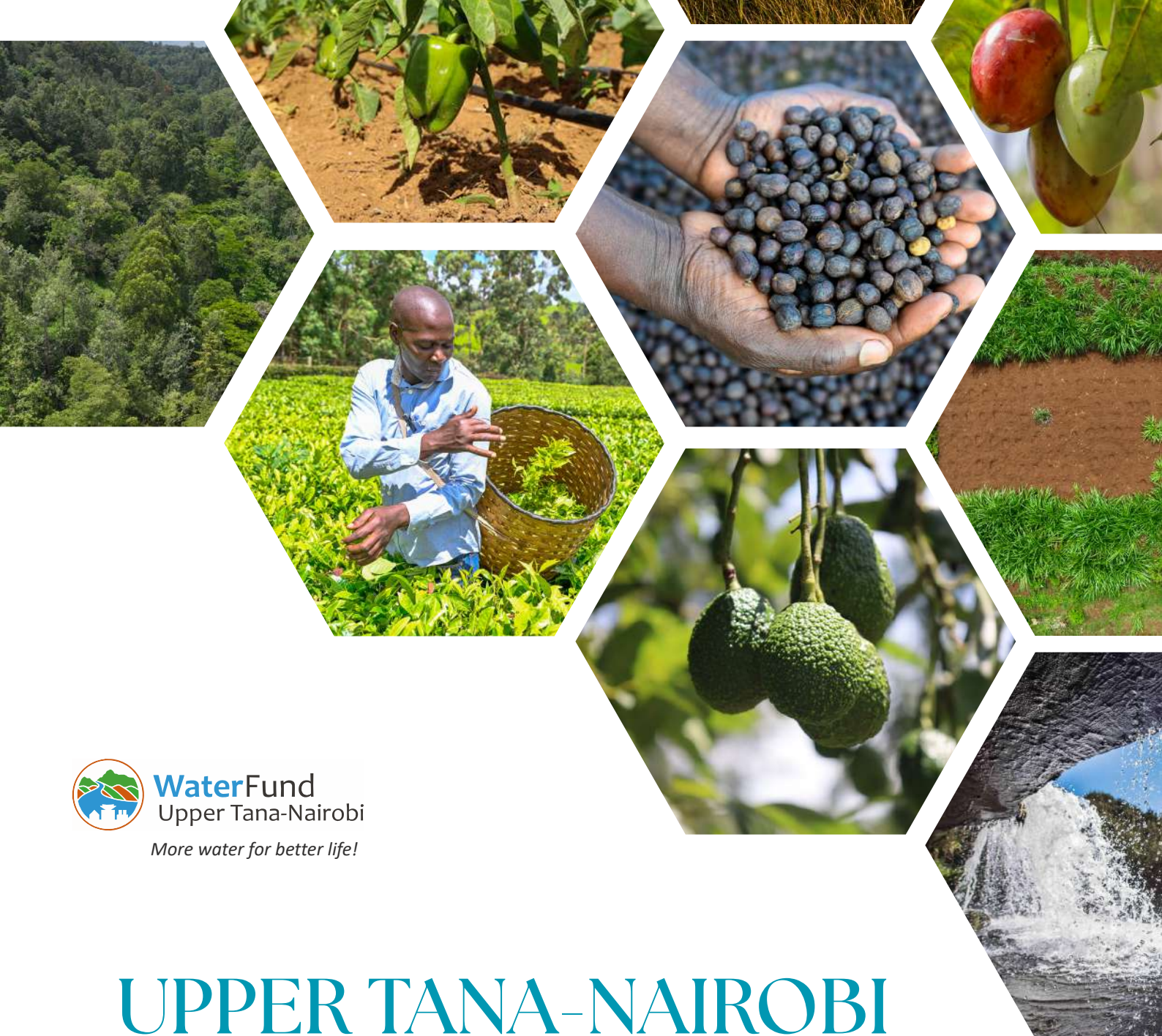




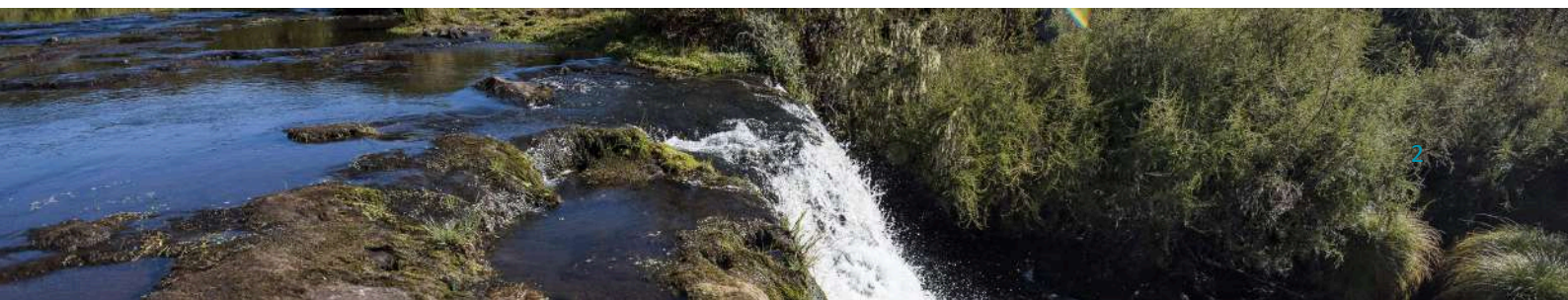
WaterFund
Upper Tana-Nairobi

More water for better life!

UPPER TANA-NAIROBI WATER FUND TRUST ECONOMIC IMPACT SURVEY REPORT 2026

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List of Abbreviations and Acronyms

KII	Key Informant Interview
KES	Kenya Shilling
NGO	Non-Governmental Organisation
NCWSC	Nairobi City Water and Sewerage Company
TNC	The Nature Conservancy
USD	United States Dollar
UTNWFT	Upper Tana-Nairobi Water Fund Trust
WRA	Water Resources Authority
WRUA	Water Resource Users Association
Currency Conversion: \$1 = KES 130	



EXECUTIVE SUMMARY



Executive Summary

The Upper Tana-Nairobi Water Fund Trust (UTNWFT) is a public charitable trust registered under the Trustees (Perpetual Succession) Act. The first of its kind in Africa, the mission of the Trust is to support the long-term conservation, protection, and maintenance of the Upper Tana watershed, thereby improving Nairobi city's water supply security and hydropower generation along the Tana River.

The UTNWFT works with national and county governments, farmers, and other stakeholders in the Upper Tana watershed to promote environmental conservation, reforestation, and riparian protection through sustainable land management, watershed restoration, and livelihood improvement interventions to address declining water quality and quantity in the Upper Tana catchment by utilising Nature-based Solutions.

This impact assessment evaluates the environmental outcomes and economic benefits of UTNWFT activities across the priority sub-catchments of Thika-Chania, Sagana-Gura, and Maragua.

A mixed-methods approach combining a household survey of 983 farmers (88% response rate), extensive document review, and key informant interviews with county government officials, community groups, and members of the Water Resource Authority, Water Resource Users Association, and the Nairobi City Water and Sewerage Company was used to assess outcomes across value chains and governance structures.



Key Findings

01 Agricultural Benefits and Livelihoods



\$29.27M
(KES 3.8B)

Average annual sales

\$117.1M
(KES 15.2B)

Cumulative sales (2022–2025)



86%

Tree survival rate

1.29B fruits

Total harvested

500 fruits/day

Average worker productivity

2.59M
person-days

Seasonal employment generated

Avocado Value Chain

- Adoption and survival

The avocado establishment has been strong across the applied agro-ecologies, with an 86% tree survival rate, indicating good seedling quality and husbandry practices.

- Production and value

Annualised sales across recent harvest years average \$29.27 million (KES 3.8 billion), with cumulative sales of \$117,084,942 (KES 15,221,042,460) (2022–2025), reflecting both orchard maturation and access to higher-value markets.

- Employment effects

Harvest labour is a major source of seasonal employment. At an average of 500 fruits per worker per day, the 1,296,400,866 fruits harvested translated to about 2,592,802 person-days, largely benefiting local youth during peak seasons (on a piece-rate or daily basis).

These results signal a well-functioning value chain from nurseries through buyers/exporters, with significant income from farms and benefits to local input and transport services.



Key Findings

01 Agricultural Benefits and Livelihoods

Fodder Grass Value Chain

- Super Napier grass.

This high-protein (16–18%) fodder is now the dominant fodder choice among adopters (86% of farmers), replacing lower-protein local Napier. Improved nutrition was associated with up to a 20% higher milk yield, thereby strengthening household cash flow and food security.

- Productivity.

Reported average production is approximately 22.9 kg per metre per harvest, with approximately three harvests per year, supporting both on-farm feeding and local sales when surplus exists.

- Economic contribution.

Estimated annual sales from fresh fodder are about \$1.14 million (KES 148,236,249). Savings from reduced purchases of concentrates and the agronomic benefits of recycled manure contribute to the economic impact.

- Livestock carrying effect.

At an average intake of about 66 kg wet matter/cow/day, current production levels are sufficient to sustain around 1,130 cows annually (indicative).

- Labour dynamics.

Most households rely on family labour (57%); 4.4% rely primarily on employees; the remainder use a mix of family and hired help. Typical remuneration is KES 9,000/month (permanent) or KES 400/day (casual), with most farms engaging one hired worker when needed. Integrating fodder on contours/terraces stabilises soil and underpins resilient dairy incomes; conservation and livelihoods reinforce each other.



86%

Farmers adopting Super Napier

16–18%

Protein content (high-quality fodder)

+20%

Increase in milk yield (up to)

22.9 kg/metre

Average production per harvest



\$1.14M (KES 148.2M)

Estimated annual fodder sales



Key Findings

01 Agricultural Benefits and Livelihoods



15,900

Water pans constructed
and lined

1.72 billion
litres

Annual water harvested

13,333 pans

Actively used for irrigation



\$2.16M
(KES 281.3M)

Annual aggregate income
from irrigation

KES 21,099
(\$162.90)

Average annual income per pan



Water Pans Value Chain

- Scale and storage

15,900 lined water pans have been excavated and lined, enabling an estimated 1,719,337,800 litres of water to be harvested annually through rainfall/runoff capture.

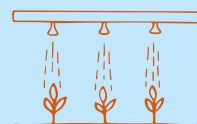
- Use and income

A large majority (83.8%) of water pans are used for irrigation (subsistence and market). Farmers report average incremental income of KES 21,099 (about \$162.90) per pan per year.

At 13,333 pans used for irrigation, that equates to \$2,163,988 (KES 281,318,440) per year in aggregate produce sales. Water pans extend the growing season (often by two to four cropping cycles/year); reduce time spent fetching water; and reduce pressure on riparian abstraction when paired with efficient irrigation.

Key Findings

01 Agricultural Benefits and Livelihoods



$\frac{1}{8}$ – $\frac{1}{4}$ acre

Typical plot size under drip irrigation

Drip Kits Value Chain

- Water-efficient production

Drip kits have catalysed the expansion of horticulture, improved water-use efficiency, and crop diversification, especially on $\frac{1}{8}$ - to $\frac{1}{4}$ -acre plots.

- Economic signal

Reported sales of drip-irrigated produce are estimated at \$1.1 million (KES 140.2 million) per year across supported households. Drip performance is strongest when paired with on-farm storage (e.g., pans/tanks) and basic operation and maintenance (e.g., filtration and emitter care).



**\$1.1M
(KES 140.2M)**

Annual sales from drip-irrigated produce

Key Findings



KES 48.9M

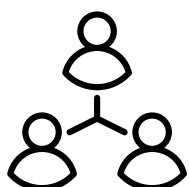
Cumulative savings in water treatment costs (2013–2023)

02 Environmental Outcomes

UTNWFT interventions have substantially improved catchment health. Key stakeholders reported significant to very significant increases in water quantity and quality, reduced sedimentation, and improved seasonal water availability. Riparian management, terracing, and grass strips reduced soil erosion and surface runoff, thereby increasing soil fertility and vegetation cover.

- Downstream treatment benefits:

Nairobi City Water and Sewerage Company operational data indicate a multi-year decline in turbidity and reduced chemical (alum) use relative to earlier baselines, yielding cumulative savings of approximately **KES 48.9 million (2013–2023)**. These trends align with reduced sediment loads and more stable inflows, demonstrating tangible downstream benefits from upstream conservation.

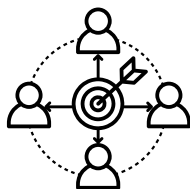


03 Social Outcomes and Inclusion

UTNWFT activities enhanced local capacities through training, extension support, and community engagement. Stakeholders noted improvements in youth empowerment, women's participation, the formation of farmer groups, and access to new income-generating activities.

However, structural barriers—including limited land ownership, lack of capital, and insufficient technical skills—continued to limit the full participation of women, youth, and persons with disabilities (PWDs).

Key Findings



04 Governance and Collaboration

Collaboration between UTNWFT and institutions such as the Water Resources Authority (WRA), Water Resources Users Associations (WRUAs), Nairobi City Water and Sewerage Company (NCWSC), and county governments was rated good to exceptionally good, reflecting effective coordination from planning to monitoring.

- County extension officers, community-based organisations, and WRUAs played a critical role in planning, implementation, monitoring, and community mobilization.
- County governments provided technical support and linkage to agricultural extension systems.
- NGO partners contributed to community capacity building and intervention sustainability.

Challenges and Lessons Learnt

- Dam liner maintenance:

Farmer capacity gaps in the repair of liner damage in some sites reduce the utilisation of pans.

Remedy: Improve vendor alignment to strengthen user training and implement a rapid replacement/repair mechanism.

- Uneven awareness and uptake:

Some areas show lower visibility of interventions and benefits.

Remedy: Target outreach via WRUAs/county extension, peer demonstrations, and bundled packages (e.g., water pan + drip + fodder crops) tailored to local conditions.

