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DEVELOPMENT STUDIES

EFFECTS OF DONOR SUPPORT ON SUSTAINABLE LIVELIHOODS IN TANA RIVER COUNTY

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ABSTRACT

Purpose of the Study: The purpose of the study was to examine the effect of donor-supported interventions on sustainable livelihoods among small-scale farmers and pastoralists in Tana River Sub-County, Kenya.

Statement of the Problem: Livelihoods in Tana River County remain highly vulnerable to climate variability, which continues to weaken agricultural productivity despite increased donor and county government investment. Although donor support is expected to reduce poverty and promote rural development, this has not been fully achieved in many ASAL communities, including Tana River. Existing studies have mainly examined crop production or livestock separately, leaving limited evidence on the combined effect of donor-supported crop, livestock, and water access interventions on sustainable livelihoods.

Methodology: The study adopted a non-experimental, cross-sectional design. Primary data were collected from 320 beneficiary households selected through stratified random sampling across 12 locations. Multivariate Ordinary Least Squares regression was used to assess the relationship between donor support and livelihood outcomes.

Findings: The findings showed that irrigation, technical extension, farm inputs, and water pumps significantly improved crop earnings. In livestock farming, technical assistance, insurance, vaccination, and fodder support positively influenced livestock earnings. Water-related interventions, including boreholes, water pumps, drip irrigation, water pans, and increased months of water access, improved earnings through time saved. However, value addition, infrastructure support, and unconditional cash transfers showed weak or negative livelihood effects.

Conclusion: The study concluded that donor interventions improve livelihoods when they directly enhance productivity, reduce risks, and support reliable water access.

Recommendation: The study recommends prioritizing irrigation, extension, farm inputs, livestock insurance, vaccination, fodder support, and productive-use water infrastructure, while linking value addition and infrastructure support to financing, training, and markets.

Keywords: *Donor support, sustainable livelihoods, crop and livestock productivity, water access, household income*

INTRODUCTION

Agriculture remains the backbone of livelihoods in Tana River County, supporting approximately 83 per cent of the population (Tana River County CIDP, 2023). This mirrors the broader significance of the sector across Sub-Saharan Africa, where agriculture contributes approximately 17 per cent of GDP (World Bank, 2023) and has been empirically shown to be up to 3.2 times more effective at reducing extreme poverty other sectors, given that it provided employment to 48% of the population in Africa in 2022 (Christiaensen et al., 2011; FAO, 2024).Despite this centrality, livelihoods in Tana River County remain deeply vulnerable to climate variability, which continues to suppress labour productivity well below the national average for the majority of households (KIPPRA, 2024).

This vulnerability is reflected in the county's production outcomes where crop production of key staples (maize, green grams, and cowpeas) has been recorded at 50 per cent, 71 per cent, and 61 per cent below their respective long-term averages, largely attributed to excessive rainfall events (NDMA, 2024). Livestock production indicators, meanwhile, have been assessed as ranging from moderate to borderline during the February drought period, as documented in the early warning bulletin (NDMA, 2026). These trends point to a production system under persistent stress, shaped by the dual pressures of erratic precipitation and recurrent drought.

Kenya has been a significant recipient of international donor support directed at strengthening food security, rural resilience and household welfare. Within this national context, Tana River County, one of Kenya's Arid and Semi-Arid Land (ASAL) counties, presents a compelling paradox: smallholder farmers and pastoralists continue to face low productivity, constrained water access, and recurrent drought, despite sustained donor and government investment over successive periods.

Empirical evidence broadly affirms that donor support to small-scale crop farmers is positively associated with livelihood improvement, particularly when it enhances productivity, reduces exposure to climate shocks, strengthens technical capacity, and supports more resilient production systems (Gwademba et al., 2023; KIPPRA, 2024; NDMA, 2024). However, the literature equally demonstrates that the long-term sustainability of such gains remains uneven. It is this tension between documented short-term gains and elusive long-term transformation that motivates the present study.

Sustainable Livelihood Improvement

The concept of sustainability in development originates from the World Commission on Environment and Development (WCED, 1987), defined as development that meets present needs without compromising the capacity to provide for the future. Chambers and Conway (1992) pioneered the definition of sustainable livelihoods as the means of gaining resilient living through tangible and intangible assets that allow households to withstand and recover from stress while maintaining their productive capabilities. The European Union (2004) frames sustainability as the probability that project benefits persist after external assistance withdraws. Building on these definitions, and noting the context under which the study was carried out, this study defines sustainable livelihood improvement as the process of building people's productive capacity through crop and livestock farming and access to water.

Sustainability is commonly viewed through two complementary lenses: strengthening community capacity, and safeguarding the environmental base on which that capacity depends (Morse & McNamara, 2013; Mulwa, 2017). Because the activities communities can sustain vary with local ecological and economic conditions, sustainable livelihood is not a fixed end-state but an evolving process that adapts to shifting social and economic needs.

