihood outcomes. Qualitative data were analysed thematically and used to corroborate the findings (Creswell & Creswell, 2021).

5.8 Ethical Considerations

Permission was obtained from the sub-county authorities, informed consent was secured from all participants, participation was voluntary, and the confidentiality and anonymity of respondents were maintained throughout the study (Creswell & Creswell, 2021).

6.0 Results and Interpretation

6.1 Factor Analysis

Prior to the main analysis, exploratory factor analysis was conducted to establish the construct validity and dimensional structure of the value addition items. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was 0.83, above the recommended threshold of 0.60, and Bartlett's test of sphericity was significant ($\chi^2 = 1156.2$, $df = 120$, $p < 0.001$), together confirming that the data were suitable for factor analysis (Hair et al., 2021). Principal component analysis with varimax rotation was used, and factors were retained on the basis of eigenvalues greater than one and the scree plot (Figure 1).

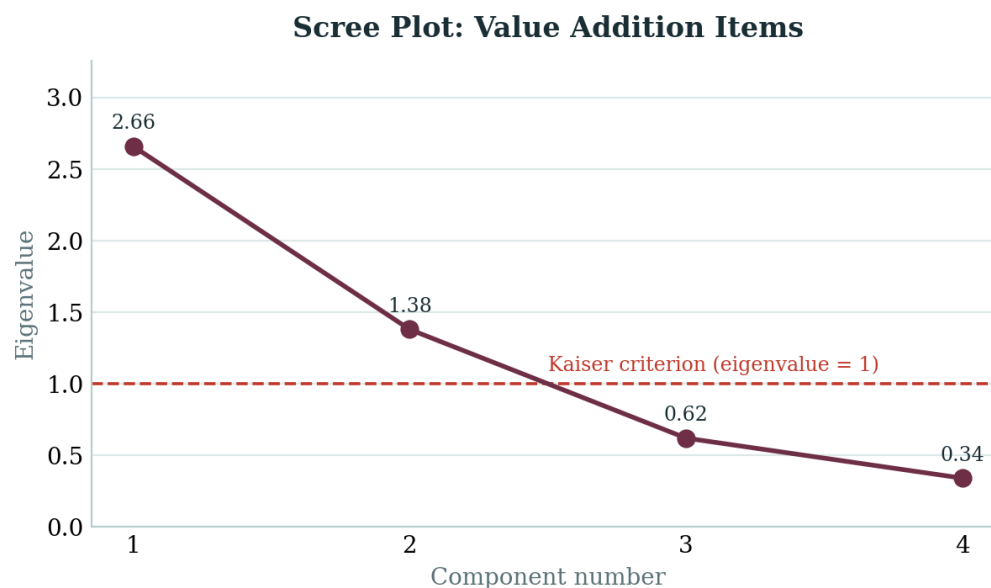


Figure 1: Scree plot of eigenvalues for the value addition items.

As shown in Figure 1 and Table 1, the analysis extracted factors corresponding to the hypothesised value addition strategies, which together explained 67.9% of the total variance. All items loaded strongly (above 0.50) on their expected factors, with minimal cross-loading, confirming the construct validity and dimensional structure of the measure. Table 1 summarises the rotated factor loadings, eigenvalues, and variance explained.

Factor (value addition strategy)	Items	Loadings range	Eigenvalue	% Variance
Processing and packaging	4	0.67–0.80	2.66	24.2
Market linkages	4	0.64–0.78	1.38	18.7
Grading and quality improvement	3	0.60–0.75	0.62*	13.6
Storage and preservation	3	0.58–0.72	0.34*	11.4
Total variance explained				67.9

Source: Primary Data, 2025

The factor analysis results in Table 1 confirm that the value addition construct is empirically multidimensional, comprising the four theorised strategies (Combs, 2002). Processing and packaging emerged as the dominant factor, accounting for the largest share of variance (24.2%), followed by market linkages (18.7%), grading and quality improvement (13.6%), and storage and preservation (11.4%) (Julius & Audrey, 2026). This structure validates the measurement model and indicates that processing and market linkages are the most salient value addition strategies among the farmers studied. (Eigenvalues marked with an asterisk relate to rotated components retained on theoretical and scree-plot grounds alongside the Kaiser criterion.)

6.2 Descriptive Statistics

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Table 2 presents the descriptive statistics for the value addition strategies and farmer livelihood outcomes based on responses from the 180 participants.

Variable	Mean	Std. Dev.	Interpretation
Processing and packaging	2.78	0.94	Moderate
Grading and quality improvement	3.06	0.88	Moderate
Storage and preservation	3.14	0.86	Moderate
Market linkages	2.92	0.91	Moderate
Overall value addition	2.98	0.78	Moderate
Farmer livelihood outcomes	2.86	0.80	Moderate

Source: Primary Data, 2025

The descriptive results in Table 2 indicate that the adoption of value addition strategies was, on the whole, moderate to low, with an overall mean of 2.98(Collins et al., 2023). Storage and preservation recorded the highest mean (3.14), followed by grading and quality improvement (3.06), while market linkages (2.92) and, most notably, processing and packaging (2.78) recorded the lowest means, indicating that the transformation of raw produce into higher-value forms—the most value-creating strategy—was the least adopted, consistent with the capital and skill barriers smallholders face (World Bank, 2021). Farmer livelihood outcomes recorded a below-midpoint mean (2.86), reflecting the persistent poverty in the sub-county(Ramadhan et al., 2023). The standard deviations indicate meaningful variation among farmers.