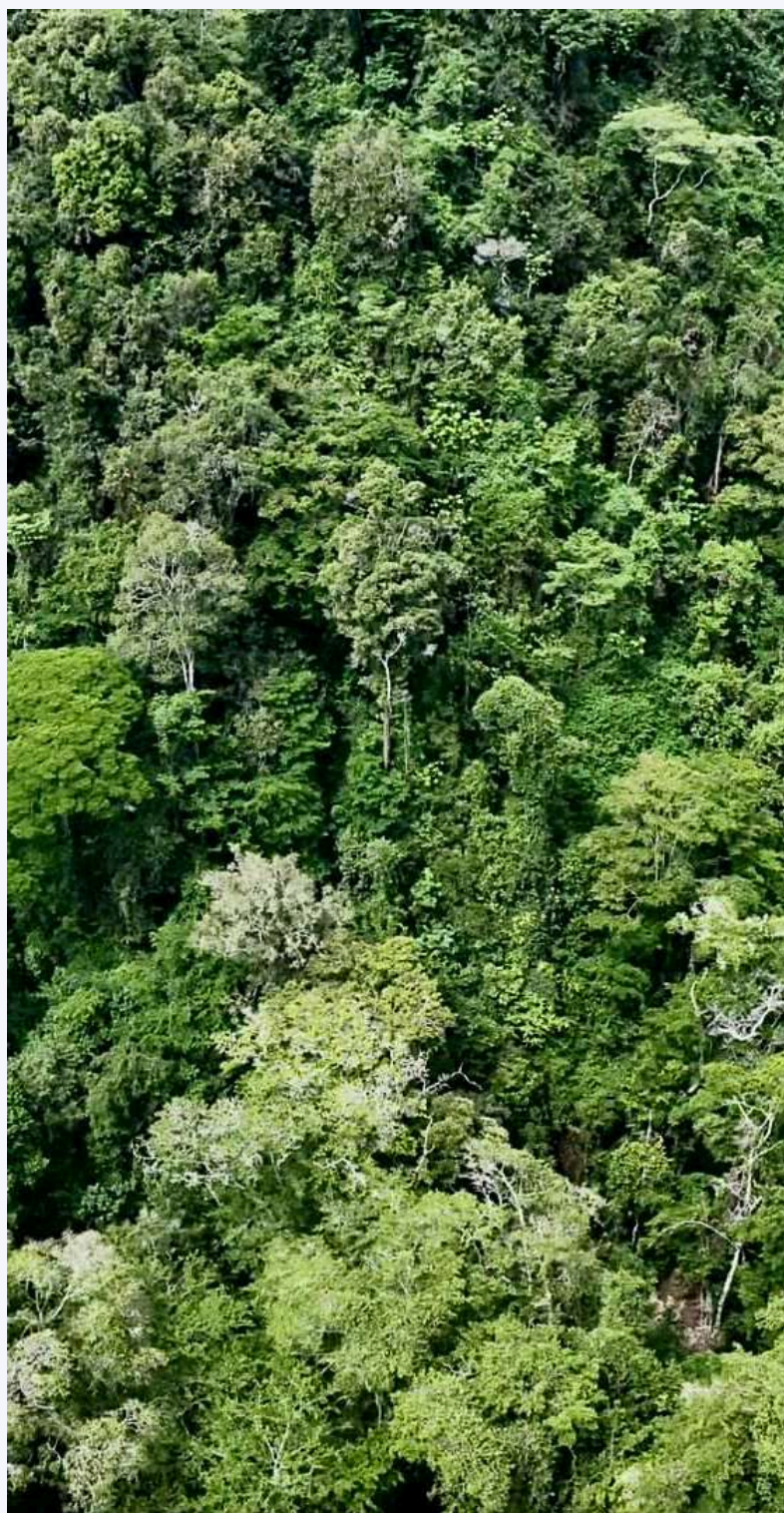
- Equity constraints:

Access to land and capital remains a binding constraint for women, youth, and PWDs.

Remedy: Facilitate inclusive finance (group savings/credit), asset co-financing, land-use arrangements, and mentored pathways into higher-value production.

Eng. Lawrence Mwangi,
Managing Director,
Losai Management Limited.

INTRODUCTION





1.1 Background

1.1.1 The Upper Tana Catchment Area

The Upper Tana River catchment covers approximately 17,000 square kilometres and encompasses diverse ecosystems, from high-altitude forests to arid lowlands. It is characterised by a complex hydrological network that includes several major rivers, including the Thika, Sagana, Gura, and Chania rivers, which converge into the Tana River, the longest river in Kenya (Figure 1). The catchment supports approximately 5.3 million people, including smallholder farmers, pastoralists, and urban residents, who depend on its resources for their livelihoods.[1]

The Tana River supplies 95% of Nairobi's water and 40% of Kenya's hydroelectricity, sustains over 300,000 smallholder farmers in the upper basin, and supports livestock in its lower reaches—making the Upper Tana vital for irrigation, domestic, and industrial uses.[2]

Yet sedimentation and unsustainable farming have degraded water quality and reliability, increasing treatment costs, triggering water and power rationing, and eroding downstream livelihoods. Population growth and climate change are intensifying pressures and conflicts over water use.

In response, partners established the Upper Tana-Nairobi Water Fund Trust (UTNWFT) in 2014, led by The Nature Conservancy, to restore the watershed and secure water quantity and quality.

[1] The Nature Conservancy. (2015). Upper Tana-Nairobi Water Fund Business Case. Version 2. The Nature Conservancy: Nairobi, Kenya. Available at: [Nairobi-Water-Fund-Business-Case_FINAL.pdf](#)

[2] The Nature Conservancy (2018). Upper Tana-Nairobi Water Fund About the IWA Basin-Connected Cities Action Agenda. Available at: [upper-tana-nairobi-water-fund](#)

WHERE WE WORK

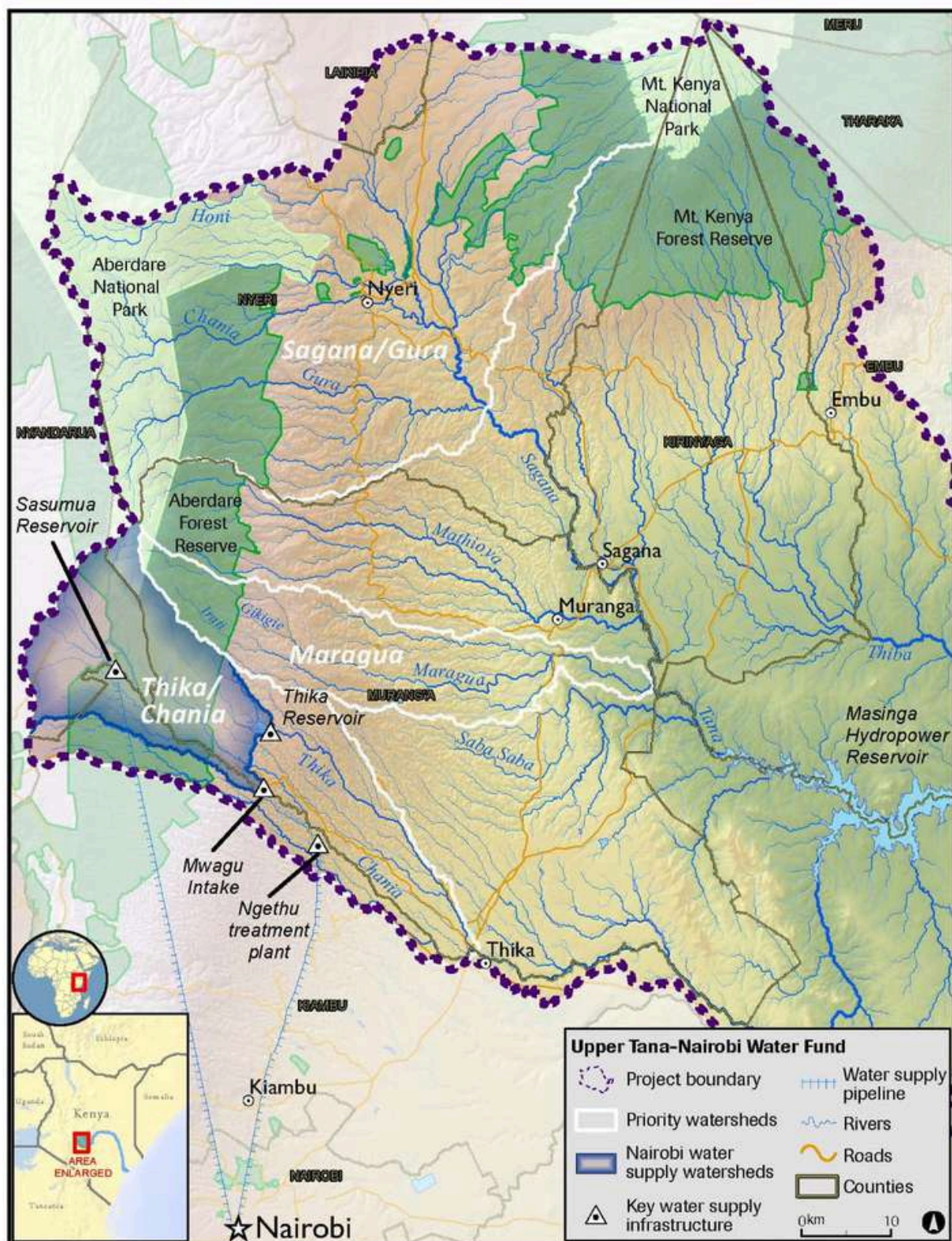


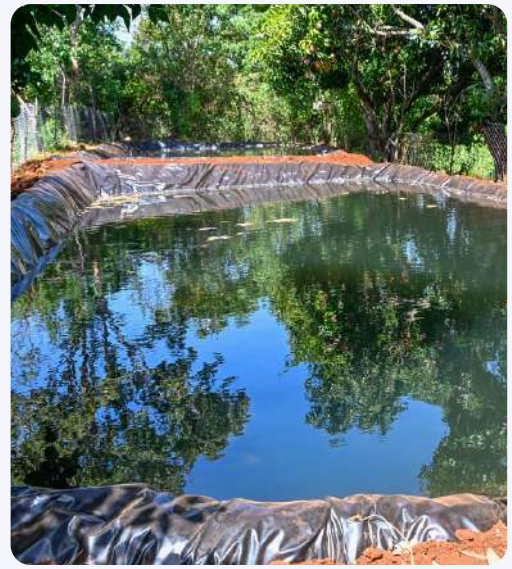
Figure 1: Distribution of the Sub-Catchments within the Upper Tana Catchment Area



01 Biogas System



02 Drip Kit



03 Water Pans



04 Terraces



05 Agroforestry Trees



06 Retention Ditches

OUR INTERVENTIONS



07 Riparian Conservation using Bamboo



08 Restoration of Gazetted Forests using Indigenous Trees

OUR JOURNEY: A DECADE OF IMPACT



470K+

hectares of forests and farmlands under improved management.

1,285 km

of terraces stabilized with Napier and Brachiaria grasses providing fodder for livestock.



260K+

farming families are benefitting from conservation benefits.



980+ km

of river riparian lands under protection with permanent vegetation cover.



2B litres

2 billion litres of rainwater harvested annually by over 17,000 water pans.



17K+

water pans excavated and lined with dam liners.

5.9 million

trees growing.



\$ 1.14 million

Income from livestock feed supporting 1,200 additional cattle.



41%

in turbidity reduction relative to 2013 baseline.



5.82MT

of CO2 Eq. sequestered (Ex-ante).



\$1.15 million

income from rainwater harvesting.



\$1.2 million

savings on water treatment costs.



\$117 million

Cumulative revenue from fruit and nut sales.



42 million

litres more water flowing to Ndaikaini dam every day as compared to the 2014 baseline.

1.1.2 The Nature Conservancy

The Nature Conservancy (TNC) is the largest global environmental organisation dedicated to conserving the lands and waters on which all life depends. In Kenya, TNC collaborates closely with communities, government agencies, and partners to promote sustainable land and water management practices, protect critical ecosystems, and enhance community resilience to climate change.

Its initiatives focus on rangeland restoration, water security, wildlife conservation, and sustainable-

livelihoods, ensuring that both people and nature thrive.

TNC launched the 10-year Upper Tana-Nairobi Water Fund programme in 2014 and, in 2017, the fund transitioned into a local legal entity (Trust) to help restore and conserve the Upper Tana catchment, address water scarcity and quality, enhance ecosystem services, and improve food security and livelihoods.

1.1.3 Upper Tana Nairobi Water Fund Trust

The UTNWFT was established as a public-private partnership to address those challenges through sustainable land management practices, conservation efforts, and improvements of the region's water resources. The rationale behind the project was that it is cheaper to invest in protecting water at the source than to address water problems downstream. The project mainly focused on water and soil conservation activities in three priority sub-catchments of the Upper Tana: Thika-Chania, Maragua, and Sagana-Gura.

The UTNWFT set out to achieve the following key objectives:



Improving water quality and quantity by reducing sedimentation in rivers and increasing green water retention



Promoting sustainable land management practices to reduce soil erosion.



Increasing agricultural productivity and improving farmers' livelihoods.



Conserving biodiversity by funding forest conservation measures such as reforestation and building community resilience to climate change by promoting practices that enhance their adaptive capacity and reduce vulnerability.

1.1.3 Upper Tana Nairobi Water Fund Trust (continued)

To achieve those objectives, the UTNWFT implemented a range of activities and interventions, such as those shown in Table 1.

Objective	Corresponding Interventions
Improving water quality and quantity by reducing sedimentation in rivers and increasing green water retention.	• Riparian land management • Terracing (Fanya Juu, Fanya Chini,[3] bench, ditches) • Grass strips • Rainwater/surface runoff harvesting (water pans)
Promoting sustainable land management practices to reduce soil erosion.	• Terracing (Fanya Juu, Fanya Chini, bench, ditches) • Grass strips • Riparian land management • Training and capacity building programs
Increasing agricultural productivity and improving farmers' livelihoods.	• Water pans • Terracing (Fanya Juu, Fanya Chini, bench, ditches) • Training and capacity building programs
Conserving biodiversity by funding forest conservation measures such as reforestation and building community resilience to climate change.	• Reforestation and afforestation • Riparian land management • Road shoulder management • Training and capacity building programs

Table 1: Summary of UTNWFT Objectives and Their Corresponding Interventions for Sustainable Water and Land Management

[3] The terracing style Fanya Juu means throw it upwards in Swahili, and Fanya Chini means 'throw it downwards'.

1.2 Impact Assessment of Upper Tana-Nairobi Water Fund Trust Activities

1.2.1 Objective of the Impact Assessment

To determine the impact of the UTNWFT's activities on community livelihood benefits, water quality and quantity, and conservation outcomes, the assessment sought to achieve the following objectives:

- Assess the environmental impacts of the project interventions.
- Evaluate the environmental, energy, and economic outcomes of the project.
- Determine the capacity of households and communities to withstand and recover from environmental and economic shocks.
- Assess the project's impact on gender equality and social inclusion.
- Document findings and insights from data collection and analysis, providing recommendations for future projects.

1.2.2 Scope of the Impact Assessment Study

The scope of the impact assessment study included:

- Review of the relevant previous project reports and documents.
- Preparation of data collection tools by developing questionnaires, interview guides, and other data collection tools, all tailored to the objectives of the impact assessment survey.
- Collect comprehensive data through questionnaires administered to selected households around the Upper Tana catchment areas, Thika-Chania, Sagana-Gura, and Maragua.
- Analyse collected data using relevant statistical methods.
- Prepare the impact survey report to summarise the findings, insights, and recommendations of the impact assessment.





RESULTS & DISCUSSIONS

2.1 Overview

The assessment targeted 1,107 farmers from a population of 266,325 and achieved a response rate of 88.8% (983 completed surveys). At a 95% confidence level with finite population correction, the achieved sample yields a margin of error of 3.12% (versus 2.95% if the full target had been reached).

This minor reduction in precision does not materially affect interpretation, and the achieved sample is adequate for statistically robust estimates and associated deductions.

The respondents were concentrated in Murang'a (615; 62.6%), followed by Nyeri (281; 28.6%) and Laikipia (87; 8.9%), based on the manner in which interventions were implemented.

One hundred percent of Murang'a County is in the Upper Tana watershed.

The overall average age of the respondents is 55 years, with county averages at Laikipia, 51; Murang'a, 56; and Nyeri, 56. Men constitute 63–64% of respondents in each county (overall: 63.4%; women: 36.6%).

By gender, average ages are 53.9 years for females and 56.0 years for males, indicating a modest male-female age gap across counties (the largest in Laikipia is 47 versus 53 years, respectively).