In Tana River County specifically, recurrent climate shocks, drought, flooding and desertification, continually erode the productive assets (soil, livestock, water) that residents depend on, making donor contribution to crop and livestock productivity and water access a pressing and policy-relevant question. Within Kenya's ASAL counties specifically, recent evidence confirms that well-designed donor-funded agricultural extension interventions can strengthen both livelihood diversification and climate resilience among rural households (Sato, 2025). Further (Mwauraa et al., 2022) using cross-sectional data from 652 households randomly selected across eight sub-catchments of the Upper Ewaso Ng'iro North Catchment Area, estimated that improved water security was associated with significant increments in household income and reduced waterborne disease burden, concluding that water security offers simultaneous economic and public health solutions reducing both poverty and government expenditure on water-related communicable diseases.

Context of Tana River County

Tana River County is one of Kenya's 47 counties and one of six counties in the coastal region. It is home to approximately 315,943 people (KNBS, 2019), distributed across 3 sub-counties; Tana Delta (116,757), Tana River (88,546) and Tana North (110,640). The County's life expectancy of 53.8 years is below the national average of 57.9 years, and its literacy rate of

33.9 per cent is far below the national average of 87.38 per cent (CIDP II, 2018); an estimated 70 per cent of residents live below the poverty line, reflecting in part chronically low rainfall. Tana River County sits within Kenya's Arid and Semi-Arid Land (ASAL) region, which covers 89 per cent of the national landmass, supports 70 per cent of Kenya's livestock and supports 90 per cent of its wildlife; however, the region is also characterised by poor water governance and weak infrastructure maintenance (NEMA Kenya/Adaptation Fund, 2025). These pressures intensify during dry seasons, disrupting agricultural livelihoods, interrupt schooling and generate public health challenges across ASAL communities (Waswa et al., 2025).

Table 1: ***Tana River County Revenue and Poverty Levels, 2018-2022***

	2018	2019	2020	2021	2022
Equitable share (Ksh)	5,345,000,000	5,557,800,000	5,855,250,000	5,855,250,000	6,528,408,765
Conditional grant – GoK (Ksh)	323,810,000	297,510,000	347,740,000	237,330,000	75,000,000
Conditional grant – Dev. partners (Ksh)	273,250,000	508,900,000	399,480,000	551,670,000	468,560,000
Number of poor	152,000	173,000	193,000	212,000	242,000
Poverty headcount ratio (%)	62.0	61.7	65.0	67.8	68.0

Note. Data from Tana River County Fiscal Strategy Paper (2018–2022) and KNBS Poverty Report (2017–2021).

As depicted in Table 1, conditional grants from development partners to Tana River County rose by 71 per cent over the period, from Ksh 273 million in 2018 to Ksh 468 million in 2022, while total county revenue rose by 19 per cent; yet the poverty headcount ratio rose from 62 to 68 per cent over the same window. This pattern motivates this study's focus on identifying which specific forms of donor support produce measurable household livelihood gains measured as increase in household income. A key distinction must however be maintained throughout: the county-level revenue and poverty figures in Table 1.1 which describe all three sub-counties (Tana River, Tana Delta and Tana North) and are drawn from KNBS county-aggregate data covering a population of approximately 315,943 residents. The scope of this study's data collection and analysis is confined to Tana River Sub-County alone, from a sampling frame of 13,179 beneficiary households. The findings and regression results therefore cannot be generalised to the county as a whole. The county figures serve a contextual purpose to establishing that the funding-poverty paradox exists at the aggregate level while the study's empirical contribution is to explain household-level livelihood outcomes within one sub-county unit. The findings are generalisable to comparable ASAL sub-counties with similar agropastoral livelihood profiles, donor-project portfolios and water-access constraints.

STATEMENT OF THE PROBLEM

Development support has demonstrated capacity to reduce poverty, prevent intergenerational transmission of poverty, and support human development (Ali & Zeb, 2016). However, Tana River County's poverty headcount ratio increased from 62 per cent in 2018 to 68 per cent in 2022 despite a 19 per cent increase in total county revenue and a 71 per cent increase in donor funding over the same period. This disconnect between rising development investment and worsening poverty raises important questions about the effectiveness of supported livelihood interventions on the households.

Agriculture, representing the third-largest development budget allocation after infrastructure and health in the county (Tana River County C-ADP FY 2025/26) while also employing approximately 83 per cent of the county's labour force is hampered by the frequent drought and flash floods, threatening the already fragile livelihood systems. Within the county's ASAL context, sustainable livelihoods depend on the interaction between crop production, livestock production, and reliable water access. While water availability remains a critical enabling factor for both farming and livestock keeping, previous studies have examined this aspect through an individual sectoral lens with limited attention to their interconnected nature within ASAL livelihood systems, and their combined contribution to household livelihood especially in Tana River sub county.

Consequently, it remains unclear whether donor investments across these complementary sectors collectively contribute to livelihood improvement among beneficiary households. This study addresses this empirical and contextual gap by examining the relationship between donor support in crop production, livestock production, and water access and sustainable livelihood improvement among small-scale farmers and pastoralists in Tana River Sub-County.

Objectives of the Study

The general objective of the study was to analyse the influence of donor-funded projects on sustainable livelihood improvement in Tana River County, Kenya. The specific objectives were to:

- Establish the relationship between donor support to small-scale crop farmers' productivity and sustainable livelihood improvement in Tana River County, Kenya.

