

Reinvestment Ventures as a Pathway to Sustainable Livelihoods for Small-Scale Maize Farmers in Kondoa District, Tanzania

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Abstract

Small-scale maize farmers often need to make one harvest serve several purposes: food, school costs, farm inputs, and capital for another livelihood activity. This study examined whether reinvesting maize-sale income in other crops, horticulture, livestock, and small businesses was associated with more sustainable livelihoods among farmers in four wards of Kondoa District, Tanzania. A cross-sectional mixed-methods design combined a household survey of 406 farmers with focus-group and key-informant evidence collected in 2022. Descriptive statistics established the prevalence of reinvestment, Cronbach's alpha assessed the internal consistency of two livelihood-outcome indices, chi-square tests examined ward differences, and ordinary least-squares models with HC3 robust standard errors estimated adjusted associations. Half of respondents reported using maize income to support other crops (50.5%), 45.2% horticulture, 51.0% livestock, and 40.5% a small business. The asset-improvement and social-well-being indices showed good internal consistency ($\alpha=.777$ and $.815$). Crop reinvestment was positively associated with asset improvement ($B=.166$, $p<.001$) and social well-being ($B=.123$, $p<.001$). Livestock ($B=.106$, $p=.005$) and small-business reinvestment ($B=.092$, $p=.003$) were also associated with social well-being. Among respondents with complete income data, small-business reinvestment was associated with 40.6% higher income from other livelihood activities ($B=.341$, $p=.039$), controlling for maize income and household characteristics. Focus-group accounts helped explain these patterns: farmers described diversification as a practical response to unreliable maize markets and as a way to meet everyday household needs. Because the evidence is cross-sectional and self-reported, the findings indicate association rather than causation. Strengthening market access, financial capability, and context-specific advisory services may help farmers convert maize earnings into more resilient livelihood portfolios.

Keywords: Reinvestment; livelihood diversification; small-scale maize farmers; sustainable livelihoods; rural resilience; Tanzania

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1. INTRODUCTION

For many small-scale farmers, maize is more than a crop. It is food, cash, and, when a surplus can be sold, the starting capital for the next household decision. Its broad food, feed, and market roles make it central to smallholder economies well beyond the study area (Erenstein et al., 2022). Yet this centrality also creates exposure. A poor season, a weak farm-gate price, or an urgent household expense can quickly reduce the value of relying on one crop. Across rural Africa, diversification is therefore not simply an entrepreneurial choice; it is often a way of spreading risk and keeping the household economy moving between harvests (Ellis, 2000; Barrett et al., 2001; Bellon et al., 2020; Davis et al., 2017).

This issue is especially relevant in rain-fed production systems. Climate variability, production constraints, and uncertain output markets can make maize income irregular, while household expenses continue throughout the year. In Tanzania, drought, pests and diseases, and instability in maize trade arrangements have all been identified as sources of production and income risk (Arce & Caballero, 2015). Farmers may respond by directing some maize-sale proceeds into legumes, vegetables, livestock, petty trade, or other activities. These ventures can provide food, more frequent cash flow, or assets that can be sold in an emergency. However, diversification is not automatically beneficial. A new activity can also absorb scarce labour and capital, expose a household to unfamiliar markets, or generate returns too small to justify the investment.

The Sustainable Livelihoods Framework (SLF) provides a useful way to examine these choices because it treats livelihood security as more than income alone. It connects the household's natural, physical, human, financial, and social resources to the strategies used under conditions of vulnerability (Chambers & Conway, 1992; Ashley & Carney, 1999; DFID, 1999; Scoones, 2015). From this perspective, reinvestment may matter when it helps a household improve assets, manage recurring obligations, maintain social relationships, or build income streams that are not exposed to the same risks as maize.

Earlier research shows that income and crop diversification can reduce vulnerability, although benefits differ by household resources, market access, and local conditions (Barrett et al., 2001; Abate et al., 2015; Bellon et al., 2020; Davis et al., 2017; Habib et al., 2023). What remains less clear is whether the specific use of maize income to finance another venture is associated with observable livelihood outcomes in semi-arid central Tanzania. Much of the existing discussion treats diversification as a list of activities or income sources rather than tracing the source of investment capital or separating different dimensions of well-being.