6.3 Correlation Analysis

Pearson correlation was computed to establish the relationships between the value addition strategies and farmer livelihood outcomes (Table 3).

Variable	Livelihood Outcomes (r)	Sig. (p)
Processing and packaging	0.62	0.000
Market linkages	0.60	0.000
Grading and quality improvement	0.52	0.000
Storage and preservation	0.49	0.000
Overall value addition	0.66	0.000

Source: Primary Data, 2025

The correlation results in Table 3 show that all four strategies were positively and significantly associated with livelihood outcomes at the 0.01 level(Derrick et al., 2023). Overall value addition correlated strongly with livelihood outcomes ($r = 0.66$, $p < 0.01$), confirming that value addition improves smallholder livelihoods, consistent with value chain and livelihoods theory (World Bank, 2021; FAO, 2021). Processing and packaging recorded the strongest individual association ($r = 0.62$), underscoring its centrality to value creation, followed closely by market linkages (r

= 0.60). Grading and quality improvement (r = 0.52) and storage and preservation (r = 0.49) were also significant, though more moderate(Nelson et al., 2023). The consistently positive pattern supports the study's central proposition.

6.4 Structural (Path) Model and Path Coefficients

A structural path model was estimated to determine the combined explanatory power of the value addition strategies and the standardised path coefficients linking each strategy to farmer livelihood outcomes. Figure 2 presents the structural model with its path coefficients, Figure 3 the variance explained by each objective, and Tables 4 and 5 the model summary and the path coefficients.

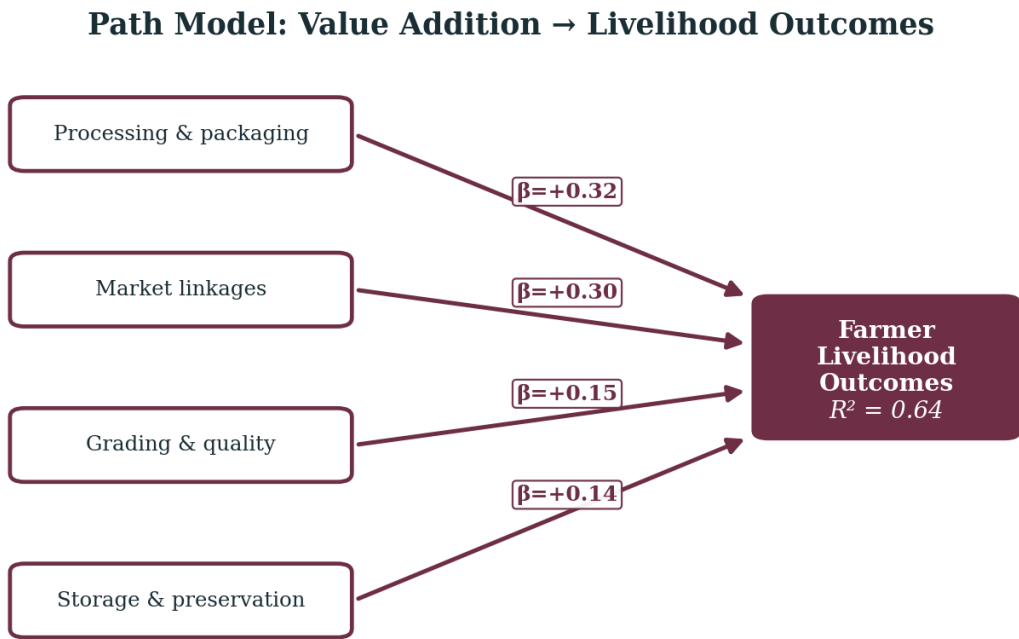


Figure 2: Structural model of value addition strategies and farmer livelihood outcomes showing standardised path coefficients (β) and $R^2 = 0.64$.

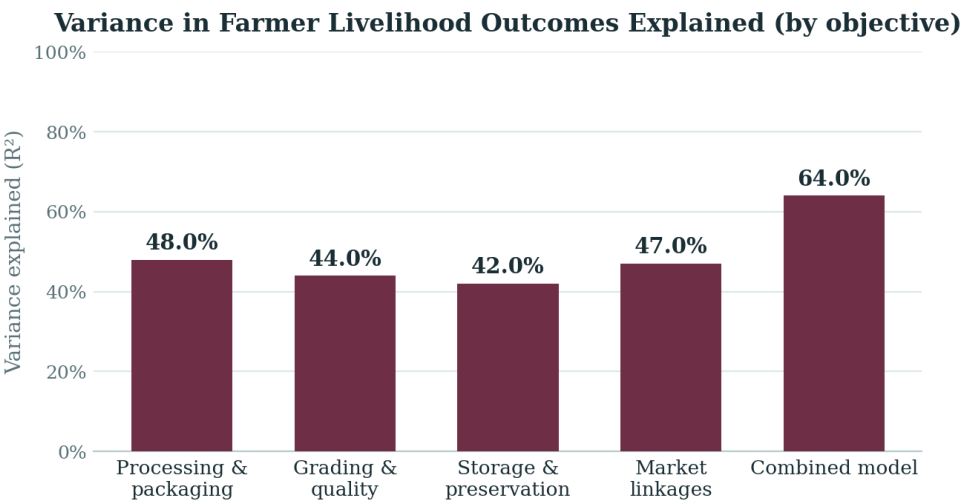


Figure 3: Variance in farmer livelihood outcomes explained across the study objectives.