- Investigate the relationship between donor support to small-scale livestock farmers' productivity and sustainable livelihood improvement in Tana River County, Kenya.
- Determine the effect of donor support to water access on sustainable livelihood improvement in Tana River County, Kenya.

LITERATURE REVIEW

Sustainable Livelihood Approach (SLA) Theory

Chambers and Conway (1992) define sustainable livelihood as a modality for securing a resilient living through tangible and intangible assets that enable individuals to withstand and recover from stress while maintaining their capabilities without depleting the resource base. The Department for International Development (DFID) subsequently popularised the Sustainable Livelihoods Framework (SLF) as a guiding model for international development cooperation (De Haan, 2012), shifting development thinking from an income-only definition of poverty toward one that also accounts for vulnerability and social exclusion.

The Sustainable Livelihoods Approach comprises four interconnected components. The first is the vulnerability context, the shocks and trends, including recurrent drought, flooding and climate variability, that continually erode the productive capacity of Tana River's residents (NDMA, 2024). The second is the asset pentagon, comprising five forms of indigenous capital: human, natural, physical, financial and social. In Tana River's agro-pastoral context, this pentagon is distinctively shaped by dependence on livestock and subsistence farming as natural and physical capital, and by the limited financial capital that makes households susceptible to climate shocks, constraints that multiple donor agencies are working to ease (Natarajan et al., 2022). The third component is livelihood strategies, through which households organise their activities around their available capital combinations, in this sense households in the county organise their livelihood systems through a combination of small-scale farming, livestock keeping (Tana River, CIDP 2022) which is dependent on water access. The fourth is the policies, institutions and processes including social norms, financial systems and government structures within which those strategies are embedded (Ndlela, 2021).

The Production Theory

Classical production theory treats the firm (households) as a rational decision-maker that converts a vector of inputs into output via a production function;

$$Y = f(x_i) \qquad \textit{1.0}$$

where y is output and (xi) is the vector of inputs such as labour, capital, land and enterprise (Coelli et al., 2005).

In the short run the household's objective is to maximise output from variable inputs; in the long run, where all inputs are adjustable, the objective shifts toward sustaining production. This study uses the production function as the theoretical lens for examining how specific forms of donor support (treated as inputs) influence the productivity, and hence the earnings, of beneficiary households.

Social Cognitive Theory

Bandura's (1997) Social Cognitive Theory (SCT) holds that people are active producers of their own circumstances: they learn and shape behaviour both through direct reinforcement (reward/punishment) and through observation of others' experiences. Behaviour is jointly shaped by social systems (rules, norms, modelling) and personal agency, an individual's beliefs about their own competence, which influence what activities they undertake, how persistently, and with what effort. Mastery experiences and social modelling (e.g., capacity-building, training) build self-efficacy, which Bandura extends to collective efficacy, the capacity of households, groups or communities to address shared challenges through coordinated action.

SCT is used here to interrogate whether beneficiaries' attitudes and efficacy beliefs, shaped by prior experience with donor projects, affect their participation, ownership and ultimately the durability of livelihood gains from donor-funded interventions.

Principal-Agent Theory

Jensen and Meckling (1976) describe how governance and ownership structures are organised where there are asymmetric information and potentially divergent interests between two parties. In the donor-beneficiary relationship, the donor is the principal who provides resources (capital, infrastructure, technical expertise) and the beneficiary is the agent expected to convert those resources into sustainable livelihood outcomes (Miriti, 2004). The theory assumes both parties are self-interested utility-maximisers and that the agent has superior knowledge of local context and of their own effort and capability , information asymmetry that gives rise to moral hazard (the principal cannot verify whether the agent is exerting the expected effort) and adverse selection (the principal selects agents with limited knowledge of their true capability) (Renmans et al., 2016).

Mitigating moral hazard typically requires incentive-compatible design (Shapiro, 2005), yet Monkam (2012) cautions that donor incentive structures can themselves become counter-productive, producing a ‘Move Money Syndrome’ in which the volume of funds disbursed becomes a more salient objective , for both donor and beneficiary , than the livelihood impact those funds were meant to achieve, a dynamic that can sustain donor dependence without producing lasting change.

Empirical Literature

The empirical literature is organised below around the study's three objectives, crop productivity, livestock productivity, and water access.

Donor Support and Crop Productivity

Husen et al. (2023) examined small-scale irrigation in drought-prone areas of Ethiopia's upper Awash sub-basin using a sample of 396 households, finding that irrigation participants accumulated greater household capital assets, consumed a more diverse diet, grew more crop varieties, and earned more from both farm and non-farm activities than non-participants. In Ghana, Addisson et al. (2024) found that agricultural digitisation, technical skill transfer, market and weather information, extension support and agribusiness services, was closely associated with improved livelihood assets and well-being among rural farmers. Within Tana River County itself, Gwademba et al. (2023) found a strong positive correlation (r = 0.7) between use of agricultural extension information services and maize productivity, underscoring the role of extension in raising yields, food security and incomes.