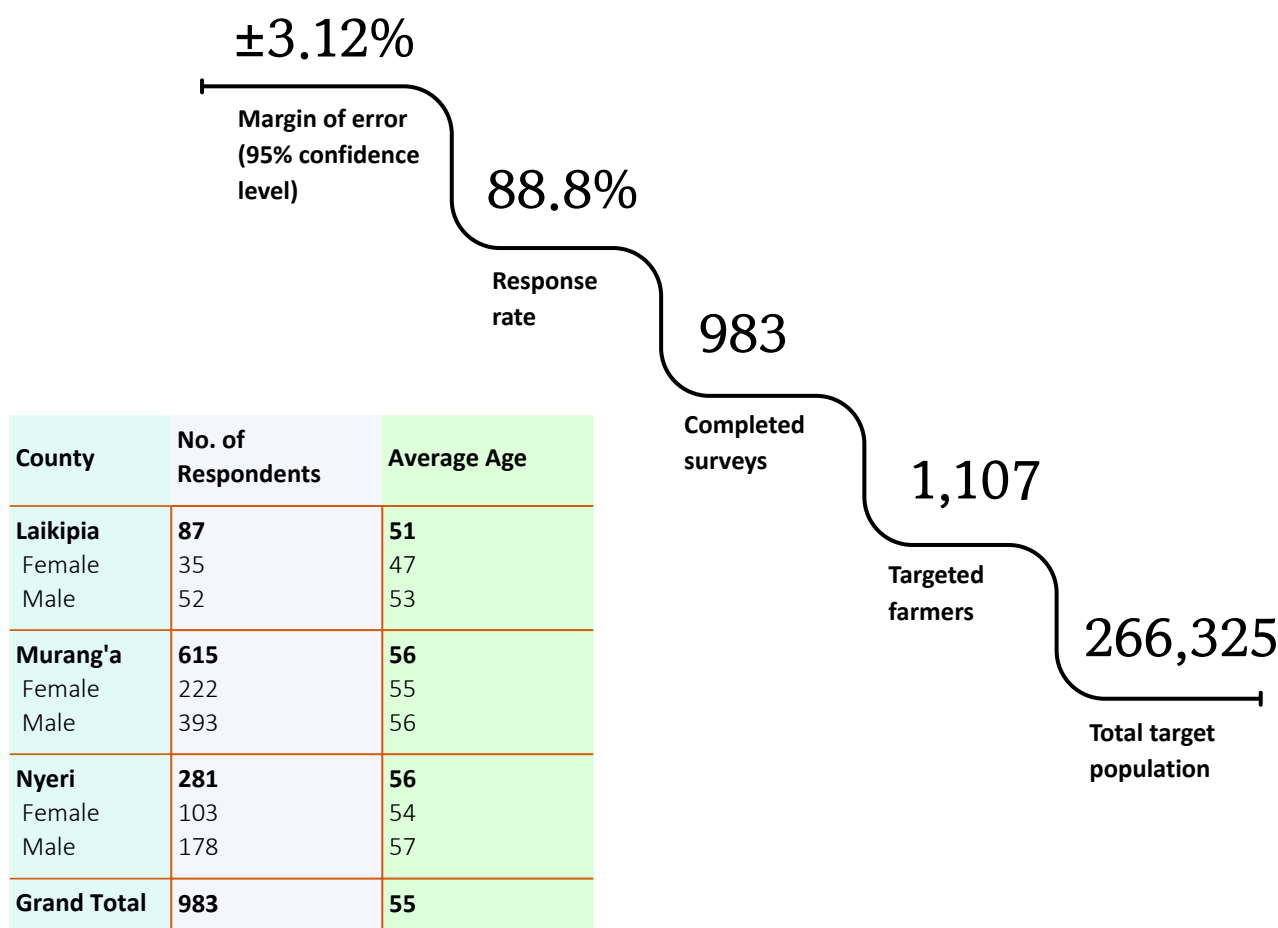


Table 2: Respondents' County, Gender, and Age

2.2 Avocado Value Chain

The avocado value chain comprises a sequence of activities that add value to the avocado as the fruit moves from farm to the final consumer. This sequence can be broadly categorised into the following stages:

- Input and production:

This involves the supply of quality seedlings, fertilizer, and manure. Cultivation of avocados requires land preparation and pest and disease management.

- Harvesting and post-harvesting:

This is key in the determination of quality and shelf life. It involves careful picking to avoid damage and the transportation to the packhouse or market (for local sale).

- Processing and value addition:

After leaving the farmer's orchard, the fruit undergoes grading and sorting for categorisation based on size and shape, specified by market standards. Fruit that does not meet fresh-market standards is then processed into avocado oil, guacamole, or pulp. Waste, such as seeds and skins, can be used to make cosmetics, compost, or other byproducts, thereby minimising waste.

- Marketing and retail:

The fruit is shipped to different markets using refrigerated trucks or reefer containers (for sea transport) to maintain a controlled atmosphere for export markets. The fruit product is also distributed to supermarkets, retailers, and foodservice channels such as hotels.

2.2.1 Analysis

General

Murang'a had the highest number of avocado trees planted (1,469,804), accounting for 89% of the total trees planted under the UTNWFT. Nyeri County and Nyandarua County followed closely with 7% and 3%, respectively. Nevertheless, Laikipia and Kirinyaga counties had a paltry 1% and below of avocado trees planted.



General (continued)

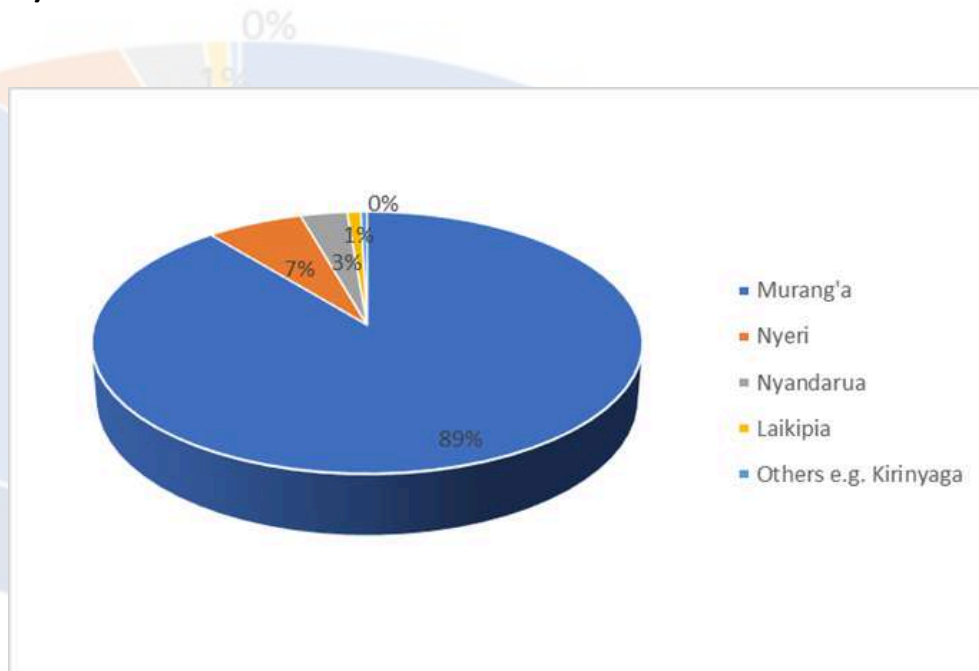


Figure 2: Percentage of Avocado Trees Planted

The tree survival rate across the counties was 86%. Table 6 presents the input costs per tree incurred by farmers in 2024. Using 2024 as the reference year for assessing input costs incurred by avocado farmers, the analysis shows that avocado production generated substantial indirect economic benefits within the input supply chain.

In 2024, farmers' demand for pesticides and fertilisers is estimated to have supported input retail businesses by about \$7.84 (KES 1,019), while the purchase of manure contributed an additional \$2,983,553 (KES 387,861,890) to farmers supplying organic inputs. These figures highlight the broader economic ripple effects of avocado farming beyond on-farm income alone.

Input Description	Cost per Tree (USD)	Cumulative cost for all trees in 2024 (USD)
Pests and Spraying	3.8	5,389,294
Manure	2.1	2,983,553
Fertilizer	1.7	2,446,117
Grand Total	7.6	10,818,964

Table 3: Input Costs as of 2024

Fruit Production

Fruit production from trees planted in 2018 has varied over the years, with average fruit yields per tree ranging from a high of 466 in 2018 (6-year-old trees) to a low of 40 in 2023 (2-year-old trees), reflecting the expected decline during the juvenile-to-early bearing transition phase.

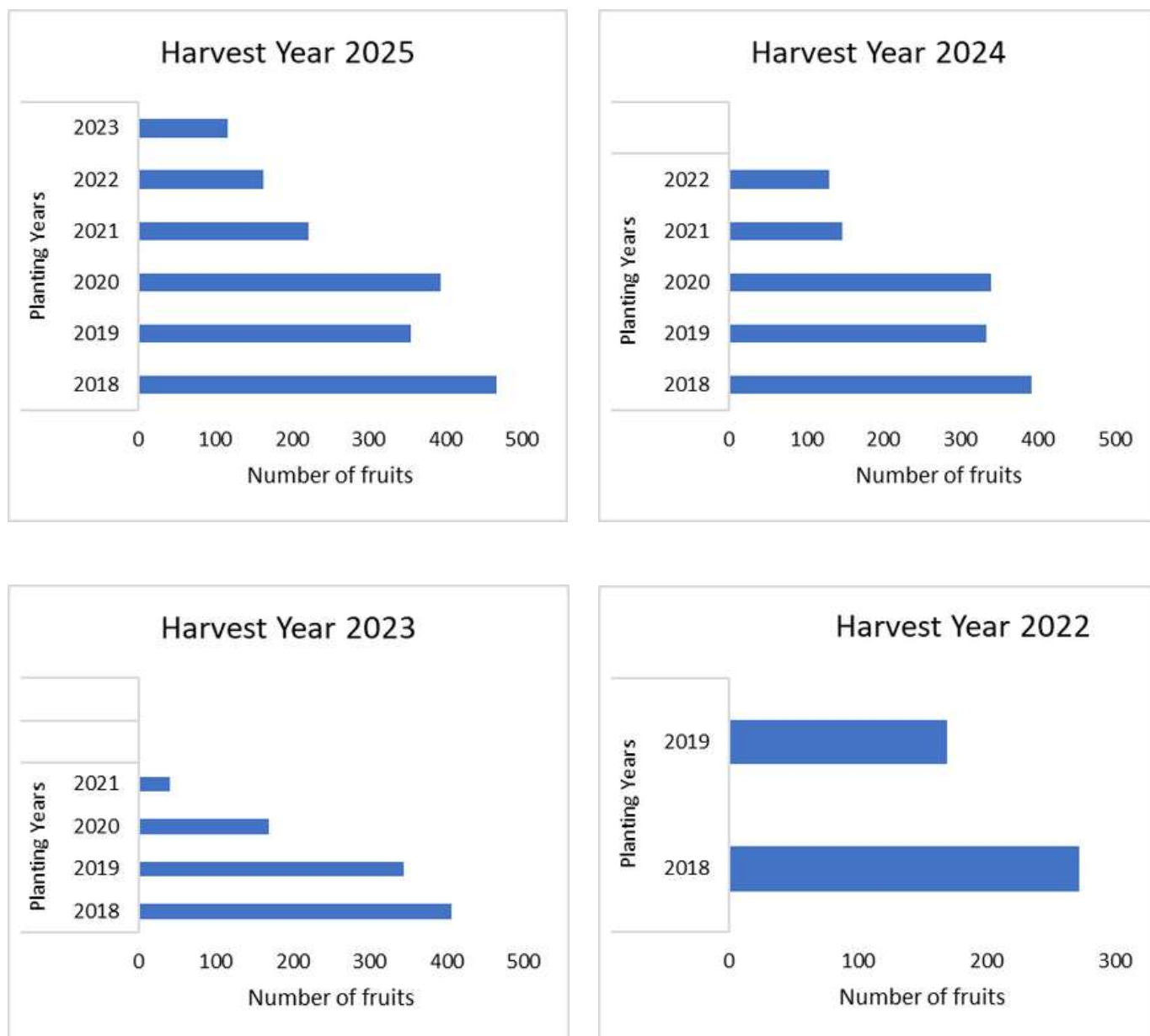


Figure 3: Year-on-Year Changes in Fruit Production per Harvest

Across counties, the average annual output—calculated from the average number of avocados produced per tree per harvest—was approximately 324,100 per year. As shown in Figure 4, production per harvest has been on a gradual upward trajectory since 2022. This trend reflects the natural maturation of avocado trees, which typically produce increasing quantities of fruit as they age, resulting in improved yields over time. See Figure 5.

Fruit Production (continued)

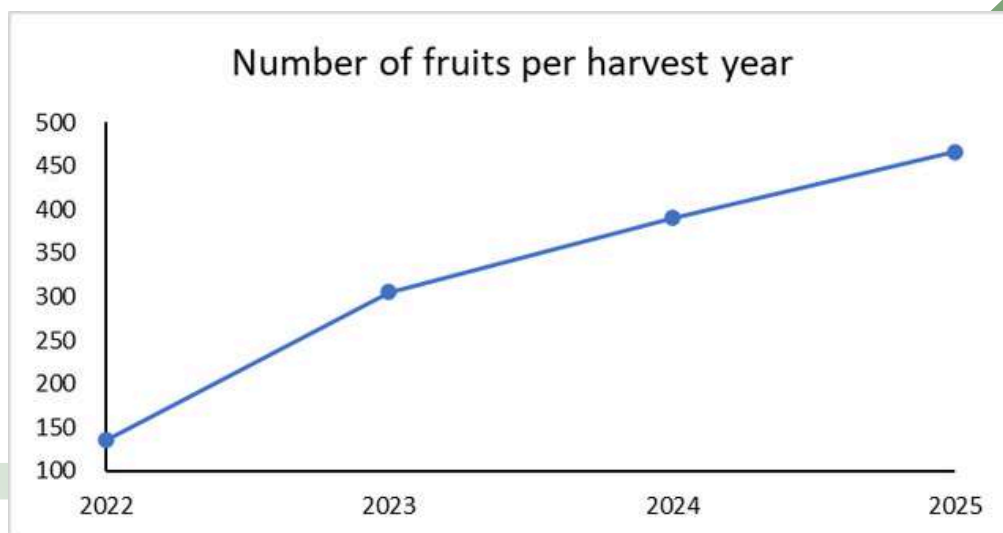


Figure 4: Number of Fruits per Harvest Year

Fruit Utilisation

Most of the harvested avocado fruit is allocated to the export market, with 68% of total production entering formal export channels (Figure 6). A further 3% is consumed directly at the household level or shared informally with family and neighbours, while 29% is sold in local markets or aggregated for local oil processing.

These proportions reflect a utilisation distribution dominated by commercial market pathways, with household consumption contributing only a marginal share of total output. The relatively small proportion consumed at home suggests a strong market orientation among producing households and indicates that subsistence utilisation represents a statistically minor component of total fruit flow.

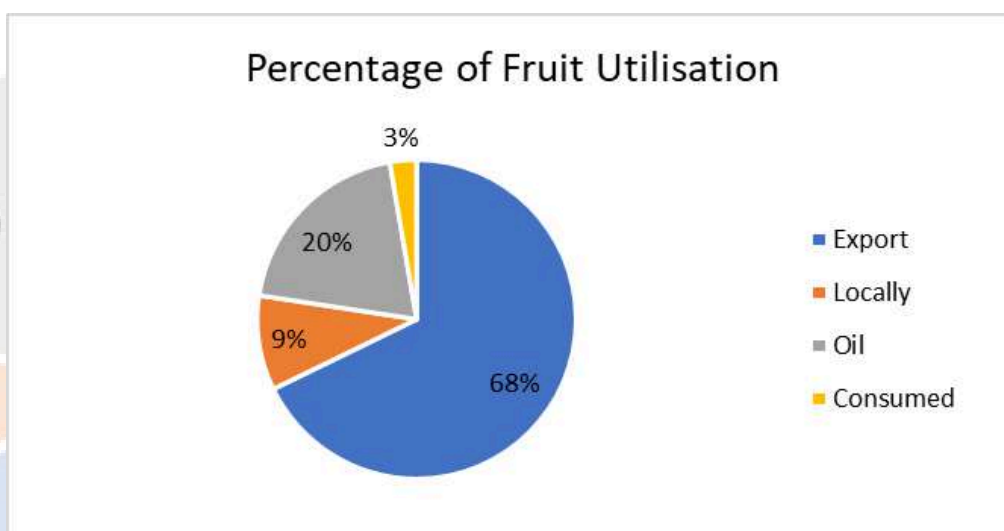


Figure 5: Percentage of Fruit Utilisation

Fruit Utilisation (continued)

Price disparities across market segments partly drive differences in utilisation pathways. Export-grade fruit commands the highest market value, ranging from KES 75 to KES 95 per kilogram, compared with KES 30 to KES 40 for locally marketed fruit and approximately KES 25 per kilogram for fruit destined for oil-processing enterprises. These price differentials create an economic incentive structure that favours grading and sorting practices that maximise the proportion of fruit sold into premium markets.