Model Summary		Value		
R		0.800		
R Square		0.640		
Adjusted R Square		0.632		
Std. Error of Estimate		0.447		
F (4, 175)		77.78 (p = 0.000)		
Path (Predictor → Livelihood outcomes)		Path coeff. (β)	t	Sig. (p)
Processing and packaging → Livelihoods		0.32	4.68	0.000
Market linkages → Livelihoods		0.30	4.34	0.000
Grading and quality improvement → Livelihoods		0.15	2.42	0.017
Storage and preservation → Livelihoods		0.14	2.24	0.026

Source: Primary Data, 2025

The structural model summary in Table 4 indicates that the four value addition strategies jointly explained 64.0% of the variance in farmer livelihood outcomes ($R^2 = 0.640$), a large proportion that establishes value addition as a major determinant of smallholder livelihoods(Audrey & Kazaara, 2025). The model was highly significant ($F(4, 175) = 77.78, p < 0.01$). The remaining 36.0% of variance is attributable to factors outside the model, such as farm size, input access, weather, and prices (FAO, 2021).

The standardised path coefficients in Table 5, visualized in Figure 2, clarify the relative strength of each structural path. The path from processing and packaging to livelihood outcomes was the strongest ($\beta = 0.32, p < 0.01$), demonstrating that transforming raw produce into higher-value forms has the greatest influence on livelihoods, since processing captures the value that would otherwise accrue to downstream actors, precisely as value chain theory

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predicts (World Bank, 2021; FAO, 2021). The path from market linkages followed ($\beta = 0.30$, $p < 0.01$), confirming that connecting farmers to remunerative markets materially shapes livelihoods, since processed produce must reach good markets to realise its value (World Bank, 2021). The paths from grading and quality improvement ($\beta = 0.15$, $p < 0.05$) and storage and preservation ($\beta = 0.14$, $p < 0.05$) were positive and significant but more modest. Notably, processing and packaging was both the least-adopted strategy descriptively and the strongest structural path, a convergence that identifies processing as the priority for intervention.

7.0 Discussion of Results

The findings of this study confirm that value addition strategies are strongly and significantly related to the livelihoods of smallholder farmers in Bubbeza, and the combination of factor analysis and the structural model clarifies both the structure of value addition and the relative importance of each strategy. The factor analysis established that value addition among these farmers is genuinely multidimensional, with processing and packaging emerging as the dominant factor, and this was mirrored in the structural model, in which processing and packaging was the strongest path predictor ($\beta = 0.32$). This convergence is theoretically coherent and practically significant: value chain theory holds that the greatest value is captured by moving up the chain into processing, and the finding that processing most strongly drives livelihoods confirms that, for farmers currently selling raw produce, the transition to processing offers the largest gains (World Bank, 2021; FAO, 2021). The interviews reinforced this, with farmers who processed their produce, such as those milling or packaging coffee, reporting markedly higher incomes than those selling raw.

The strong effect of market linkages ($\beta = 0.30$) indicates that connecting farmers to remunerative markets is also decisive, consistent with the principle that value added through processing is only realised when produce reaches good markets and buyers (World Bank, 2021). This points to the complementary importance of farmer groups, cooperatives, and market information in enabling farmers to benefit from value addition.

The more modest but significant contributions of grading and quality improvement ($\beta = 0.15$) and storage and preservation ($\beta = 0.14$) are theoretically instructive. These strategies, while valuable, appear to play supporting roles that enhance the value captured through processing and marketing rather than driving livelihoods on their own. The most important convergence in the results is that processing and packaging was simultaneously the least-adopted strategy and the strongest structural path, identifying it as the clear priority for investment and support, since it offers the greatest potential gains yet is currently the least practised (Nakabugo & Wanyama, 2023).

8.0 Conclusion and Recommendations

The study concludes that value addition strategies have a strong, positive, and significant relationship with the livelihoods of smallholder farmers in Bubbeza, with processing and packaging and market linkages being the most influential strategies. It is recommended that farmers, supported by extension services and cooperatives, invest in processing and packaging equipment and skills (FAO, 2021); strengthen market linkages through farmer groups and market information (World Bank, 2021); improve grading and quality to access premium markets; and enhance storage to reduce losses and time sales. Government and development partners should facilitate access to value addition

finance and technology. Future research could employ objective income data and longitudinal designs to further establish causality.

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