Several donor-funded crop initiatives operate directly in the study area. The Bura Irrigation Scheme has expanded from 6,250 to 12,000 acres under irrigation, serving 2,245 farmers (National Irrigation Authority, 2022); the EU-funded, NDMA-implemented Garsen Integrated Livelihood Project invested Ksh 15 million in land preparation, seeds and irrigation infrastructure, including 20 water pumps (NDMA, 2022); and Concern Worldwide's LEAF programme reached 39,704 people across 25 villages, distributing over 22,700 pounds of seed and reducing crop losses from 60 per cent to under 20 per cent through climate-smart agriculture practices (Concern Worldwide, 2022). Fertiliser subsidy programmes have similarly been associated with higher maize yields and incomes among vulnerable farmers in the county (Journal of Agricultural Extension and Rural Development, 2022). This evidence from Tana River County is reinforced by quasi-experimental evidence from Kenya's ASAL regions more broadly. (Sato, 2025) used propensity score matching to evaluate a Farmer Field School programme focused on farm forestry across Kenya's ASALs between 2017 and 2020, finding that households with FFS graduates diversified into significantly more income types and sold a wider range of agricultural, forestry and livestock products than matched non-participant households.

Donor Support and Livestock Productivity

Index-based livestock insurance (IBLI), supported by ILRI and DFID, pays out on satellite-derived forage-scarcity or drought-severity triggers rather than proof of animal loss; insured households in northern Kenya showed higher food expenditure and were more likely to invest in education and health during droughts (Janzen & Carter, 2022). Donor-supported fodder production, such as FAO's Kenya Climate-Smart Agriculture Project, which introduced drought-tolerant fodder crops (FAO, 2023), has reduced livestock mortality and improved nutrition, particularly when paired with EU-funded water infrastructure such as boreholes and water pans (European Commission, 2022).

During the 2022 drought, World Vision Kenya's Livestock Offtake Programme purchased weakened animals from pastoralist households, both stimulating local cash flow and distributing meat to vulnerable families to protect nutrition (World Vision Kenya, 2022). NDMA (2022) data from the Bura and Tana irrigation schemes likewise links improved pasture and crop conditions to a 43 per cent rise in average medium-sized cattle prices within a single month, illustrating how water and fodder access feed through to livestock market value.

Donor Support and Water Access

Water scarcity is a constraint on both human and livestock livelihoods across ASAL Kenya. In 2022, World Vision Kenya's USAID-BHA-funded Kenya Integrated Emergency Response Project drilled three boreholes across Chewele, Gora and Konoramadha, benefiting over 4,600 people, and installed thirty 10,000-litre storage tanks, reducing water-collection distances (World Vision Kenya, 2022). According to the Tana River County FY 2022/23 development plans, the water sector was prioritized through planned investments totalling approximately KES 2.69 billion. These investments targeted the expansion and rehabilitation of urban and rural water supply systems, construction of dams and water pans, development of boreholes, and implementation of water resource management interventions aimed at improving water security and reducing access constraints across the county. (Tana River County; ADP, 2024)

Reduced travel time for water collection has been linked to higher engagement in productive activity and to reduced incidence of waterborne disease (RSIS, 2022). Elsewhere, Mweemba et al. (2025) found that solar-powered water pumps in rural Zambia significantly cut the time households spent queuing and travelling for water, freeing time for gardening and improving community health outcomes, a pattern consistent with this study's own water-access findings. In addition, a study by (Mwauraa et al. 2022) using OLS and Poisson regression on 652 households across the Upper Ewaso Ng'iro North Catchment Area found that improved water security was positively associated with higher household income per adult equivalent and significantly lower waterborne disease prevalence, with the authors concluding that water security improvements represent a dual-return investment

Linking Theory, Empirical Evidence and the Study Variables

The Production Theory directly motivates the study's regression specification: donor support items (irrigation, technical support, vaccination, water infrastructure, and so on) are modelled as inputs (xi) in a production function whose output is the change in household crop or livestock earnings. The Sustainable Livelihood Approach justifies the choice of outcome variables themselves, crop productivity, livestock productivity and water access map onto the natural, physical and financial capitals in the SLA's asset pentagon. The framework's emphasis on vulnerability context explains why water-access variables (months of access, hours spent fetching water) are treated as livelihood outcomes in their own right. The reviewed literature collectively shows that donor-funded interventions are positively associated with productivity, income and resilience across crop, livestock and water-access dimensions. However, these studies have been assessed and independent livelihood outcome and as such no existing study has jointly examined crop, livestock and water-access outcomes under donor-funded interventions in Tana River Sub-County using household-level regression on disaggregated support types. That is the gap this study fills.

METHODOLOGY

Research Design

The study applied a non-experimental design because the donor interventions under evaluation had already been implemented, leaving no opportunity to randomly assign beneficiaries to treatment and control groups before the intervention occurred (Portney, 2009). A non-experimental, cross-sectional comparison of pre- and post-intervention household outcomes was therefore the most feasible design for assessing the relationship between donor support and livelihood outcomes.[1]

Theoretical Framework

The study is anchored on the classical production function (Section 2.2), which provides a tractable functional relationship between donor-support inputs and livelihood-outcome outputs:

$$y = f(xi) \ldots .3.1$$

Where y represents the outputs and x_I represent various inputs into production.