This study addresses that gap using household and qualitative evidence from Soera, Bereko, Kikilo, and Masange wards in Kondoa District. It asks three questions: (i) Which ventures do farmers finance from maize-sale income? ii) Do reinvestment patterns vary across the study wards? and (iii) Are particular ventures associated with asset improvement, social well-being, and income from other livelihood activities after accounting for household characteristics? The analysis deliberately uses associational language because the cross-sectional design cannot establish that reinvestment caused the observed outcomes.

2. Analytical framework and study expectations

2.1 Reinvestment within a livelihood portfolio

Diversification can occur within agriculture, outside agriculture, or across both spheres, and African household surveys show that farm and non-farm income sources commonly coexist (Davis et al., 2017). A household may add a drought-tolerant crop, vegetables, livestock, or a non-farm enterprise while continuing to grow maize. These activities are not interchangeable. Other crops may use familiar skills and land but remain exposed to rainfall; horticulture can provide higher-value output but may require water and rapid market access; livestock can store value but carries disease and feed risks; and small businesses can generate non-seasonal cash while demanding commercial skills and working capital (Nagler & Naudé, 2017).

Reinvestment is therefore treated here as a formative livelihood strategy rather than a psychological scale. Each venture is examined separately because combining them into one score would imply that the activities are interchangeable manifestations of a single hidden trait. The study focuses on whether respondents explicitly reported that maize-sale income enabled them to support each venture. This distinction avoids conflating general participation in an activity with maize-financed reinvestment.

2.2 Sustainable livelihood outcomes

The SLF suggests that a strategy can improve livelihoods through several channels. Financial capital may rise when another activity produces cash. Physical capital may improve when earnings support housing, electricity, or household assets. Social and human outcomes may also improve when a household can pay bills, obtain health cover, contribute to ceremonies, or assist relatives. These outcomes are related but should not be collapsed without empirical evidence that their component items form reliable scales.

On that basis, the empirical analysis tests three broad expectations. First, maize-funded ventures should be positively associated with an index of asset improvement. Second, they should be positively associated with a social-well-being index. Third, reinvestment, especially in small business, should be positively associated with income from non-maize livelihood activities. Ward differences are also expected because access to land, water, services, finance, and markets conditions the livelihood options available to rural households (Habib et al., 2023; World Bank, 2024).

3. METHODOLOGY

3.1 Study design and setting

The study used a convergent mixed-methods, cross-sectional design, in which quantitative and qualitative evidence was collected during the same fieldwork period in 2022 and integrated during interpretation (Creswell & Plano Clark, 2017). Kondoa District, in Tanzania's Dodoma Region, was selected as a semi-arid, maize-based farming area in which households face both production and market uncertainty. This setting reflects wider constraints documented in Tanzanian agriculture, including low irrigation coverage, limited

extension reach, and uneven commercialization (World Bank, 2024). The study covered Soera, Bereko, Kikilo, and Masange wards.

3.2 Population, sampling, and data collection

The target population comprised small-scale maize-farming households cultivating approximately one to two hectares, together with local actors familiar with agricultural production and extension. A multistage procedure was used, consistent with established survey-sampling practice (Cochran, 1977). The district and four wards were purposively selected for their maize production and agroecological relevance; villages were selected by simple random sampling; and households were selected systematically from village registers. The minimum planned sample was 398 households at 5% precision, and 406 completed questionnaires were obtained, equivalent to 102.0% of the target. This is a completion-to-target ratio rather than a conventional response rate because the archived field records did not retain the total number of households approached. The achieved ward totals were Soera (100), Bereko (100), Kikilo (100), and Masange (106).

A structured household questionnaire recorded demographic characteristics, maize production and income, engagement in other livelihood activities, whether maize income financed specific ventures, and reported livelihood benefits. Qualitative evidence came from focus-group discussions, semi-structured interviews with agricultural and local officials, and field observations. Discussions were audio-recorded with consent, transcribed, and coded thematically.

3.3 Variables and measurement

The principal explanatory variables were four binary indicators: maize-sale income was used for (i) other seasonal or perennial crops, (ii) horticulture, (iii) livestock projects, or (iv) a small business. ‘Yes’ was coded 1 and ‘No’ 0. Responses outside the valid binary range were treated as missing rather than forced into either category.