Avocado is also associated with substantial nutritional benefits, given its favourable nutrient profile, including elevated levels of monounsaturated fatty acids, fibre, essential vitamins, and minerals. Although local nutritional studies remain limited, international empirical evidence demonstrates that regular avocado consumption is correlated with improved cardiometabolic outcomes.

Epidemiological analyses from the National Health and Nutrition Examination Survey, for example, show that avocado consumers have lower body mass index, smaller waist circumference, and a reduced risk of metabolic syndrome compared with non-consumers. These results reinforce the potential public health value of local avocado availability, particularly in areas where dietary diversity remains constrained.[5]

Macronutrient	Amount	Key Characteristic
Calories	160kcal	Higher than most fruits due to fat content.
Total Fat	14.7g	Mostly monounsaturated fat (heart-healthy oleic acid).
Saturated Fat	2.1g	Relatively low.
Carbohydrates	8.5g	Low, making it keto-friendly.
Dietary Fibre	6.7g	Excellent source, promoting digestive health.
Total Sugars	0.7g	Incredibly low sugar content (one of the weakest among fruits).
Protein	2g	Low compared with animal products, but moderate for a fruit.

Table 4: Nutritional Value of Avocado per 100g Serving

An estimated 97% of harvested fruit is commercialised, either through export or local sales. Applying observed prices to the respective market channels, the cumulative value of the avocado value chain during the four years from 2022 to 2025 is estimated at \$29,271,235 (KES 3,805,260,550) per year, as summarised in Table 8.

This corresponds to a progressive increase in revenue across successive years, consistent with the increasing volumes of mature fruit entering the market. The scaling of revenue generation has produced measurable social impacts, including the expansion of income-generating opportunities for growers, local transporters, aggregators, and processors along the value chain.

[5] Avocado consumption is associated with better diet quality and nutrient intake, as well as lower metabolic syndrome risk in U.S. adults. From Victor L Fulgoni III, Mark Dreher, and Adrienne J. Davenport, National Health and Nutrition Examination Survey 2001–2008.

Fruit Utilisation (continued)

Year	Amount (USD)
2025	42,106,665
2024	35,221,964
2023	27,560,204
2022	12,196,109
Total	117,084,942

Table 5: Total Revenues per Harvest Year

Beyond direct income benefits, secondary utilisation of low-grade fruit for animal feed—as a high-energy, digestible supplement for livestock—offers an additional economic advantage. Farmers commonly use rejected fruit as fodder, reducing feed costs and modifying seasonal feed.

availability. As trees mature and yields expand, nutrient-dense fruit that would otherwise go to waste becomes available in larger quantities, further enhancing household benefits. Local processing activities can additionally increase oil recovery and value addition, with well-managed small-scale facilities achieving recovery efficiencies of 8–12%, depending on fruit quality and extraction technology.

Job Creation

During harvesting, farmers or fruit purchasers employ youth to pick fruit from the trees. Due to the delicate handling required for export-quality fruits, the individuals are usually paid about KES 1–KES 2 per fruit in areas such as Murang’a and about KES 500 per day in places like Nyeri for the same activity.

This results in 2,592,802 man-days of job creation per year—equivalent to 22,000 jobs created for a 120-day harvest season. Likewise, using a standardised daily wage of KES 500, fruit harvesting yields cumulative wage earnings of KES 1,296,400,866 for youth employed as fruit harvesters/pickers.



2.3 Fodder Grass Value Chain

The fodder grass value chain is built on the concept of integrating fodder production with soil and water conservation, directly addressing the pressure on riparian lands and further contributing to stable livestock production and household income streams through surplus sales. This can be categorised into the following subsections:

- Inputs:

The UTNWFT provided farmers with high-yielding fodder grass and fodder tree seedlings/splits, such as Napier grass and various legumes, such as Calliandra. The choice of fodder grass was due to its superior yield and high nutritional value.

- Production:

Farmers were supported in strategically planting grasses as buffer strips and stabilizing terraces.

- Utilisation and livelihoods:

Farmers use high-quality fodder to supplement their livestock feed. Because fodder is high yielding, it increases feed availability for farmers' livestock. The fodder is also highly nutritious, with Super Napier grass containing 16–18% protein, compared with local Napier grass at 8–12%.

2.3.1 Analysis

General

The Upper Tana-Nairobi Water Fund Trust has facilitated the establishment of about **1,904,294 metres of fodder grass**, representing the largest cumulative planting effort in the programme landscape. **Murang'a County accounts for 57% of the total fodder grass** established, reflecting both higher farmer participation and greater land allocation to livestock-feed interventions in this region.

Adoption is strongly concentrated around a single cultivar: 86% of farmers established Super Napier, while the remaining 14% adopted alternative varieties such as Kakamega and Brachiaria. Implementation timelines indicated that 55% of farmers initiated fodder grass production only after UTNWFT interventions, demonstrating a clear programme attributable shift in household investment behaviour (Figure 7).

In picture: Stabilized terraces using Super Napier grass.



General (continued)

Taken together, these statistics show that UTNWFT training, extension support, and input provision were the primary drivers of uptake, effectively catalysing the adoption of fodder-based livelihoods and soil conservation systems across participating counties.

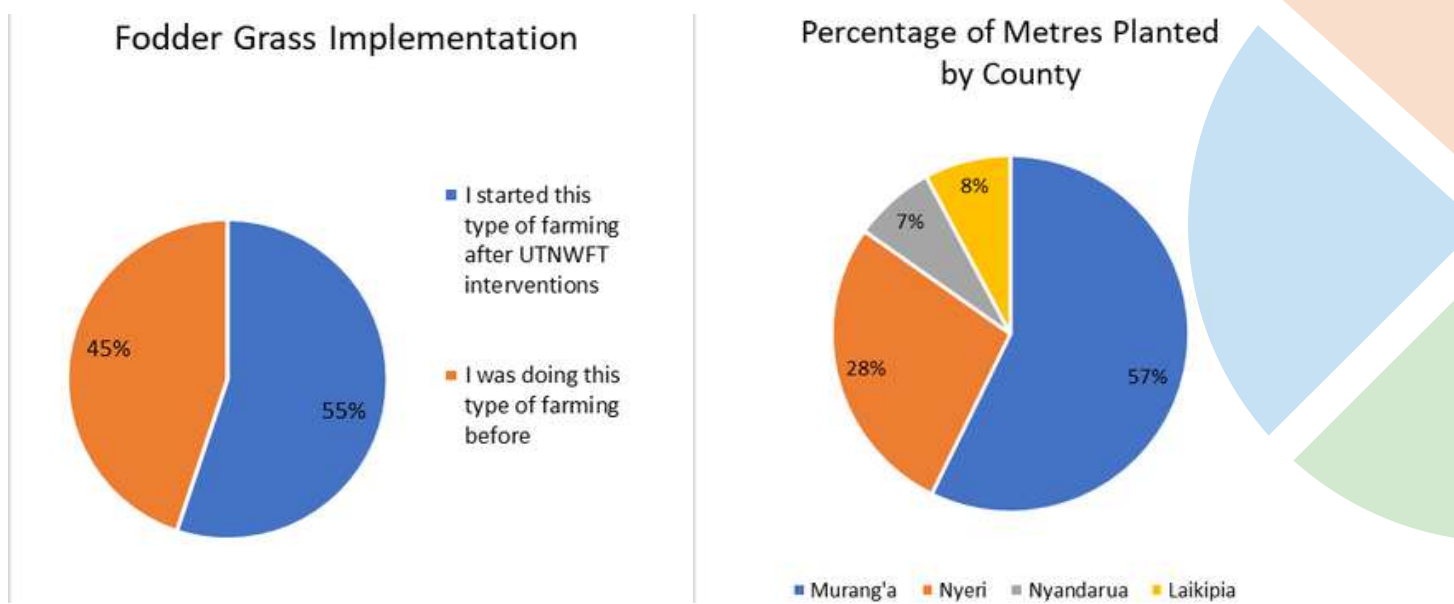


Figure 6: Fodder Grass Implementation

Yield

Super Napier grass can produce up to 200 tons of fresh fodder per acre,[6] which corresponds to approximately 49kg/m². The farmers reported an average production of 22.9 kg of fodder grass per metre of planted fodder grass, which is harvested approximately three times per year.

Across the counties, Murang'a had the highest incidence of fodder grass planting and the highest yield. Although Nyandarua and Laikipia had lower yields, their production (kg/m) was high (Figure 8).

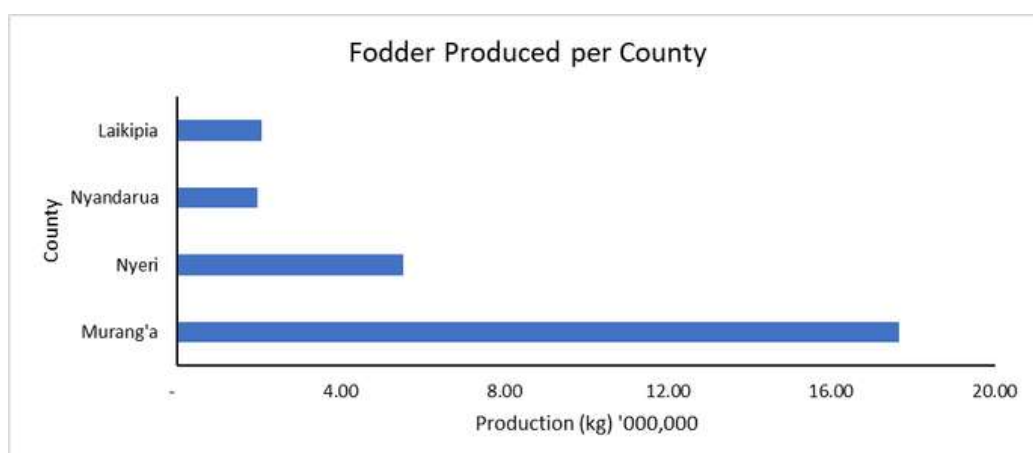


Figure 7: Fodder Grass Planted and Yields

Fodder Grass Utilisation

Most farmers (79%) use fodder grass to feed their livestock and then sell the surplus (21%). On average, a cow consumes 66 kg of fresh fodder, meaning the fresh fodder planted by farmers supports 282 cows across the four counties. Using harvested fodder grass from the supplied Super Napier as cow feed reduces farmers' costs, as they do not need to purchase commercial feed. In return, farmers apply livestock manure to grow food and cash crops, with the resulting harvests and sales further supplementing household income and food security.

Income Generation

In addition to feeding their livestock fodder, farmers sell surplus fodder to earn revenue, as reported by 21% of the surveyed farmers. On average, the farmers sell fresh fodder at KES 5/kg, translating to \$1.14 million (KES 148.2 million) in cumulative sales over the three years reviewed. Murang'a County tops the list, with fodder revenue increasing from KES 5.1m in 2018 to 149.6m in 2024. In terms of production, farmers spend approximately KES 39 on manure and KES 19 on fertiliser per square metre per year.



Figure 8: Annual Income from Fodder for Counties

Source of Water for Fodder Grass

Ninety percent of the farmers surveyed use rainwater as the primary source of water for the fodder grass, as highlighted by Figure 10. From the graph, fodder grass is maintained primarily by rainfall and nearby streams, with few farmers relying on stored water sources such as water pans or water schemes, which they must purchase. This points to an urgent need for cost-effective interventions that not only help farmers provide adequate fodder for their livestock but also ensure a stable water supply on their farms.

Source of Water for Fodder Grass (continued)

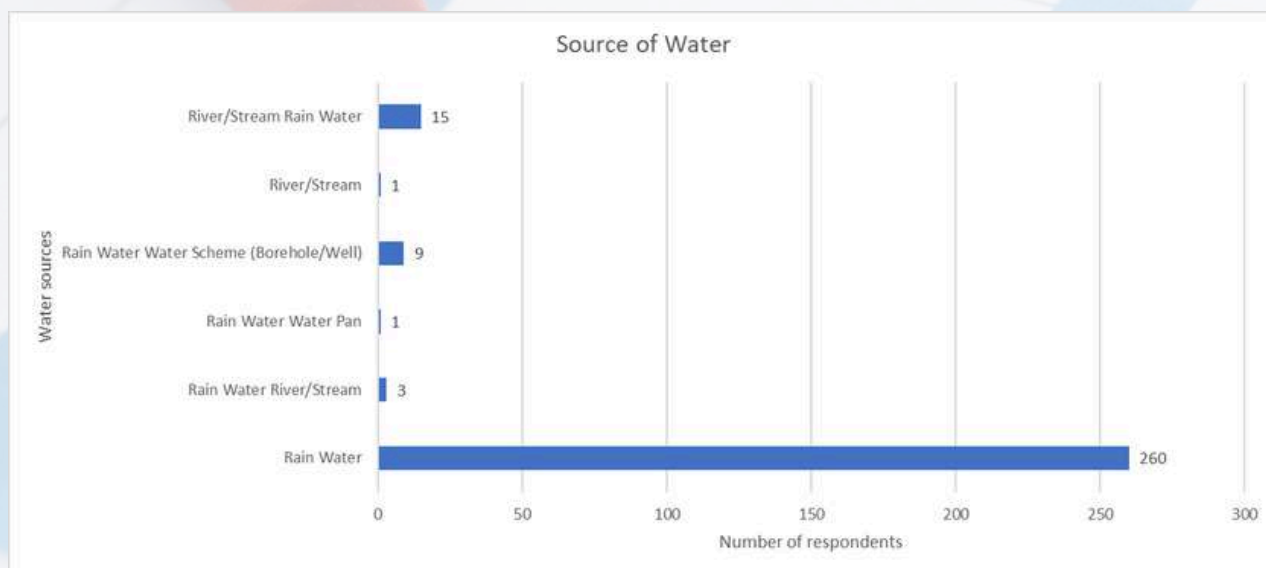


Figure 9: Fodder Grass Water Sources

Job Creation

In terms of employment, 57% of the farmers use only family labour to cultivate the fodder grass, and only 4.4% use employees fully to take care of the fodder grass. The rest of the farmers use both family and casual labourers.

The 25% of the farmers who have employees use permanent employees at a rate of KES 9,000 per month. Casual employees are mainly young men, and a farmer typically requires only one casual employee at an average rate of KES 400.

2.4 Water Pan Value Chain

A water pan is a small, excavated earth structure designed to collect, harvest, and store rainwater while minimising runoff. Typically, it is constructed by excavating the ground, compacting the sides to minimise seepage and, for the UTNWFT, lining the basin.

The water pan value chain focuses on water conservation and sediment reduction by incentivising farmers to collect rainwater in water pans and to shift away from farming along riparian land. Farmers were provided with the dam liners after excavating the water pans as per the prescribed sizes.