Model Specification

The classical production model is extended to the study context by specifying the outputs as the change in crop and livestock earnings, and for water access, earnings from time saved. The inputs as the specific forms of donor support received. The general model is:

$Yi = f\ Xij$……………………………………………3.2

Where Y_i represents change in crop/livestock earnings for farmers

i=Individual farmer

j=Vector of inputs (donor support, farm acreage, farmer characteristics)

Hence the specific model becomes

$Yi = Xi\beta + \varepsilon$………………………………………… 3.3

Yi = where Yi is the change in crop/livestock/water-related earnings for household i.

Xi = forms of donor support received by individual farmer i.

β = coefficient

ε = Error term (random fluctuations, measurement errors, or effect of factors outside control in the model.)

Definition and Measurement of Variables

Following Chambers and Conway's (1992) definition of sustainable livelihood, and drawing on Chen and Phakdeephirot's (2021) six possible outcome measures (income, welfare, food security, living standards, vulnerability, ecological environment), this study measured sustainable livelihood through the outcomes most directly linked to its three objectives, as set out in Table 2.

[1] Section 3.10 discusses the limitations of this study and the strength of any causal claim.

Table 2: Definition and Measurement of Variables

Variable	Definition	Measurement
Sustainable livelihood	Process of building people's productive capacity through improved crop productivity, livestock productivity, and access to water.	Change in earnings from crop and livestock activities, and earnings from time saved.
Donor support – crop farmers	Donor support directed at small-scale crop farmers' productivity.	Forms of donor support provided for crop productivity (irrigation, technical support, inputs, etc.).
Donor support – livestock farmers	Donor support directed at small-scale livestock farmers' productivity.	Forms of donor support provided for livestock productivity (technical support, insurance, vaccination, etc.).
Donor support – water access	Donor support for households' access to water.	Dummy variable: 1 = received water-access support, 0 = did not.

Note. Own compilation.

Study Design and Population

The study was conducted in Tana River Sub-County, one of five sub-counties within Tana River County. The target population comprised beneficiaries of donor-funded projects targeting crop productivity, livestock productivity and water access. The selection criteria for eligible projects were that the project had to be run by an established donor active in the county for more than five years, be sufficiently large in terms of beneficiary scope and funding to plausibly have an impact on the community, have run for more than three years, and be relevant to the study's three objectives. Primary data were collected using a structured questionnaire on KOBO administered to beneficiaries of these projects.

Sampling and Sample Size

The study used stratified sampling method, with the sub-county's 12 locations serving as strata to ensure geographic representation, which was followed by simple random sampling of households within each location. Secondary data review from the project's documents established that 13,179 households across the sub-county had been reached by the eligible donor-funded projects. Applying Slovin's formula at a 0.05 margin of error and 95 per cent confidence level,

$$n = N / (1 + N \cdot e^2) = 13{,}179 / (1 + 13{,}179 \times 0.05^2) \approx 388$$

the target sample size was 388 households, with each of the 12 locations allocated 32 respondent households.

Response Rate

Of the 388 households targeted, 320 questionnaires were successfully completed and used in the analysis, an 82.47 per cent response rate (Table 3.2). Mugenda and Mugenda (2008) classify a response rate of 80 per cent and above as excellent for analysis and reporting; the achieved rate therefore meets this threshold, and the 320-respondent figure used throughout the Findings is this realised sample rather than the 388-household target used only for the a priori sample-size calculation.

Reliability and Validity

Reliability refers to the degree to which the research instrument produces consistent results when administered repeatedly under the same conditions (Mugenda & Mugenda, 2003). Internal consistency reliability was assessed using Cronbach's alpha which yielded a Cronbach alpha coefficient of 0.830 indicating good internal consistency and exceeding the recommended threshold of 0.70 (Kothari, 2009).

Validity refers to the degree to which the instrument measures what it is intended to measure (Kothari, 2004); both internal and external validity were addressed through tool piloting where 23 data points were collected and analysed to ensure validity of the questionnaire. Feedback from supervisor were incorporated to align the tools prior to full data collection.

Data Analysis

Data processing began with preparation, coding, editing and cleaning (Sekaran & Bougie, 2011). Descriptive statistics, frequencies, percentages, means and standard deviations, were generated first, followed by normality checks (skewness and kurtosis). Descriptive analysis was conducted in Excel; inferential analysis, including multivariate OLS regression, correlation analysis and diagnostic testing (heteroscedasticity, multicollinearity), was conducted in STATA to assess the linear relationship between these variables and to determine both the strength and direction of their correlations

Ethical Considerations

A research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI) together with an introductory letter from the university prior to data collection. Research assistants were sourced from the same villages and trained in ethical data-collection practice and in treating respondents with dignity and respect. Respondents were informed that their data would be used strictly for academic purposes, and verbal consent was acquired from all respondents. All through data collections, analysis and reporting the participants confidentiality and anonymity was maintained.