Three outcomes were analysed. The asset-improvement index was the mean of three items recording change in housing status, access to electricity, and household furniture; improved responses were coded 1, while unchanged or deteriorated responses were coded 0. The social-well-being index was the respondent-level mean of six binary items covering improved reputation, peace of mind, health insurance, ability to pay bills, contribution to ceremonies, and assistance to relatives. Invalid item codes were treated as missing, and the respondent mean was calculated from the remaining valid items; reliability estimates used the 404 complete cases. The third outcome was the natural logarithm of annual income from other livelihood options. One implausible value of TZS 6 was excluded before logarithmic transformation.

Control variables were sex, age category, education, household-size category, farming-experience category, cultivated acres, and ward. The income model additionally controlled for log annual maize income. Age, household size, and experience were retained in their recorded ordinal categories because the archived file did not contain verified continuous measures for all respondents. The data were analysed using a single simplified equation representing all three regression models:

$$Y_i = \beta_0 + \beta_1 C_i + \beta_2 H_i + \beta_3 L_i + \beta_4 B_i + \beta_5 Z_i + \varepsilon_i$$

Where:

- Y_i = livelihood outcome for farmer i , measured by asset improvement, social well-being, or income from other livelihood activities;
- C_i = reinvestment of maize income in other crops;
- H_i = reinvestment in horticulture;
- L_i = reinvestment in livestock;
- B_i = reinvestment in a small business;
- Z_i = the combined control variables, including sex, age, education, household size, farming experience, cultivated land, ward and, for the income model, maize income;
- β_0 = constant;
- β_1 – β_4 = coefficients showing the association between each reinvestment venture and the livelihood outcome;
- β_5 = coefficient for the control variables;
- ε_i = error term.

3.4 Data preparation and statistical analysis

Data were labelled and coded in SPSS before analysis. Frequencies and percentages describe the sample and reinvestment prevalence. Cronbach's alpha assesses the internal consistency of the candidate multi-item outcome measures in the final sample. Separate pilot reliability output was not retained in the archive; the manuscript therefore reports final-sample alpha values and does not claim an item-deletion-and-retest procedure. Pearson chi-square tests evaluate ward differences in each venture. A Pearson correlation matrix was not used because the focal predictors are binary reinvestment indicators and the research questions concern adjusted, outcome-specific associations. Multivariable ordinary least-squares models estimate adjusted associations with asset improvement, social well-being, and log income. Unstandardised coefficients are reported because each binary coefficient directly represents the adjusted mean difference between farmers who did and did not finance the venture from maize income. Coefficient inference uses HC3 heteroskedasticity-robust standard errors, t statistics, p -values, and 95% confidence intervals (MacKinnon & White, 1985). Overall model significance is reported using the conventional OLS ANOVA F test and a heteroskedasticity-robust Wald F test. Diagnostics include variance-inflation factors, the Breusch-Pagan test for heteroskedasticity (Breusch & Pagan, 1979), the Jarque-Bera residual-normality test (Jarque & Bera, 1980), and Ramsey's RESET test for functional form (Ramsey, 1969). Complete-case analysis was used for each model, and statistical significance was evaluated at $p < .05$. Data were prepared from the archived IBM SPSS Statistics file and analysed using Python 3.12 numerical routines.

3.5 Qualitative analysis, integration, and research ethics

Qualitative transcripts were analysed using the six-phase thematic approach described by Braun and Clarke (2006). Initial codes captured market experience, crop choice, household obligations, asset use, and perceived risks. Codes were grouped into themes and compared with the quantitative patterns. Integration was expressed as convergence, complementarity, or divergence, not as a statistical correlation between unlike forms of evidence, consistent with the logic of mixed-methods integration (Onwuegbuzie & Leech, 2005; Creswell & Plano Clark, 2017). Participation was voluntary, informed consent was obtained, and the study followed the university's procedures for confidentiality and ethical research. Quotations are

identified only by discussion code and ward and are lightly edited for readability without changing their substantive meaning.

4. RESULTS

4.1 Characteristics of respondents

The sample was predominantly male (77.6%), and primary education was the modal educational level (78.6%). Nearly two-thirds of respondents were aged 41 years or older. These characteristics are descriptive; they should not be read as evidence that sex, education, or age caused differences in reinvestment.