Additionally, the water pans are expected to provide irrigation water even after the rainy season, thereby ensuring food security for farmers. Surplus produce from irrigation farming is sold to improve farmers' financial status. The farmers also engage in high-value crop diversification, including market-ready horticultural crops such as tomatoes, cabbage, kale, spinach, and French beans.

2.4.1 Analysis

General

The water pans supported by UTNWFT activities were of three sizes: 24,000 litres (24 m³), 50,000 litres (50m³), and 100,000 litres (100 m³). The UTNWFT provided dam liners to the farmers after the water pans were dug out. The farmers collect rainwater for the water pans. The water pans are replenished two to three times for rainwater harvesting.

Water Pan Uses

On average, 68,773 litres of water are harvested annually from each water pan, for a total of 1,719,337,800 litres per year. The evapotranspiration rate in the Upper Tana region is approximately 644 mm per year, which is insufficient to affect the volume of water harvested materially. In terms of use, the primary use of the water pans is irrigation farming (83.8%), followed by livestock watering, as illustrated in Figure 11.



Water Pan Uses (continued)

Some farmers established fish farms, but because of the size of the water pans, the amount of water available, and the time required to maintain the fish commercially, they primarily use the fish farms for subsistence farming.

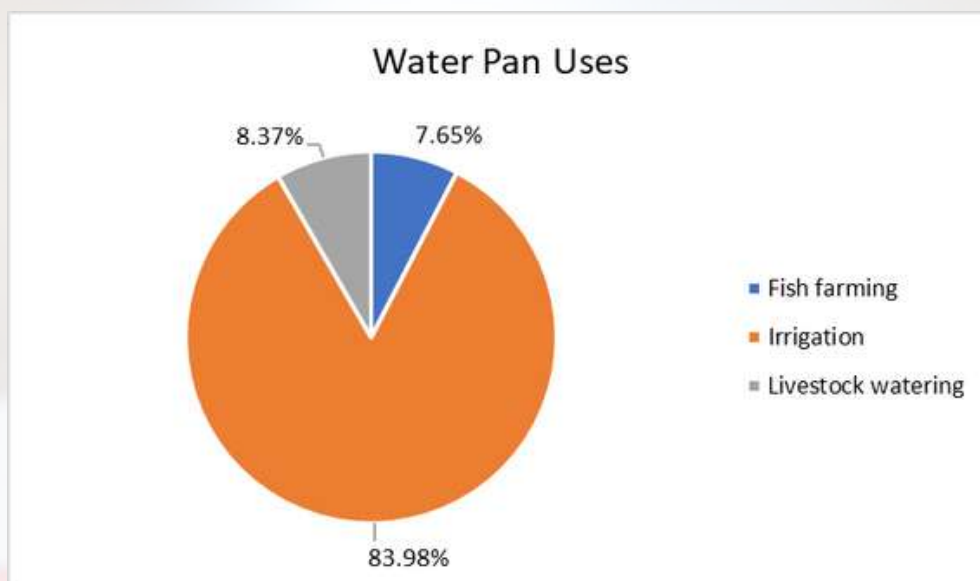


Figure 10: Water Pan Uses

Most (59%) of the farmers started undertaking the farming enterprise they reported due to the activities introduced by the UTNWFT, as illustrated in Figure 12.

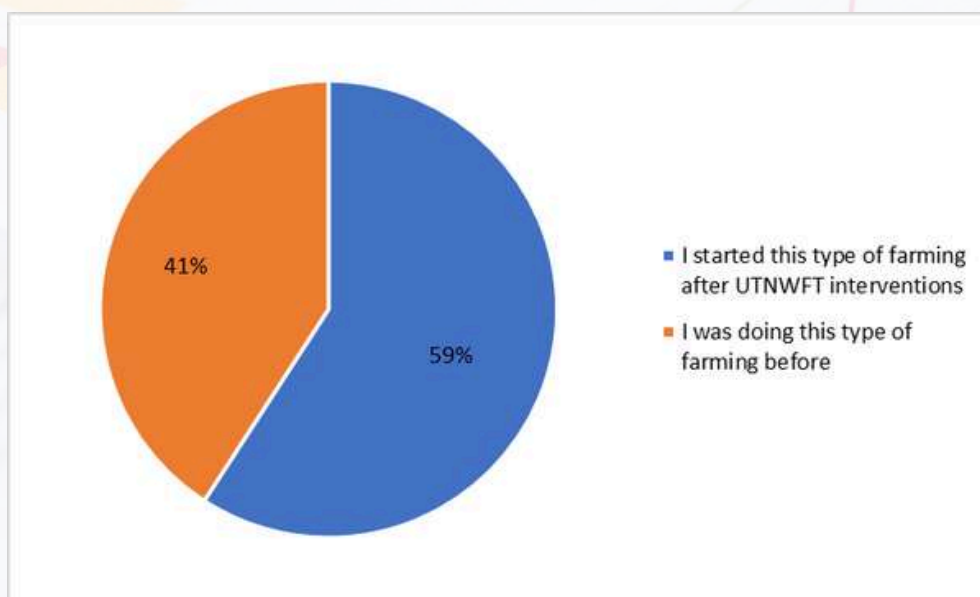


Figure 11: Previous and Current Farming Practices

Water Pan Uses (continued)

The farmers who use the water pans for watering livestock reported a growth in the number of animals as a result of an increase in the availability of water, as evidenced by Table 9.

Livestock	Increment (Number)	Value (KES)
Cows	2	38,813
Goats	9	7,257
Sheep	4	7,333
Any other (Poultry)	9	463

Table 6: Animal Increase with Water Availability

In addition to water access, farmers with water pans also utilised stored water for irrigation, cultivating a range of crops under small-scale horticulture. As illustrated in Figure 13. Vegetables were the dominant irrigated crop (48%), reflecting farmers' preference for short-cycle, high-value crops that maximise the benefits of limited stored water.

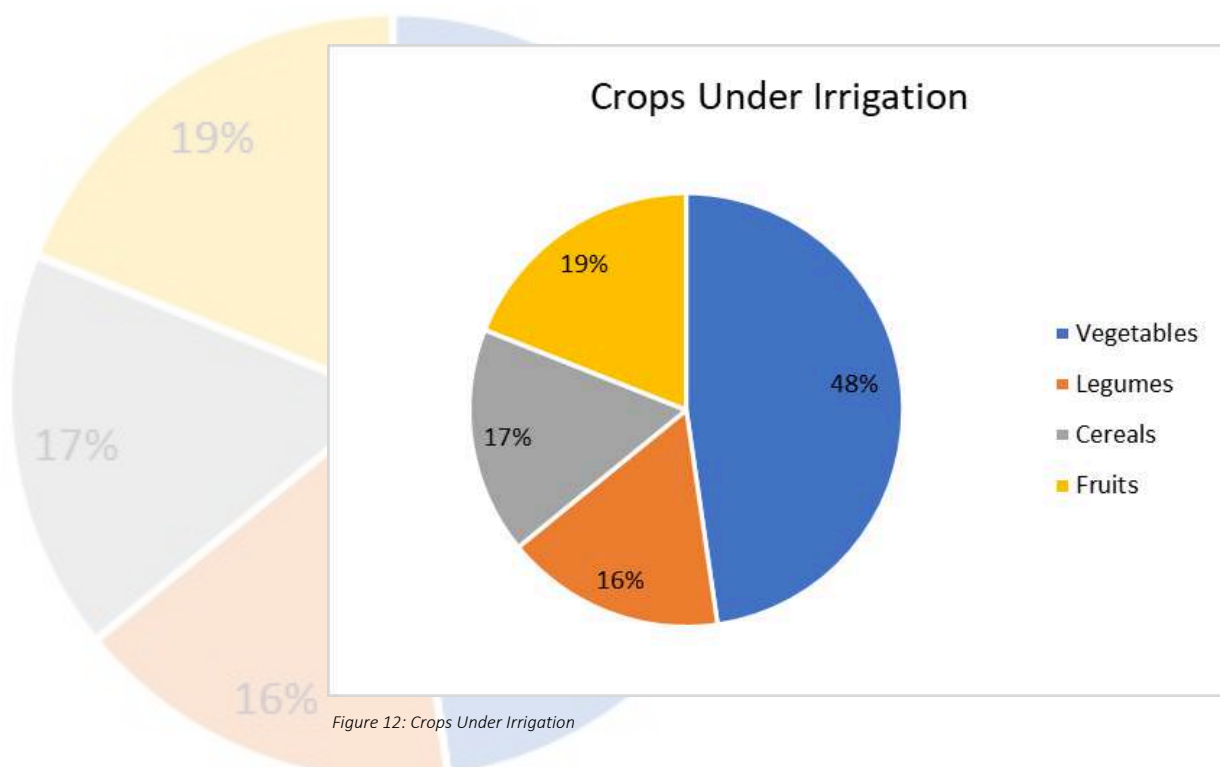


Figure 12: Crops Under Irrigation

Among farmers who already had crops before the introduction of water pans, 87% reported that the number of cropping cycles increased from two to four per year, indicating substantial production intensification attributable to improved water availability.

Benefits

Farmers using water pans reported meaningful economic and livelihood benefits from the intervention. Among those who sold irrigated produce, the average annual income was KES 21,099 (\$162.30). Applying this average to the estimated 13,333 water pans used for irrigation, out of the 15,900 constructed by the UTNWFT, the projected annual revenue from water-pan–supported irrigation is approximately \$2,163,988 (KES 281,318,440).

Beyond income gains, 94% of farmers indicated that the water pans significantly reduced the time previously spent fetching water, freeing household members—often women and youth—to engage in additional productive or domestic activities. Labour use patterns indicate that 64% of farmers rely primarily on family labour, with the remainder using a combination of family and hired labour to manage irrigated crops.

The intervention also stimulated indirect job creation by increasing demand for dam liner manufacturing and supply, thereby contributing additional economic value along the implementation chain.



2.5 Drip Kit Value Chain

The farmers were provided with drip kits to catalyse conservation-oriented water harvesting and sustainable agricultural practices, while preventing farming on riparian land, thereby securing benefits for downstream water users.

Drip kits offer maximum water efficiency by minimising water loss from surface runoff, evaporation, and deep percolation below the root zone. Drip irrigation has been shown to improve water use efficiency by up to 95% and increase crop yields by 20–90%, depending on the crop.[7]

By maximising the use of the drip kits through water harvesting, it reduces the need for farmers to abstract water directly from the rivers, especially during the dry season. The drip kits enable farmers to practice irrigation, particularly for high-value horticultural crops, thereby increasing household income. Farmers can also engage in subsistence farming, thereby ensuring their food security.

3.4.1 Analysis

General

Of all farmers using drip irrigation kits, 42% operate on plots of approximately 0.25 acres, as illustrated in Figure 14, with the remainder distributed across 0.125 acres (28%), 0.5 acres (21%), and 1 acre (9%). This land allocation is sufficient to support both horticultural production and subsistence farming activities.

Farmers highlighted that the drip kits were particularly beneficial during the dry season, noting they provided a more reliable and efficient irrigation source than their previous water-use practices.

[7] Arup Mondal and Sourakanti Sarkar (2025). "Drip Irrigation vs. Traditional Methods: Who Wins and Why?" Available at: [Drip_Irrigation](#)



General (continued)

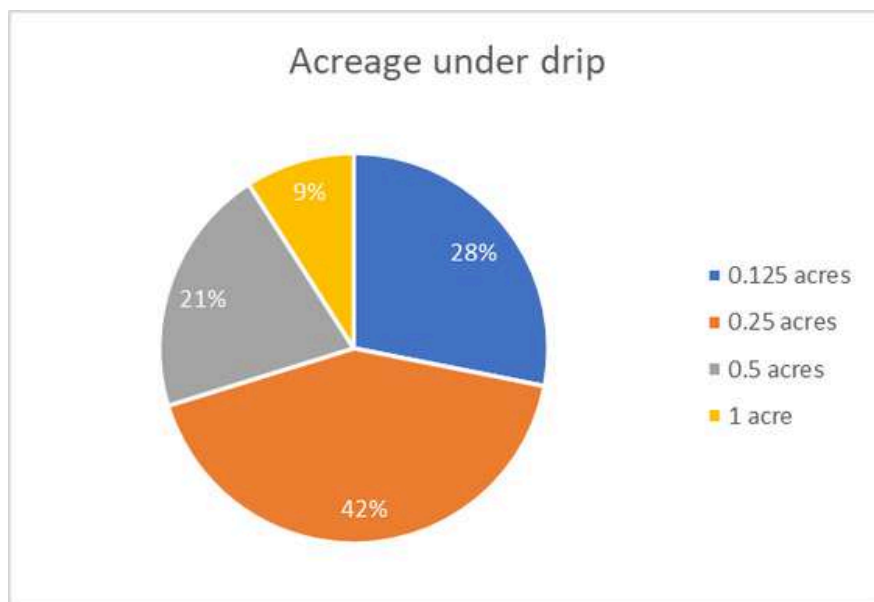


Figure 13: Acreage Under Drip Irrigation

Drip Kit Uses

Forty-eight percent of the farmers with drip kits plant vegetables such as kale, spinach, cabbage, and French beans. However, they do not farm vegetables exclusively but also combine them with fruit, cereal, and other crops such as potatoes, as illustrated in Figure 15. This shows the diversification of farming activities, which ensures the stability of farm income and food security among farmer households.

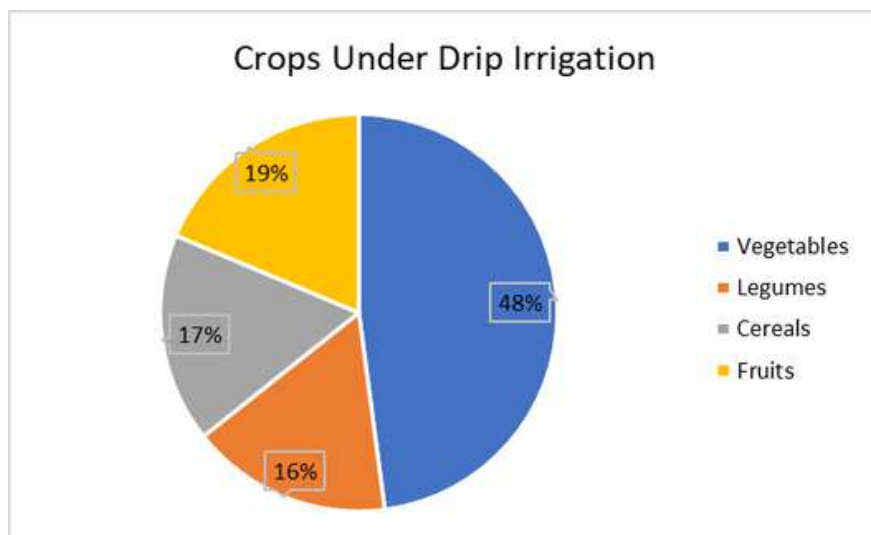


Figure 14: Crops Under Drip Irrigation

Slightly over half of the farmers (54%) were already engaged in the same type of farming before receiving drip irrigation kits, whereas 46% adopted or expanded their farming activities after obtaining the kits (Figure 16).

Drip Kit Uses (continued)

Drip systems were used primarily to support both commercial and household production: 55% of farmers irrigated for both sale and self-consumption, 25% focused mainly on sales, and 20% produced mainly for home use. Farmers reported that the improved reliability of water supply from drip kits enhanced both incomes and food security, prompting many to request additional kits and storage tanks to expand irrigated areas on their farms. From the sale of drip-irrigated produce, the value chain generated about **\$1.1 million (KES 140.2 million)**.