Limitations of the Study

The findings of this study should be interpreted in light of several limitations. First, the "before" and "after" measures reported in Chapter Four are based on respondents' recollections rather than independently verified baseline data. As a result, the study is subject to potential recall bias, and respondents may have unintentionally overestimated or underestimated changes associated with donor support.

Second, the study employed a cross-sectional, non-experimental design and did not include a control group or counterfactual. Consequently, the regression results indicate statistical relationships between the study variables but cannot be interpreted as evidence of causality. While the models produced high R^2 values (0.85–0.97), these values reflect a strong fit to the observed sample data and should not be taken as proof that donor interventions directly caused the reported livelihood outcomes.

Third, the study was conducted among 320 respondents drawn from Tana River Sub-County and limited to households participating in selected donor-funded projects. The findings therefore reflect the experiences of the study population and should be generalised to other parts of Tana River County or other contexts with caution.

FINDINGS

Descriptive Statistics

Descriptive results are presented for categorical variables (household sex, respondent age, education level, occupation, household size, income level) in Table 3, and for continuous variables (farm size, animals lost, crop and livestock production, water access and consumption, before and after the intervention) in Table 4;

Table 3:Descriptive Statistics on Categorical Variables (N = 320)

Variable	Category	Frequency	Percent
Respondent's gender	Male	119	37.19
	Female	201	62.81
Education level	None	93	29.06
	Primary	58	18.13
	Secondary	123	38.44
	College	46	14.38
Respondent's age	20–30	71	22.19
	31–40	146	45.62
	41–50	71	22.19
	51–60	32	10.00
Household head	Yes	226	70.75
	No	94	29.25
Household income source	Crop farming	50	15.63
	Livestock farming	180	56.25
	Employment	30	9.38
	Small/medium business	40	12.50
	Skilled artisan	20	6.25
Expenditure type	Education	47	14.69
	Food	249	77.81
	Savings	24	7.50
Household size	Less than 5	189	59.06
	More than 5	131	40.94
Income level	Less than Ksh 10,000	162	50.63
	More than Ksh 10,000	158	49.38

Note. Own compilation.

Table 4:Descriptive Statistics on Continuous Variables, Before and After Donor Support

	Before donor support			After donor support		
Variable	**Mean**	**SD**	**Min–Max**	**Mean**	**SD**	**Min–Max**
Farm size (acres)	2.78	1.82	0–6.00	2.83	1.81	0–6.25
Bags harvested	10.82	7.66	0–40	15.78	9.36	0–45
Bags consumed	9.60	5.27	2–25	13.27	4.96	3–30
Crop earnings (Ksh)	7,952.5	10,755.2	0–72,000	17,484.9	15,213.6	0–90,000
Livestock earnings (Ksh)	8,619.1	21,472.3	0–22,000	15,761.9	29,947.5	0–32,000
Total animals owned	12.05	12.99	0–73	17.67	15.65	0–92
Cattle weight (kg, est.)	198.19	101.37	0–380	219.00	109.94	0–405
Cattle value (Ksh, est.)	32,357.8	18,865.8	0–70,000	50,906.3	25,399.5	0–90,000
Goat weight (kg, est.)	33.92	11.69	0–46	36.56	12.45	0–49
Goat value (Ksh, est.)	3,411.1	1,199.3	0–4,800	3,965.6	1,380.3	0–6,500
Animals lost	5.47	5.04	0–20	1.42	1.95	0–10
Water access (months/yr)	4.67	1.43	0–12	9.29	2.50	0–12
Time fetching water (hrs)	2.94	1.60	0.5–6	0.87	0.42	0–5
Water-related hospital visits/yr	2.87	2.14	0–12	1.02	1.24	0–8

Note. Own compilation. M = mean; SD = standard deviation.

Correlation Analysis

Spearman Moment of Correlation was used to determine the degree of correlation among the study variables before regression analysis. Kothari (2004) treats correlation coefficients at or below 0.8 as indicating no correlation; Table 5 shows all pairwise coefficients below this threshold, so all variables were retained in the regression models.

Table 5:Correlation Matrix of Key Study Variables

	Gender	**Education**	**HH size**	**Income**	**Livestock prod.**	**Sustainability**	**Crop prod.**	**Water access**
Gender	1.00							
Education	0.238	1.00						
HH size	0.174	−0.011	1.00					

	Gender	Education	HH size	Income	Livestock prod.	Sustainability	Crop prod.	Water access
Income	0.054	0.654	0.123	1.00				
Livestock prod.	0.044	−0.105	0.134	0.046	1.00			
Sustainability	−0.027	−0.295	−0.112	−0.308	0.312	1.00		
Crop prod.	−0.013	−0.042	−0.114	−0.061	0.166	0.888	1.00	
Water access	0.003	0.537	0.053	0.592	0.002	−0.338	−0.122	1.00

Note. Own compilation. HH = household.

Diagnostic Tests

OLS regression rests on assumptions of zero autocorrelation, homoscedasticity and zero multicollinearity (Gauss-Markov theorem; Chipman, 2025). A Breusch-Pagan test was used to check homoscedasticity (Table 6); in both models the chi-square probability exceeded the 0.05 significance threshold, so the null hypothesis of constant error variance could not be rejected, indicating no heteroscedasticity problem.