Table 1. Selected characteristics of survey respondents (N=406)

Characteristic	Category	n	%
Sex	Male	315	77.6
	Female	91	22.4
Age category	18–30 years	36	8.9
	31–40 years	110	27.1
	41–50 years	131	32.3
	51 years or older	129	31.8
Education	No formal education	34	8.4
	Primary education	319	78.6
	Vocational training	11	2.7
	Ordinary secondary	33	8.1
	Advanced secondary	4	1.0
	Certificate	2	0.5
	Diploma	3	0.7

Source: Field survey, 2022. Percentages may differ slightly from 100 because of rounding.

4.2 General diversification and maize-funded reinvestment

General participation in livelihood activities and maize-funded reinvestment answered different questions. Overall, 50.0% of respondents participated in other crops, 30.5% in horticulture, 55.9% in livestock, and 27.1% in a small business. By contrast, 50.5% reported that maize income facilitated other crops, 45.2% horticulture, 51.0% livestock, and 40.5% a small business. The earlier claim that ‘about 70%’ invested in other crops and non-farm ventures was not supported by any single measured category and has therefore been removed.

Table 2. Maize-funded reinvestment by ward

Venture	Soera n (%)	Bereko n (%)	Kikilo n (%)	Masange n (%)	Overall n (%)
Other crops	77 (77.0)	48 (48.0)	43 (43.0)	37 (34.9)	205 (50.5)
Horticulture	50 (50.0)	45 (45.0)	54 (54.0)	34 (32.1)	183 (45.2)
Livestock	72 (72.0)	36 (36.0)	50 (50.0)	49 (46.2)	207 (51.0)
Small business	43 (43.0)	44 (44.0)	37 (37.0)	40 (37.7)	164 (40.5)

Note: Ward labels were reconstructed from documented record blocks and remain provisional. Overall horticulture and small-business percentages use a valid n=405 because each variable contained one invalid or missing response.

4.3 Reliability of livelihood-outcome measures

The asset-improvement index showed acceptable-to-good internal consistency ($\alpha=.777$), and the social-well-being index showed good internal consistency ($\alpha=.815$). These are the only multi-item scales used in the regression analysis. A four-item human-benefit group had low reliability ($\alpha=.524$), while a four-item financial-benefit group was borderline ($\alpha=.682$); neither was combined into a scale.

Table 3. Internal consistency of candidate outcome measures

Measure	Items	Complete n	Cronbach's α	Decision
Asset improvement	3	406	.777	Retained
Social well-being	6	404	.815	Retained
Human benefits	4	404	.524	Not combined
Financial benefits	4	404	.682	Reported as separate items

Note: For binary items, Cronbach's alpha is equivalent to the Kuder–Richardson formulation under the same assumptions.

4.4 Ward variation in reinvestment

Reinvestment patterns were not spatially uniform. Crop, horticulture, and livestock reinvestment differed significantly across the reconstructed wards, whereas small-business reinvestment did not. Soera had especially high proportions for other crops and livestock, while horticultural reinvestment was most common in Kikilo. The absence of a ward difference for small business suggests that barriers to non-farm enterprise may be more broadly shared across the study area.

Table 4. Pearson chi-square tests of ward differences

Maize-funded venture	χ^2	df	p
Other crops	40.905	3	<.001
Horticulture	11.025	3	.012
Livestock	27.657	3	<.001
Small business	1.707	3	.635

Note: Expected cell counts exceeded 40 in every test. Ward inference remains provisional because ward labels were reconstructed.

4.5 Adjusted associations with livelihood outcomes

The asset model explained 11.7% of the observed variation (adjusted $R^2=.084$; $n=392$). After adjustment, only reinvestment in other crops was associated with a higher asset-improvement score ($B=.166$, 95% CI [.071, .262], $p<.001$). Horticulture, livestock, and small-business coefficients were not statistically distinguishable from zero in this model.