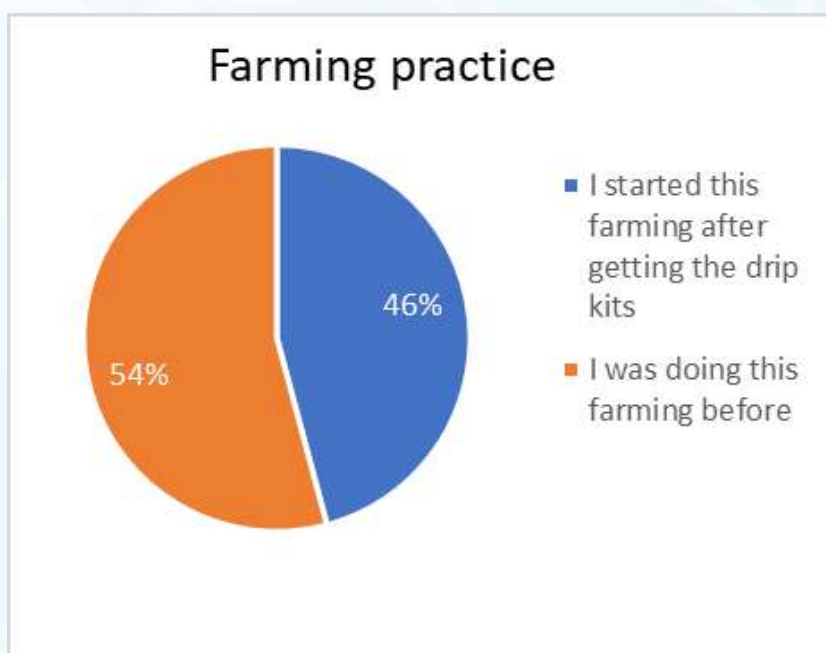


Figure 15: Farming Practice

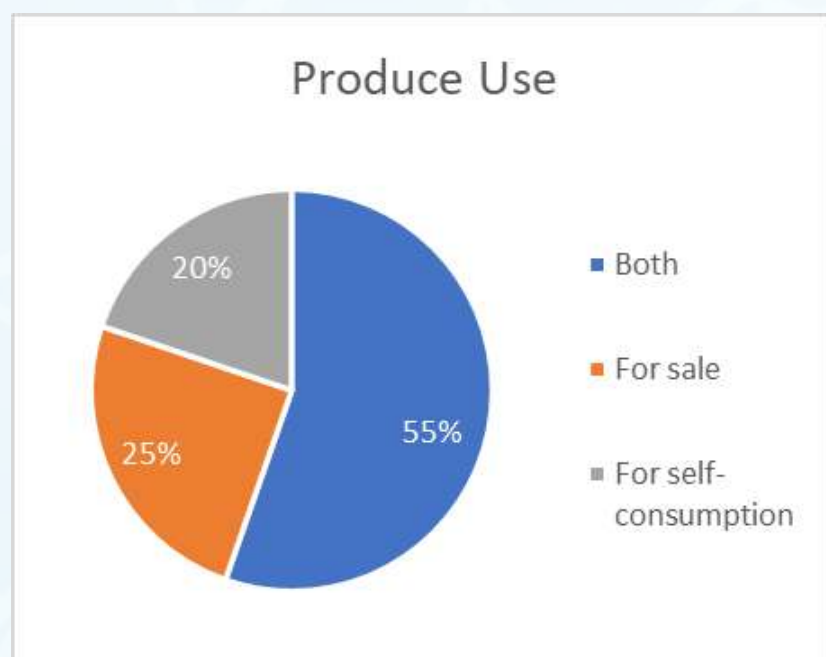


Figure 16: Produce Use



2.6 Water Utility Value Chain

Nairobi City Water and Sewerage Company (NCWSC) obtains water from the Ndakaini Dam, which is fed by the River Tana, from Upper Tana Catchment. The activities undertaken by UTNWFT are aimed at increasing downstream water availability for beneficiaries, including Nairobi City Water and Sewerage Company and the people it serves within and outside Upper Tana catchment areas.

The assessment examined the relationship between rainfall and water inflows to the Ndakaini Dam. Figure 18 and Figure 19, illustrates the relationship between rainfall and water inflows into Ndakaini Dam:

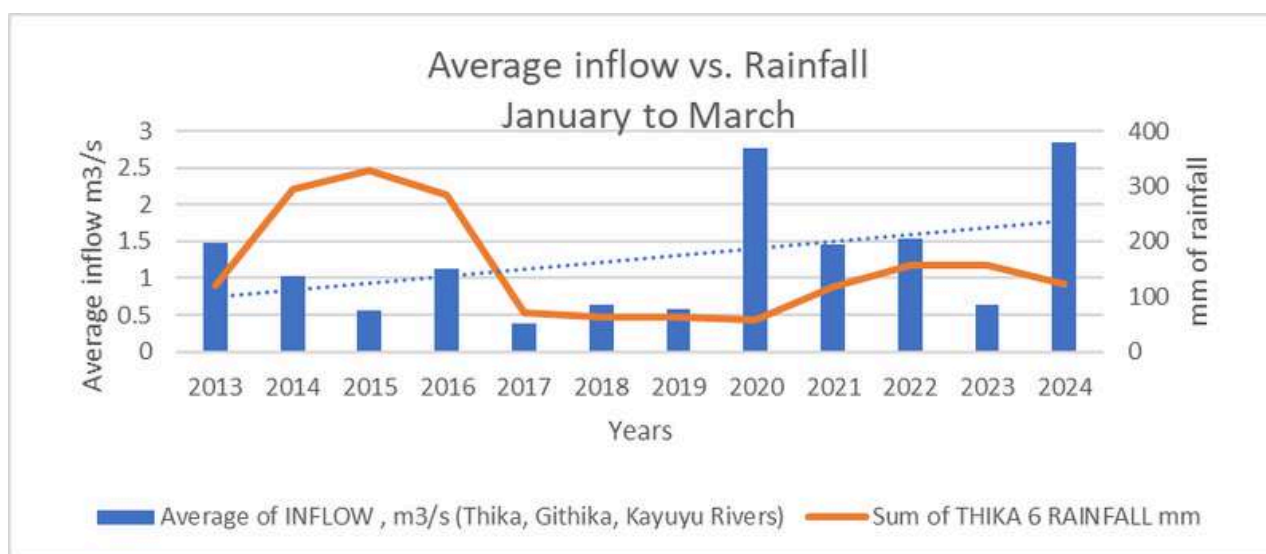


Figure 17: Average Water Inflow into Ndakaini Versus Rainfall (January to March)

Water Utility Value Chain (continued)

The data indicate that inflows from January to March range from 0.38 m³/s to 2.84 m³/s, and rainfall varies from 57 mm to 328 mm. Several years exhibit high inflow despite low rainfall, such as 2020 and 2024, whereas others exhibit low inflow despite high rainfall, such as 2015 and 2017–2019.

The inconsistency indicates that the flow is affected not only by the timing and density of short rains but also by improved catchment infiltration and storage, which may result from sustainable land practices upstream, some of which have been implemented by UTNWFT.

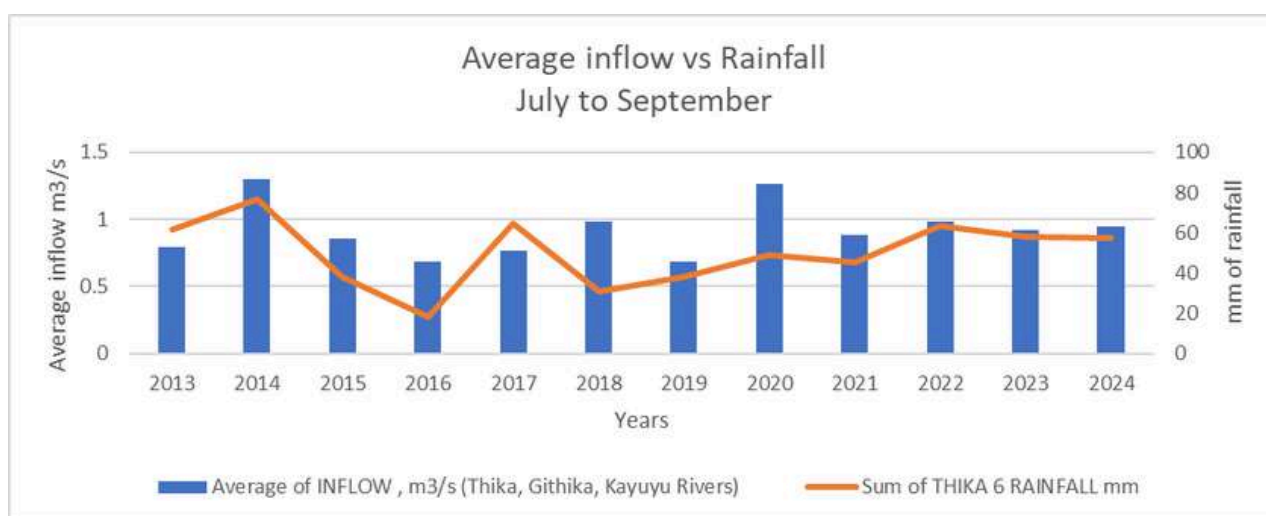


Figure 18: Average Water Inflow into Ndakaini Versus Rainfall (July to September)

Water inflows from July to September were more stable, as indicated by data ranging from 0.68 m³/s to 1.3 m³/s. Rainfall was consistently low (18–76 mm), but flow remained above 0.68 m³/s. This characteristic indicates increased infiltration during the long rains and a stable catchment that releases water gradually into the rivers even during the dry season. The sustainable land management activities undertaken by UTNWFT have contributed to the retention and infiltration of rainfall water upstream.

From Figure 20, The trendline shows an increase in water inflow into Ndakaini Dam during the dry months of January to March of about 1 m³/s.

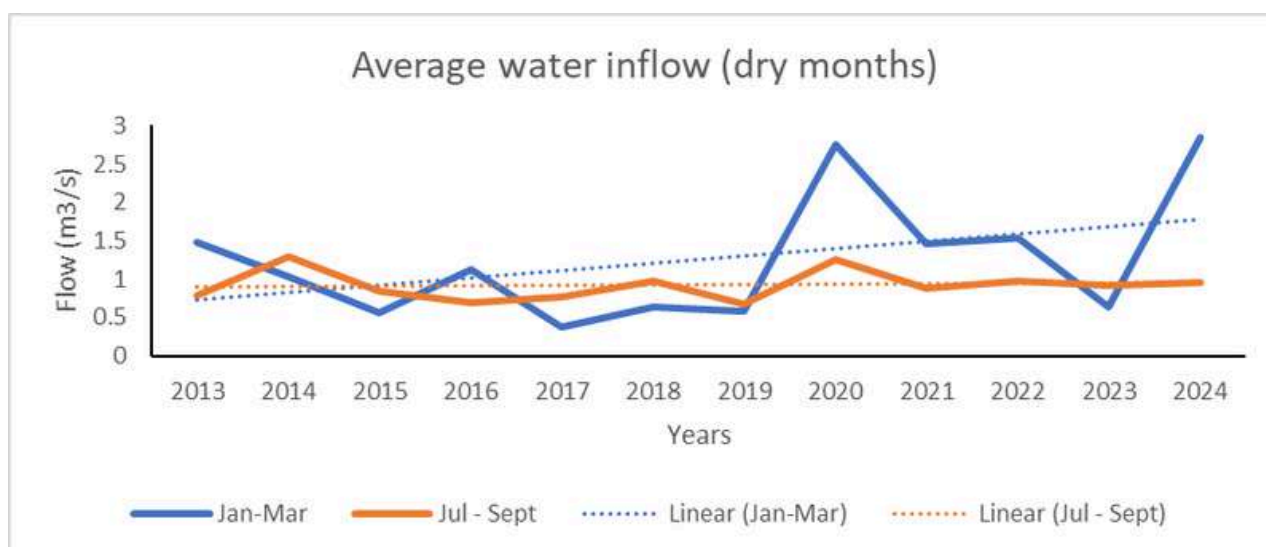


Figure 19: Average Water Inflow During Dry Months

Water Utility Value Chain (continued)

In addition to increased water volumes, UTNWFT activities were expected to improve the quality of water reaching the dam, thereby reducing the number of chemical reagents used in the treatment of water at Nairobi City Water and Sewerage Company's water treatment plants.

From the data, compared to the baseline year of 2013, the amount of Alum used has been decreasing over time, with only surges in 2016 and 2024, as illustrated in Figure 20. The surge in 2024 is attributed to increased water inflows to the dam, thereby increasing the volume of water being treated.

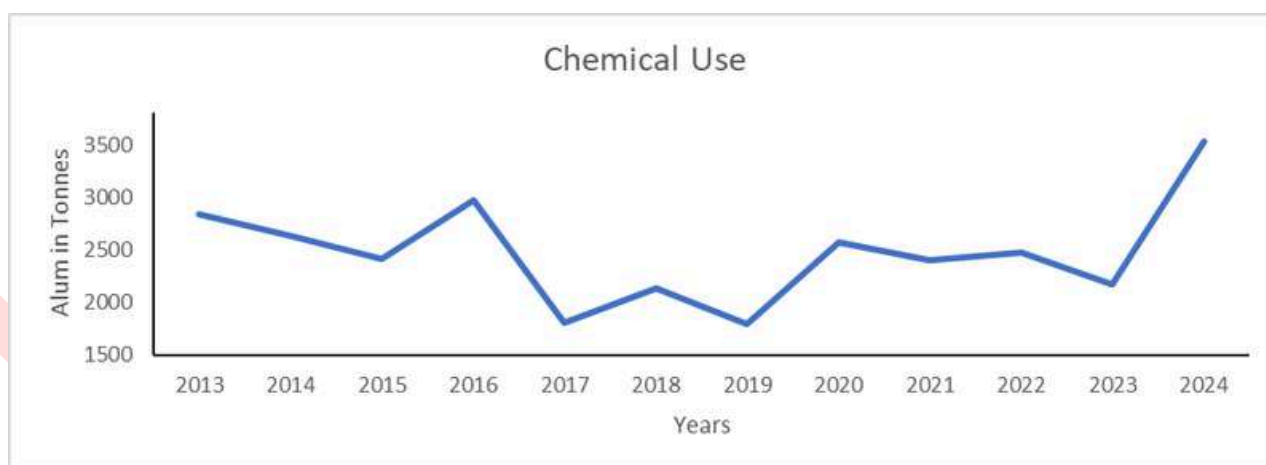


Figure 20: Chemical Use

The reduction in chemical use can also be attributed to the reduced turbidity of water, as illustrated in Figure 22.

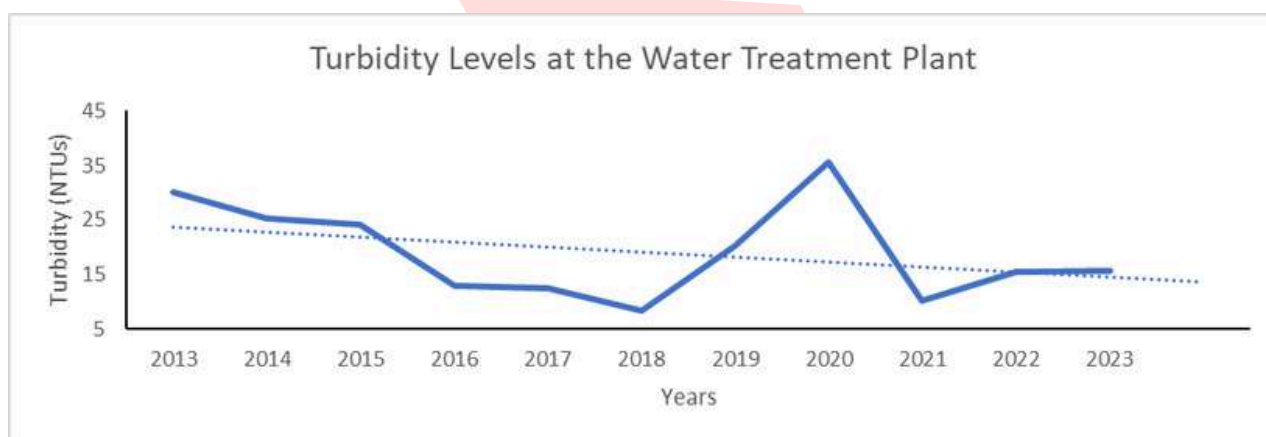


Figure 21: Turbidity.