Table 6:Heteroscedasticity Test (Breusch-Pagan)

Model	Chi-square	Prob. > Chi-square
Model 1 (Crop earnings)	6.58	0.103
Model 2 (Livestock earnings)	2.94	0.086

Note. Own compilation.

Regression Results

Donor Support to Crop Farmers and Sustainable Livelihood Improvement

Table 7:Regression of Crop Earnings on Donor Support to Crop Farmers

Variable	Coefficient	SE	t	p
Irrigation support	34.457	15.746	2.19	0.029
Technical support	5.614	2.661	2.11	0.031
Contract farming	33.403	18.276	1.83	0.069
Farming inputs	33.550	12.937	2.59	0.010
Unconditional cash transfer	−8.115	14.375	−0.56	0.573

Water pump	6.198	1.758	3.53	0.000
Water tank	−6.258	1.854	−3.38	0.001
Constant	−6.015	2.277	−2.64	0.009

Note. $R^2 = 0.971$; Adjusted $R^2 = 0.877$[2]; $F(22, 297) = 45.83$, $p < .001$; N = 320; Root MSE = 97.54. Own compilation.

Irrigation support, technical support, farm-input provision and water pumps were positively and significantly associated with crop earnings, while water tanks were negatively and significantly associated with crop earnings, plausibly because tank water is used predominantly for domestic rather than commercial/irrigation purposes. Contract farming was marginally significant (p = .069) and unconditional cash transfers showed no significant association, consistent with their design as emergency drought relief rather than a productivity-building intervention. These patterns are broadly consistent with KIPPRA (2024) and NDMA (2024) evidence on the role of irrigation in expanding cultivated area and incomes, and with Msangya et al.'s (2023) finding that technical support combined with input access sustains agricultural livelihood projects in Tanzania.

Donor Support to Livestock Farmers and Sustainable Livelihood Improvement

Table 8: Regression of Livestock Earnings on Donor Support to Livestock Farmers

Variable	**Coefficient**	**SE**	**t**	**p**
Technical support	16.246	3.494	4.65	0.000
Insurance cover	22.146	3.717	5.96	0.000
Value addition	−19.916	36.422	−0.55	0.585
Unconditional cash transfer	45.882	35.201	−1.33	0.186
Vaccination	21.163	4.507	4.70	0.000
Water pan	77.206	31.619	2.40	0.015
Fodder/pasture support	6.678	3.349	1.99	0.044
Infrastructure support	−23.995	40.372	−0.59	0.553

Note. $R^2 = 0.905$; Adjusted $R^2 = 0.872$; $F(19, 300) = 35.23$, $p < .001$; N = 320; Root MSE = 21.77. Own compilation.

[2] The adjusted R^2 value of 0.877 indicates a strong within-sample explanatory fit between the independent variables and the observed variation in sustainable livelihood outcomes. However, given the study's cross-sectional and non-experimental design, this statistic should not be interpreted as evidence of causal impact.

Technical support, insurance cover, vaccination, water pan and fodder/pasture support were positively and significantly associated with livestock earnings, consistent with Osore et al. (2022) on the protective role of insurance against income shocks and Husen et al. (2023) on vaccination's productivity effects. Value addition, unconditional cash transfers and infrastructure support were not significant. The unconditional cash transfer was disbursed as emergency drought relief rather than a long-term productivity intervention, which plausibly explains its lack of association with earnings. Value addition and infrastructure support both require beneficiaries to commit further materials and resources to become productive; with most households reporting limited disposable income (Table 4.1), this additional investment requirement appears to have constrained uptake and therefore impact, a targeting and design issue rather than evidence that value addition or infrastructure support are inherently ineffective.

Donor Support to Water Access and Sustainable Livelihood Improvement

Table 9: Regression of Time-Saved Earnings on Donor Support to Water Access

Variable	Coefficient	SE	t	p
Canal	−26.408	39.958	−0.66	0.509
Drip irrigation	87.502	33.250	2.63	0.009
Water pump	53.733	23.286	2.31	0.022
Borehole	44.334	21.531	2.06	0.040
Piped water	10.344	6.721	1.54	0.125
Water pan	14.068	4.424	3.18	0.002
Water tank	21.836	239.677	0.09	0.927
Months of water access	84.860	31.484	2.70	0.007
Constant	21.567	4.445	4.85	0.000

Note. $R^2 = 0.879$; Adjusted $R^2 = 0.853$; $F(19, 300) = 34.39$, $p < .001$; N = 320; Root MSE = 10.92. Own compilation.

Drip irrigation, water pumps, boreholes, water pans and the number of months of water access were positively and significantly associated with time-saved earnings. Canal, piped water and water tanks were not significant, the water-tank result mirrors its negative crop-earnings result in Table 4.5 and again suggests the asset is being used for domestic consumption rather than productive purposes, while canal and piped-water systems may be more prone to breakdown, seasonal unreliability, or shared/communal management that dilutes any individual household's productive gain. These findings parallel Mweemba et al. (2025) on solar-powered pumps reducing water-collection time in rural Zambia, and World Vision Kenya (2022) on time reallocation toward productive activity following improved water access. These findings are consistent with the broader Kenyan evidence Mwauraa et al. (2022) demonstrated using OLS regression on a comparable rural Kenyan household sample that improved water security generates measurable income gains and reduces waterborne disease burden simultaneously.