Table 5. Maize-funded ventures and asset improvement

Predictor	B	HC3 SE	t	95% CI	p
Other crops	.166	.049	3.42	[.071, .262]	<.001
Horticulture	-.059	.042	-1.40	[-.142, .024]	.161
Livestock	.054	.051	1.07	[-.045, .153]	.286
Small business	.049	.047	1.05	[-.043, .141]	.296

Model $n=392$; $R^2=.117$; adjusted $R^2=.084$. Controls: sex, age category, education, household-size category, farming-experience category, acres cultivated, and ward. Reference categories: male, no formal education.

The social-well-being model explained substantially more variation ($R^2=.420$; adjusted $R^2=.398$; $n=392$). Reinvestment in other crops ($B=.123$, $p<.001$), livestock ($B=.106$, $p=.005$), and small business ($B=.092$, $p=.003$) was positively associated with the outcome. The horticulture coefficient was positive but not significant. Farming experience and cultivated area were also positively associated with social well-being, while adjusted ward differences remained. These ward coefficients should be interpreted cautiously because of the reconstructed label variable.

Table 6. Maize-funded ventures and social well-being

Predictor	B	HC3 SE	t	95% CI	p
Other crops	.123	.036	3.40	[.052, .195]	<.001
Horticulture	.033	.029	1.13	[-.024, .089]	.258
Livestock	.106	.037	2.84	[.033, .179]	.005
Small business	.092	.031	2.95	[.031, .154]	.003

Model $n=392$; $R^2=.420$; adjusted $R^2=.398$. Controls and reference categories are as in Table 5.

The income model used the 224 cases with complete information. Small-business reinvestment was positively associated with income from other livelihood options ($B=.341$, $p=.039$). Because the outcome was logged, this coefficient corresponds to approximately 40.6% higher annual other-livelihood income, holding the included covariates constant. The coefficients for crops, horticulture, and livestock were not significant. Log maize income was strongly positive, indicating that households with more maize income also tended to report more income from their other livelihood activities. This may reflect greater overall productive capacity rather than a causal reinvestment effect.

Table 7. Maize-funded ventures and log income from other livelihood activities

Predictor	B	HC3 SE	t	95% CI	p
Other crops	-.200	.188	-1.07	[-.571, .170]	.288
Horticulture	-.002	.146	-0.02	[-.290, .285]	.987
Livestock	-.190	.178	-1.07	[-.540, .160]	.287
Small business	.341	.164	2.08	[.018, .664]	.039
Log maize income	.463	.081	5.69	[.303, .624]	<.001

Model $n=224$; $R^2=.367$; adjusted $R^2=.321$. Controls: sex, age category, education, household-size category, farming-experience category, acres cultivated, ward, and log maize income.

Table 8. Regression model summary and omnibus tests

Outcome	n	R^2	Adjusted R^2	ANOVA F (df)	Robust Wald F (df)	p
Asset improvement	392	.117	.084	3.57 (14, 377)	3.78 (14, 377)	<.001
Social well-being	392	.420	.398	19.49 (14, 377)	26.98 (14, 377)	<.001
Log other income	224	.367	.321	8.03 (15, 208)	9.03 (15, 208)	<.001

Note: The ANOVA F test is based on the ordinary least-squares decomposition. The robust Wald F test is the preferred omnibus inference because coefficient standard errors use HC3 correction.

Table 9. Regression diagnostic tests

Outcome	Maximum VIF	Breusch-Pagan LM (df), p	Jarque-Bera, p	RESET F (df), p	Assessment
Asset improvement	2.53	33.64 (14), .002	24.30, <.001	2.17 (2, 375), .115	HC3 warranted; no RESET evidence
Social well-being	2.53	8.96 (14), .833	17.20, <.001	4.41 (2, 375), .013	Functional-form caution
Log other income	3.63	27.34 (15), .026	5.14, .077	0.64 (2, 206), .526	HC3 warranted; diagnostics otherwise acceptable

All three models were jointly significant under both the conventional ANOVA and HC3-robust Wald tests. Maximum VIF values ranged from 2.53 to 3.63, below the commonly used threshold of 5, so multicollinearity was not a serious concern. Breusch-Pagan tests indicated heteroskedasticity in the asset and income models, supporting the use of HC3 standard errors. Jarque-Bera tests indicated non-normal residuals for the asset and social-well-being models, although the large analytical samples and robust inference reduce reliance on residual normality. Ramsey's RESET test did not indicate functional-form problems in the asset or income models, but it was significant for social well-being ($p=.013$). The social-model coefficients should therefore be interpreted as average adjusted associations rather than a complete structural representation of well-being. None of the models is a causal treatment-effect model.