The reduction in Alum, as illustrated in Figure 23, used for water treatment, also lowers chemical costs, allowing NCWSC to save on operational expenses.

Water Utility Value Chain (continued)

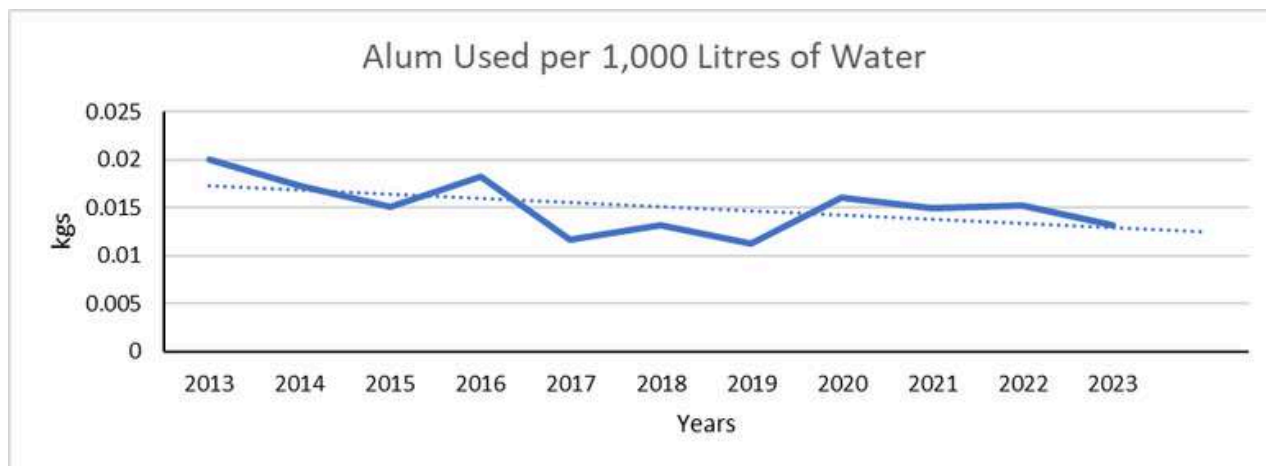


Figure 22: Alum Used per Unit of Water

Figure 24 Shows how much the NCWSC has saved over the years and how much it would have saved if the cost of chemicals had remained the same as in 2013, without the inflation, delays, and price fluctuations experienced in 2019. As of 2023, the current savings are KES 48,985,541; if the price had remained constant since 2013, the savings would have been KES 153,288,003. In 2024, water flow increased, necessitating greater chemical treatment.

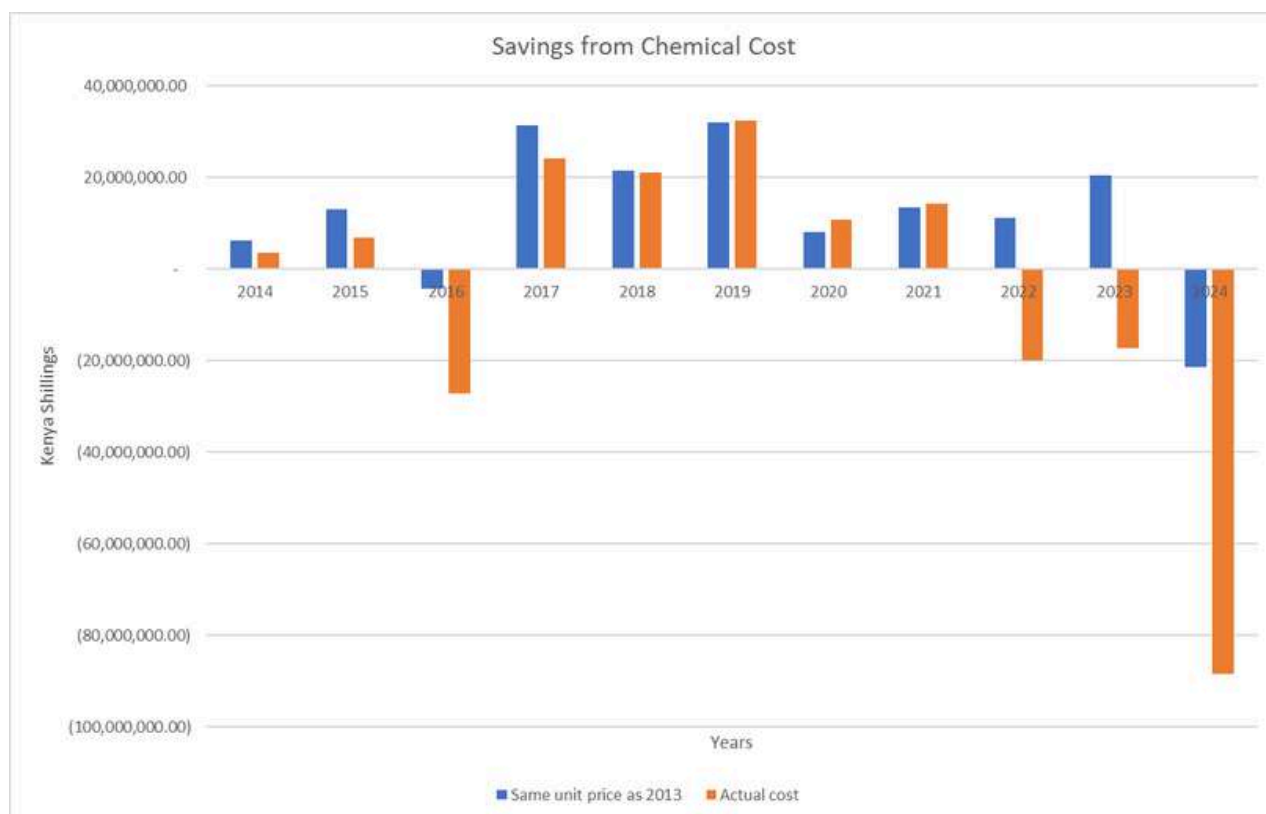


Figure 23: NCWSC Savings on Chemical Cost



2.7 Power Utility Value Chain

The Upper Tana water catchment area provides water for the rivers that feed into the Tana River, which KenGen uses to generate hydroelectric power. The hydropower stations along the Tana include Tana, Wanjii, Masinga, Kamburu, Gitaru, Kindaruma, and Kiambere. See Figure 25 below.

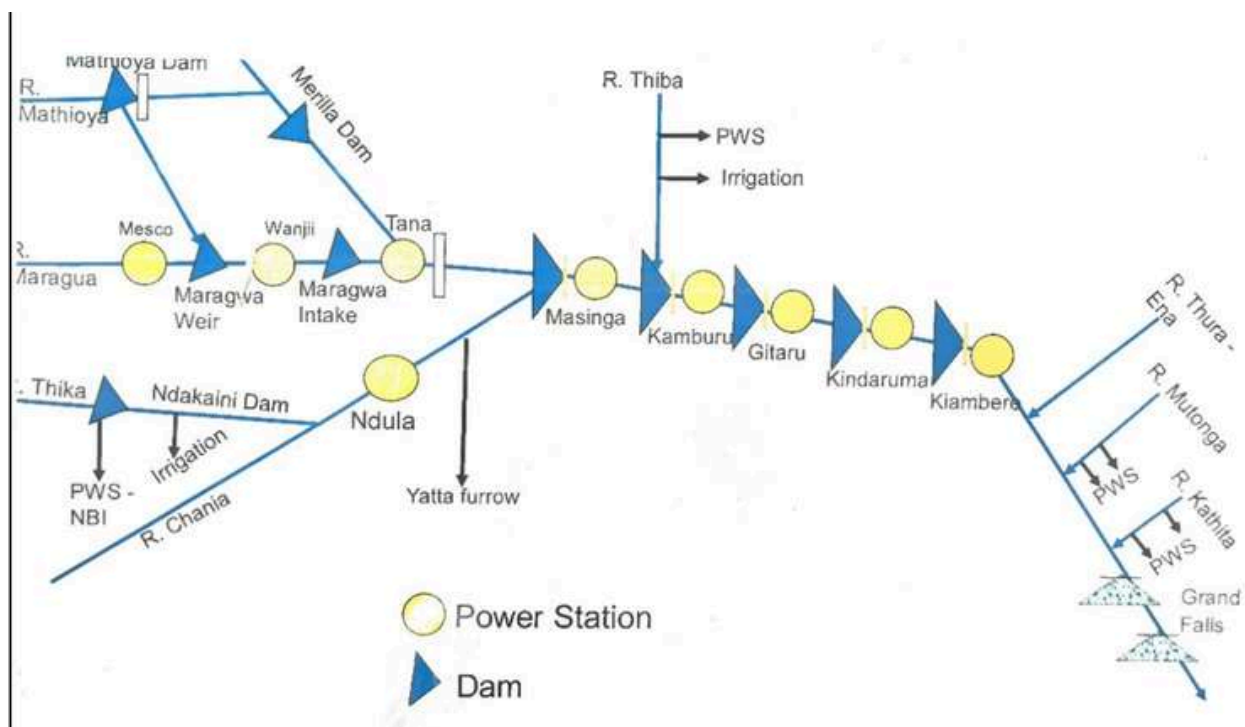


Figure 24: Hydropower Stations along the Tana

Power Utility Value Chain (continued)

The sustainable land management practices undertaken by the UTNWFT have helped clean the rivers by reducing soil erosion and increasing water availability during the dry season. Water availability increases power generation at KenGen's hydropower stations.

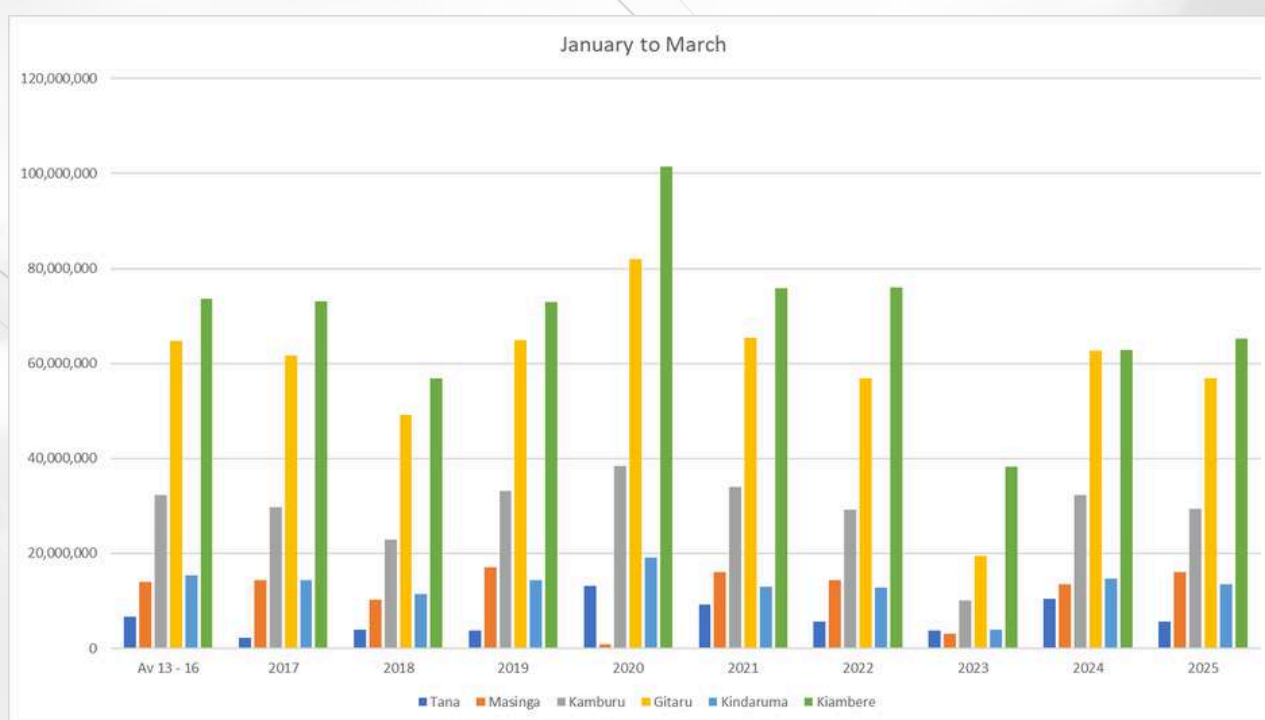


Figure 25: Power Production in Kwh from January to March

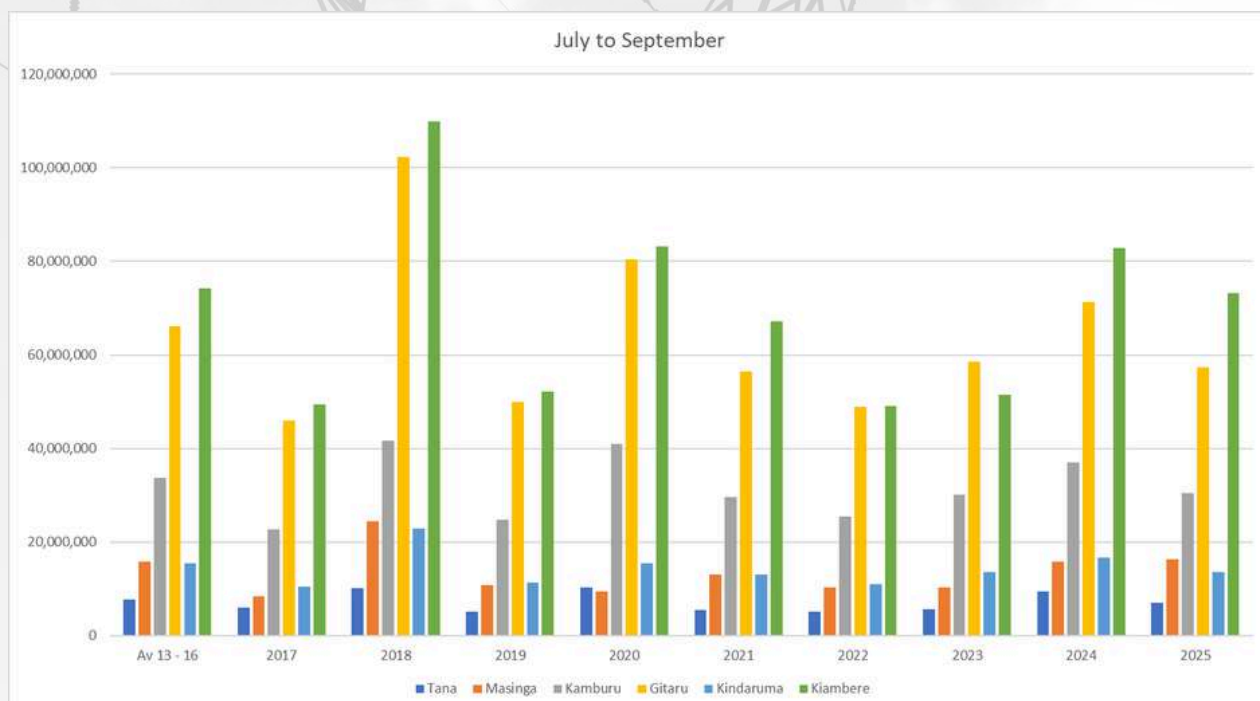


Figure 26: Power Production in Kwh from July to September

Power Utility Value Chain (continued)

Figure 26 and Figure 27 show the average power production in kWh in the dams fed by the Masinga Dam. The production of the dams downstream of Masinga is based on the amount of water released from the Masinga Dam station, which varies by season, to avoid situations in which power cannot be generated at the stations. However, Kamburu also receives water from the River Thiba to supplement its supply.