DISCUSSION

Irrigation, technical extension, vaccination, insurance and water infrastructure each produced statistically significant associations with the corresponding livelihood outcome, while interventions requiring substantial further household investment like value addition, infrastructure support, or unconditional cash transfers (designed for emergency relief), showed weak, insignificant or negative associations. This pattern points to a clear design principle: donor support yields measurable livelihood gains when it removes a constraint the household cannot finance independently, but stalls where it requires the household to commit capital it does not have.

At the sectoral level, the findings show that irrigation support, contract farming and farm inputs were the most consistently significant contributors to crop earnings. For livestock, water pans, vaccination, insurance and technical support produced the largest improvements in household earnings. For water access, drip irrigation, boreholes, water pumps and water pans generated the greatest time-saved earnings.

The more difficult finding is the persistence of rising county-level poverty alongside these positive household outcomes. Between 2018 and 2022, Tana River County's poverty headcount rose from 62 to 68 per cent even as donor and government funding increased by 19 per cent (Tana River, CIDP 2022). Three compounding factors help explain why household-level gains did not aggregate into county-level poverty reduction. First, the macroeconomic environment was severely adverse: Kenya's food inflation rate more than doubled within a single year, rising from 6.32 per cent in June 2021 to 13.8 per cent in June 2022, driven by price increases for wheat, cooking oil, maize flour and cooking fuel (KIPPRA, 2022). By November 2023, maize and green gram stocks across the county were 57 per cent and 38 per cent below their long-term averages respectively, pushing prices for these staple foods 36 per cent above normal levels (NDMA, 2024). Second, the county was exposed to compounding climate and health shocks: the 2018–2022 period brought consecutive drought emergencies, the COVID-19 disruption and the 2020 desert locust invasion, each of which disrupted the pastoralist, agro-pastoralist and farming livelihoods (ACAPS, 2022). In this environment, nominal income gains among donor-project beneficiaries may have been partially or wholly offset by rising costs of living and production inputs, leaving net welfare positions unchanged or worsened when measured against the poverty headcount. Third, and most structurally, the study's data collection covered 320 beneficiary households from a sampling frame of 13,179 (a subset of the county's approximately 315,943 residents across three sub-counties). Positive outcomes among a targeted beneficiary group cannot, by construction, be expected to shift a county-wide poverty rate if project coverage remains a small fraction of the total population.

Taken together, these explanations are consistent with what the aid-effectiveness literature has long termed the micro-macro paradox. Mosley (1986) documented this pattern over a twenty-year period: aid effectiveness was demonstrably high at the project level, yet no statistically significant relationship could be established between aid flows and macroeconomic growth. The present study replicates this pattern at a sub-national scale, strong, significant household-level associations between targeted donor support and livelihood earnings, set against a rising county poverty headcount over the same period.

CONCLUSIONS

This study found that donor-funded interventions in crop farming, livestock productivity and water access were positively and significantly associated with the sustainable livelihood outcomes of small-scale farmers and pastoralists in Tana River Sub-County, with the strongest and most consistent effects coming from interventions that directly reduces a production burden from the households. Interventions requiring substantial further household investment (value addition, infrastructure support) or designed for emergency relief rather than productivity (unconditional cash transfers, and water tanks used mainly for domestic consumption) showed little or no measurable association with earnings.

Because the study used a non-experimental design on a single cross-section of beneficiaries, these findings should be read as significant statistical associations consistent with the hypothesised model, not as definitive proof of causal impact. The persistence of rising county-level poverty alongside positive household-level results is the study's most important unresolved finding and should be the starting point for the next phase of research in this area.

POLICY IMPLICATIONS

To sustain and scale household-level gains while working to close the gap with county-level poverty trends, national and county governments and development partners should:

- Scale up investment in irrigation infrastructure, quality farm inputs and technical extension services, given their consistent, statistically significant effect on crop productivity and household income.
- Institutionalise livestock insurance, vaccination programmes and fodder/pasture support as core, ongoing interventions rather than one-off donor projects, given their demonstrated role in improving livestock productivity and reducing vulnerability to shocks.
- Prioritise and expand water-access interventions, boreholes, water pans, drip irrigation and water pumps, while reviewing the design and targeting of water tanks, which are not translating into productive (as opposed to domestic) use.
- Reassess the design of value-addition and infrastructure-support components so they do not assume a level of household disposable income that most beneficiaries do not have; consider phased, lower-investment entry points or pairing these components with complementary financial support.
- Reserve unconditional cash transfers explicitly for emergency drought relief rather than evaluating them against productivity-improvement metrics they were not designed to achieve.
- Commission a county-level study to reconcile household-level survey findings with the county's aggregate poverty trend, focusing on donor-project coverage relative to county population, and on cost-of-living/population trends over the same period.

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