4.6 What farmers said about reinvestment

The qualitative evidence converged with the quantitative finding that farmers do not treat maize and diversification as opposites. Instead, maize often remains the base activity from which another crop or enterprise becomes possible. Participants repeatedly linked diversification to unstable maize markets and the need for year-round cash.

“Because it is very hard to find a reliable market for my maize grain, I decided to grow lentils and another crop. At least I can get some extra cash. Relying on maize alone is not good because we have children to take care of, and the money from maize is never enough.” FGD 003, Masange

This account gives practical meaning to the positive crop coefficient in the asset and social-well-being models. The additional crop was not described as abandoning maize; it was a response to the timing and reliability of cash. Participants in Kikilo made a similar connection between sorghum, millet, and lentils, family needs, and better marketing opportunities.

“The main reason many farmers are now growing sorghum, millet, and lentils is that we need money to support our families. Maize is important, but we do not make much money from it when there is no reliable market.” FGD 001, Kikilo

Farmers also described reinvestment in tangible assets. A Soera participant explained that maize earnings had helped some households obtain land, improve houses, and establish small

businesses. This supports the interpretation of reinvestment as a bridge between financial and physical capital, although the survey cannot establish when each investment occurred.

“Maize has enabled some of us to buy plots, establish small-business investments, purchase farms, build houses, and improve doors, windows, latrines, and toilets.” FGD 008, Soera

Finally, farmers stressed that diversification had to fit existing production systems. One Masange participant described intercropping maize with beans, sunflower, and Bambara nuts to improve profitability. The account adds nuance to the statistical results: the relevant livelihood strategy may be a linked portfolio of crops rather than a clean shift from one activity to another.

“When we grow maize alone, we do not make a profit. We intercrop maize with beans, sunflower, and Bambara nuts so that the farm can give us a better return.” FGD 001, Masange

Taken together, the two strands of evidence are complementary. Survey models identify adjusted associations; the discussions explain why households may pursue those combinations and what they believe the ventures accomplish. The qualitative material does not independently prove the size or statistical significance of an effect.

5. DISCUSSION

5.1 Reinvestment is common, but the pathway differs by venture

Roughly two in five to one in two respondents reported that maize income had helped finance each of the four ventures. This confirms that multiple livelihood activities are normal rather than exceptional among African smallholders, a pattern also evident in conceptual and multi-country household evidence (Barrett et al., 2001; Davis et al., 2017). Loison’s (2015) review similarly found widespread livelihood diversification across sub-Saharan Africa, but also emphasized that its forms and returns vary with household assets and local opportunities. The present study adds a more specific insight: maize is not merely one activity within the portfolio; its sale proceeds can provide the capital that allows another activity to begin or expand.

The results also correspond with evidence from Tanzania. Ellis and Mdoe (2003) showed that rural livelihood outcomes depend on households’ ability to combine farm and non-farm activities, while Khan and Morrissey (2020), using three waves of Tanzania’s National Panel Survey, found that greater income diversification was associated with improved household welfare. Their results were nevertheless activity-specific: non-agricultural self-employment was welfare-enhancing, especially in rural areas, whereas agricultural wage employment was not associated with higher consumption. This distinction supports the present paper’s decision to analyse crops, horticulture, livestock, and small business separately instead of assuming that every form of diversification produces the same outcome.

The ward differences for crops, horticulture, and livestock underline the role of local opportunity structures. Access to suitable land, water, veterinary support, buyers, and roads

can make one venture realistic in one place and difficult in another. Habib et al. (2023) likewise identified landholding, farming experience, credit, market access, education, and group membership as recurring determinants of livelihood diversification. Thus, the Kondoa pattern is consistent with the SLF: livelihood choices are shaped by existing assets, institutions, and exposure to risk, rather than being unconstrained household preferences (DFID, 1999; Scoones, 2015).

Small-business reinvestment was less geographically differentiated. One possible explanation is that entry barriers; working capital, skills, customer demand, and market access, operate across all four wards. Comparative evidence from rural sub-Saharan Africa shows that such enterprises are widespread but are often small, informal, and constrained in productivity (Nagler & Naudé, 2017). Haggblade et al. (2010) similarly cautioned that the poverty-reducing potential of the rural non-farm economy depends on access to expanding and sufficiently productive market opportunities, not simply participation in any low-return activity. This explanation remains an inference because the Kondoa dataset does not identify business type, start-up capital, distance to markets, or enterprise survival.

5.2 Different ventures relate to different livelihood outcomes

The regressions do not support a blanket statement that every type of reinvestment improves every dimension of livelihood sustainability. Crop reinvestment was the most consistent predictor, showing positive associations with both asset improvement and social well-being. This agrees with Makate et al. (2016), whose study of Zimbabwean smallholders linked crop diversification with higher productivity, income, food security, and resilience. Both studies suggest that diversified cropping can build on skills, labour, and land already used for maize while widening food and market options. However, the Kondoa analysis measures reported asset and social outcomes rather than crop productivity or food security, so the findings are complementary rather than directly equivalent.

Horticultural reinvestment was common but was not independently associated with any of the three outcomes. This qualifies the generally positive diversification literature. A plausible explanation is that participation alone does not capture the scale, profitability, irrigation requirements, perishability, or marketing losses of horticultural production. Loison (2015) similarly concluded that the consequences of diversification are mixed and that better-resourced households are often more able to exploit higher-return opportunities. The non-significant Kondoa result should therefore not be interpreted as evidence that horticulture has no livelihood value; it indicates that the available measure did not show an adjusted average association with the selected outcomes.

Livestock and small-business reinvestment were associated with social well-being but not with the asset index. The social measure includes the ability to meet bills, maintain peace of mind, participate in ceremonies, and assist relatives. Livestock may provide a reserve that can be mobilized when cash is needed, while a small business may produce more frequent income than a seasonal crop. These results broadly correspond with Mahama and Nkegbe (2021), who found that livelihood diversification in Ghana generated both short-run consumption gains and longer-run wealth creation, although they measured diversification at

household level rather than separating the source of investment capital. The difference in measurement may explain why the Kondoa results vary across the asset, social, and income outcomes.

The small-business result in the income model is especially noteworthy. Conditional on maize income and other characteristics, business reinvestment was associated with about 41% higher income from other livelihood activities. This direction is consistent with Khan and Morrissey's (2020) finding that non-agricultural self-employment was a welfare-enhancing strategy in rural Tanzania and with Haggblade et al.'s (2010) argument that productive rural enterprises can provide a pathway beyond seasonal farm income. Nevertheless, the Kondoa estimate does not mean that starting a business will raise every farmer's income by that amount. Selection is likely: households with stronger networks, more capital, better locations, or greater risk tolerance may be more able both to start a business and to earn more.

The non-significant income coefficients for crops, horticulture, and livestock also deserve attention. They contrast with studies that report broad income gains from diversification, but the apparent difference may arise because those studies often use an overall diversification index or estimate crop productivity and consumption effects. In this paper, each coefficient represents the adjusted association of one maize-funded venture with income from other livelihood activities, while simultaneously controlling for the remaining ventures and maize income. Returns from agricultural reinvestment may also appear as food, livestock holdings, or assets rather than immediately reported cash income. This helps explain why crop and livestock reinvestment were related to non-income dimensions even when their income coefficients were not significant.

5.3 Implications for the Sustainable Livelihoods Framework

The results illustrate how one form of capital can be converted into another. Maize revenue provides financial capital; financing other crops, livestock, or trade can then influence physical assets and social well-being. This interpretation is consistent with Mahama and Nkegbe (2021), who found that differences in human, social, financial, natural, and physical assets help explain welfare variation among diversified households in Ghana, and with Habib et al.'s (2023) conclusion that access to livelihood capitals conditions the success of diversification. The Kondoa results extend this reasoning by identifying the original financial resource, maize-sale income, and tracing its associations with distinct outcome dimensions.

The conversion is neither automatic nor uniform. It depends on the household's existing assets, experience, land, and local market conditions. The strong ward terms in the social model, even after household adjustment, reinforce Ellis and Mdoe's (2003) argument that rural poverty and livelihood outcomes in Tanzania cannot be understood from household activities alone; the policy and institutional environment also matters. The present ward findings remain provisional, but they point to the need for place-specific rather than uniform diversification programmes.

The evidence also cautions against defining sustainable livelihoods only through higher income. Farmers' accounts emphasized reliability, the capacity to pay for everyday needs, and

reduced anxiety about depending on one crop. These dimensions sit comfortably within the SLF's broader conception of well-being and resilience and help explain why some ventures were associated with social well-being even when their cash-income coefficients were not significant. At the same time, this study did not directly observe recovery after a shock or environmental sustainability. 'Resilience' should therefore be understood as a reported capacity and diversified asset position, not as a demonstrated response to a measured future shock.

5.4 STUDY LIMITATIONS

Seven limitations bound the conclusions. First, the study is cross-sectional, so temporal ordering and causality cannot be established. Second, the reinvestment and outcome variables are self-reported and may be affected by recall or social-desirability bias. Third, missing income data reduced the adjusted income sample to 224 cases; those respondents may differ systematically from farmers without complete income information. Fourth, the archived dataset did not retain an explicit ward field. Reconstructing ward from documented record blocks reproduced the original ward totals, but all ward comparisons require confirmation against field identifiers before publication. Fifth, the archive did not preserve the total number of households approached or separate pilot reliability output; therefore, the paper reports a completion-to-target ratio and final-sample reliability rather than a conventional response rate and pilot alpha. Sixth, residual normality was rejected for the asset and social models, and RESET identified possible functional-form misspecification in the social-well-being model. HC3 inference reduces sensitivity to heteroskedasticity, but it does not remove functional-form or measurement limitations. Seventh, the dataset did not provide sufficiently complete measures of storage, value addition, detailed marketing channels, food security, or exposure and recovery from a defined shock. Those themes are therefore not presented as tested determinants in this paper.

6. PRACTICAL AND POLICY IMPLICATIONS

Support should be organized around viable livelihood portfolios rather than promoting diversification in the abstract. Four priorities follow from the evidence.

Improve market reliability through better price information, aggregation, storage, transport, and buyer linkages to increase the value of maize and alternative products while reducing distress sales. These measures respond to documented production and market risks in Tanzania and to the need for more competitive, climate-resilient value chains.

Build venture-specific capabilities by tailoring crop and livestock advice to local agro-ecological conditions and strengthening business skills in record-keeping, cash-flow planning, customer assessment, and separating household from enterprise funds. The importance of matching skills, finance, and market access to the type of rural enterprise is also emphasized in cross-country evidence.

Use ward-level assessments to identify local constraints and tailor interventions rather than applying a uniform district-wide package. Assess water access, veterinary services, market proximity, and enterprise demand before recommending a venture. This place-specific approach follows evidence that livelihood options are conditioned by local access to assets

and services and aligns with calls for locally adapted technologies and proximity-based advisory support in Tanzania.

Financial services can complement these measures, but credit should not be treated as a stand-alone solution. Savings products, appropriately timed loans, and financial-literacy support are most useful when matched to the cash cycle and risk profile of the chosen activity. Women's participation also merits deliberate attention because women represented only 22.4% of respondents. Evidence from Tanzania and other rural African settings shows that women commonly face distinct constraints in access to land, finance, technology, markets, and non-farm enterprise opportunities.

7. CONCLUSION

Maize remains the foundation of many household economies in the study area, but farmers often ask it to do more than provide food or a single seasonal payment. About half of the surveyed farmers reported using maize income to support other crops or livestock, while substantial shares financed horticulture or a small business. These choices were associated with different livelihood outcomes: crop reinvestment was linked to asset improvement and social well-being; livestock and business reinvestment were linked to social well-being; and business reinvestment was positively associated with income from other livelihood activities among respondents with complete income data.

The central lesson is not that any diversification is automatically sustainable. Reinvestment appears most useful when it fits local resources, skills, and markets and when households can protect both the maize enterprise and the new activity. Policies that improve market reliability, practical financial capability, and locally appropriate advisory services can help farmers make that conversion more successfully. The evidence supports reinvestment as a plausible pathway toward more resilient livelihoods, while leaving causal confirmation to longitudinal research.

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