The analysis focused on Tana and Masinga as the primary sources, as the remaining dams depend on water from them. Figure 28 shows the average power production during the dry months, from January to March and from July to September.

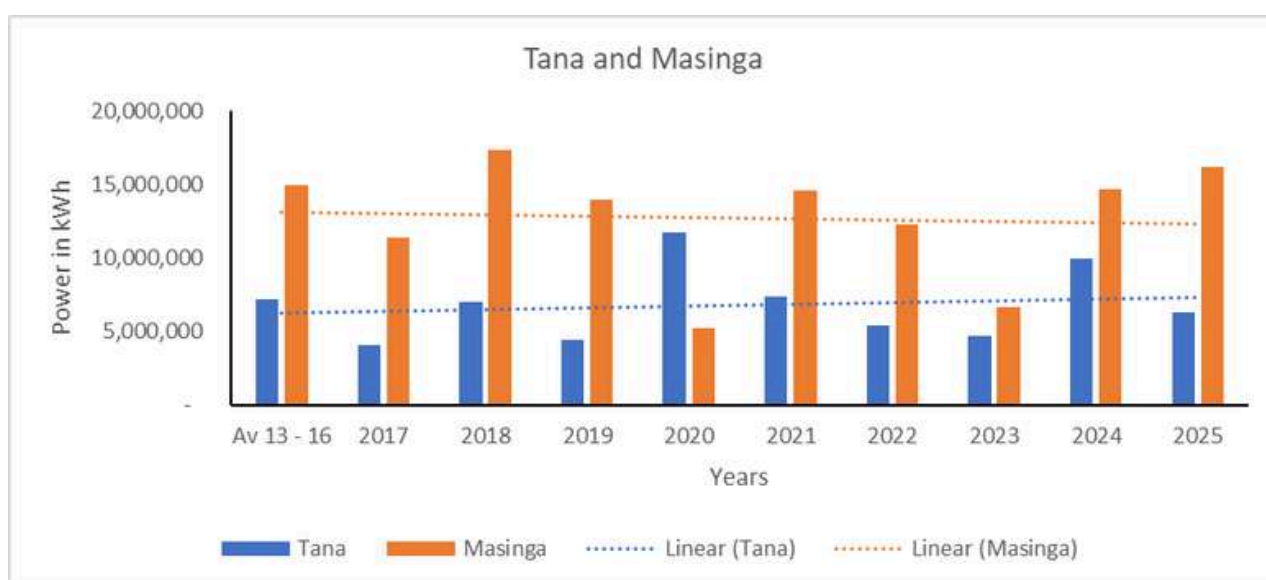


Figure 27: Average Power Production from Masinga and Tana across the Dry Months

As illustrated in Figure 28 there is a 17.1% increase in average power production during the dry months relative to the 2013–2016 baseline. This can be attributed to increased water in the Tana River resulting from activities undertaken upstream in the Upper Tana catchment area.

The lower production from the Masinga Dam (5.9%) can be attributed to increased production from the geothermal well fields also operated by KenGen; by 2020, the energy mix was 43.6% geothermal and 36.5% hydropower.[8]

Since Masinga is the main reservoir supplying the other dams, power production is monitored and controlled to mitigate the effects of prolonged droughts on power output, depending on the reservoir's water levels.

However, the increase in power production at the Tana Hydroelectric Power Station indicates that more water is flowing through the Tana River, despite increased agricultural activities and greater water abstraction.

[8] Fact sheet for geothermal development to promote Public Private Partnerships in East Africa, Kenya, 2022. United Nations Industrial Development Organisation. Available at: [Geothermal](#)

Lessons Learnt



The success of watershed and livelihood interventions depends on **effective collaboration among multiple stakeholders**. Active engagement by public sector institutions—including national agencies such as the Water Resources Authority and county governments—is essential to provide policy support, technical oversight, and extension services. Likewise, civil society organisations, including NGOs and community-based organisations, play a critical role in mobilising communities, strengthening participation, and building trust at the grassroots level.



Sustainability of conservation practices is strongly influenced by the extent to which interventions generate **tangible household benefits**. Farmers consistently maintained practices that either increased income or improved food security. For example, high-income interventions (such as avocado seedling distribution) and food-security-enhancing technologies (such as drip irrigation) were widely adopted and sustained.



Follow-up support is essential to safeguard long-term sustainability. Some farmers abandon investments such as water pans when they are damaged, and others remove drip kits due to insufficient water storage capacity. These cases demonstrate the need for continued technical assistance, monitoring, and troubleshooting after the initial rollout of interventions.



Context-specific targeting of interventions is crucial. County-level differences show that interventions must be matched to local ecological, climatic, and socioeconomic conditions. For instance, avocado tree survival rates were lower in Laikipia than in Murang'a. Farmers in Laikipia showed strong uptake of fodder grass, water pans, and drip kits, indicating that these technologies were better suited to their context.



Continuous farmer training and capacity building remain critical for enhancing the adoption of sustainable agricultural practices and improving productivity. Regular training enables farmers to optimise the performance of interventions and maximise returns.



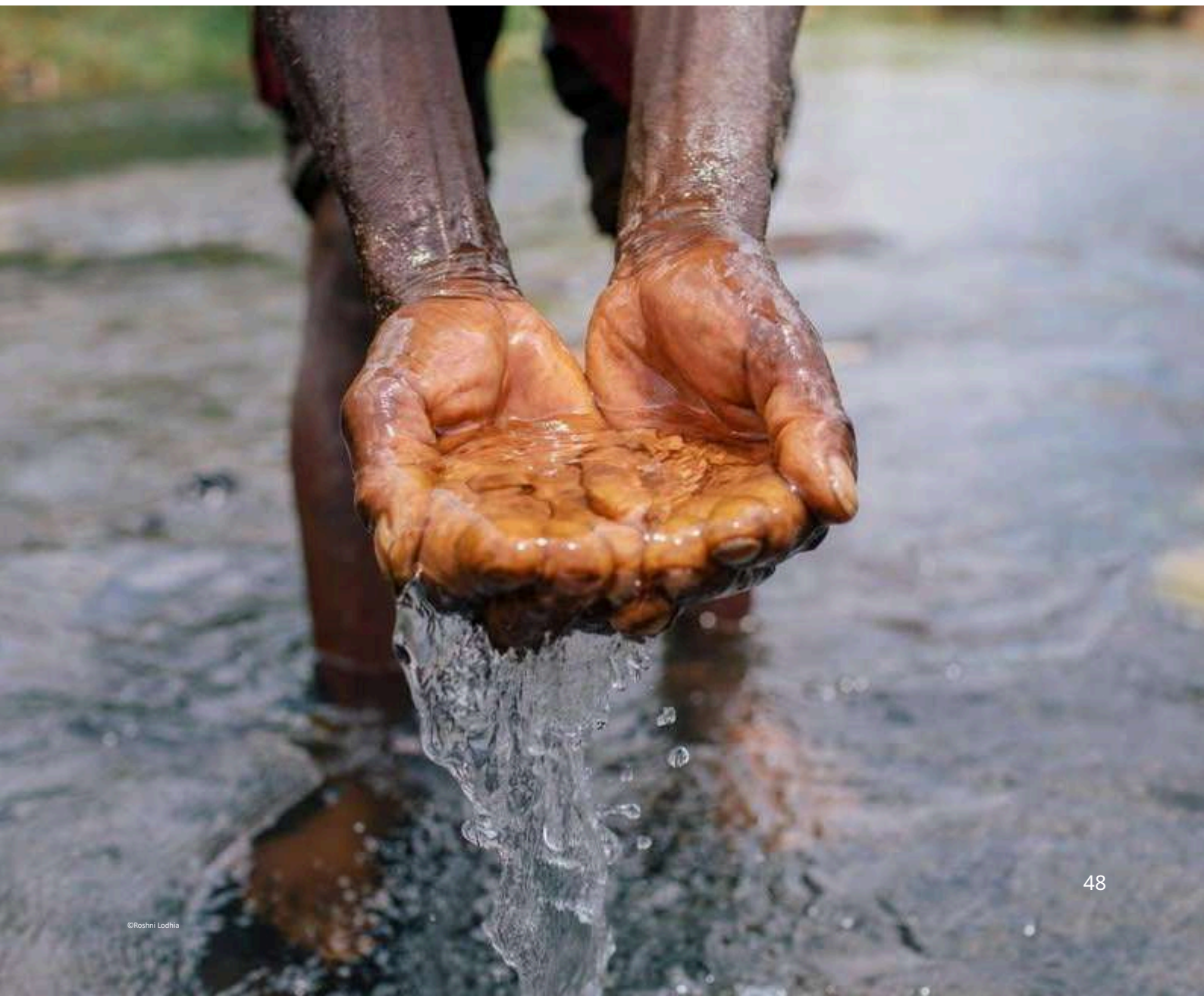
The **choice of fodder variety significantly influences productivity outcomes**. Super Napier proved to be an excellent selection due to its superior biomass yield and higher protein content than local Napier varieties, making it the preferred option for livestock feeding systems in the programme areas.

CONCLUSION

The impact assessment confirms that the Upper Tana-Nairobi Water Fund Trust has largely achieved—and in several areas has even surpassed—its objectives.

Through the implementation of sustainable land management practices, agroforestry promotion, water harvesting systems, and community capacity enhancement, the UTNWFT has generated measurable environmental, economic, and social benefits across the Upper Tana catchment.

The findings from household surveys, institutional data, and stakeholder interviews demonstrate strong progress toward the Trust's goals of improving water quality and quantity, reducing soil erosion, strengthening biodiversity, enhancing agricultural productivity, and improving community resilience.



Objectives



Improving water quality and quantity by reducing sedimentation and increasing green water retention.

The programme made considerable progress toward this objective. Interventions such as riparian land restoration, terracing, grass strips, and water harvesting have collectively improved hydrological function across the catchment. Different stakeholders, including WRA, WRUAs, county governments, and NCWSC, reported significant improvements in both water quality and water availability during dry periods.

Quantitative data from NCWSC indicate sustained reductions in turbidity and declining alum use, resulting in **cumulative savings of KES 48.9 million between 2013 and 2023**. The distribution of **15,900 water pans, harvesting over 1.72 billion litres annually**, further enhanced green water retention and reduced pressure on riparian zones. These outcomes clearly demonstrate that UTNWFT effectively met this objective.



Promoting sustainable land management practices to reduce soil erosion.

This objective was achieved successfully. The adoption of terracing and grass strips significantly reduced soil erosion and surface runoff.

The analysis of qualitative data from targeted stakeholders confirmed improvements in soil fertility, increased vegetation cover, and stabilization of degraded landscapes.



Increasing agricultural productivity and improving farmer livelihoods.

- Avocado value chain:

Total sales from 2022 to 2025 reached **\$117,084,942 (KES 15,221,042,460)**, reflecting significant market integration and production growth. With an 86% survival rate, avocado production continues to rise, resulting in even stronger revenue streams.

Labour demands for harvesting generated approximately 2,592,802 person-days of employment over the years, equivalent to **22,000 jobs per year** for the four-month harvesting season, largely benefiting youth.

- Fodder grass value chain:

Fodder grass generates **\$1.14 million (KES 148.2 million) annually**, with improved livestock nutrition leading to higher milk yields and thus increased household income. The fodder value chain sustains an estimated 1,130 cows annually, further supporting livestock-based livelihoods.

- Water pans and drip kits:

Irrigation supported by water pans generates **\$2.16 million annually (KES 280.8 million)**, driven by increased cropping cycles and higher yields. Drip irrigation contributes an additional \$1.1 million (KES 140.2 million) annually through expanded horticultural production and water-use efficiency.

Objectives (continued)



Conserving biodiversity and enhancing community resilience to climate change.

Soil and water conservation structures helped stabilise ecosystems and reduce climate vulnerability. The increased availability of irrigation water and fodder further strengthened household capacity to withstand drought periods.

While biodiversity data are primarily qualitative, stakeholder feedback indicates that conservation outcomes are becoming more visible and stronger over time, demonstrating progress toward achieving this objective.



Objectives (continued)

Building community capacity and promoting inclusive participation.

Capacity building, farmer training, and provision of extension support improved technical knowledge, facilitated the adoption of innovative technologies, and strengthened local governance structures.

Stakeholders reported enhanced youth involvement, improved women's participation, and increased the formation of farmer groups and cooperatives.

RECOMMENDATIONS

Due to scale and level of advancement of the UTNWFT work as well as the insights obtained from stakeholders, the following recommendations are suggested for consideration as the Water Fund grows in future:



Increase investment in avocados in Murang'a and Nyeri, which would yield remarkable results, as the survival rate is higher and the ecosystem of the entire value chain is well established.



Strengthen links between farmers and market actors—e.g., exporters, cooperatives, and agro-processors—to improve price stability, quality standards, and value addition.



Promote savings groups, cooperatives, and farmer organisations that support asset maintenance, group investment, and collective marketing.



Improve the farmer follow-up system to provide continuous guidance on maintaining water pans, using drip kits, pruning fruit trees, and managing fodder grass.



Prioritise interventions based on agro-ecological zones—for instance, scaling up use of water pans, drip irrigation, and fodder grass in drier regions, while expanding avocado and fruit tree value chains in areas with demonstrated high survival rates, such as Murang'a.



Facilitate collaboration with county departments to improve extension capacity, including joint training programmes, resource sharing, and field demonstrations.

APPENDICES



This section synthesises insights from key informant interviews conducted with the Water Resources Authority, Water Resource Users Associations, Nairobi City Water and Sewerage Company, county/local government officials, and private sector partners.

The analysis highlights the nature of engagement with the UTNWFT, perceived changes in water resources and livelihoods, challenges faced, and recommendations.

Appendix I: Roles of Stakeholders engaged during the survey.

Water Resources Authority



WRA's engagement in UTNWFT activities was anchored in its statutory mandate to regulate, manage, and protect water resources, ensuring their sustainable use and equitable allocation across the country.

The WRA participates through planning, implementation, and monitoring, providing technical support, logistical assistance, capacity building and, where applicable, financial support. Collaboration with the UTNWFT was rated between good and exceptionally good, though some informants noted the need for more substantial incentives and more structured engagement to strengthen coordination.

Water Resource Users Associations

WRUAs are central to community-level water governance and are heavily involved in planning, implementing, and monitoring UTNWFT interventions. Their participation spanned agroforestry, riparian conservation, grass strips installation, water pans, and drip irrigation kits.

Collaboration with UTNWFT was highly positive, reinforced by training, leadership development, and funding for community projects. WRUAs also played an essential role in mobilizing youth and marginalised groups. It was noted that gaps still exist in ensuring broader inclusion.



Nairobi City Water and Sewerage Company



NCWSC's involvement is driven by its interest in catchment health, given its direct impact on water treatment costs. NCWSC has acknowledged significant to incredibly significant improvements in water quality and quantity, as well as a reduction in treatment costs attributable to interventions such as riparian conservation and agroforestry.

Collaboration with the UTNWFT was considered particularly good, with suggestions for deeper inclusion in planning processes.

Roles of Stakeholders engaged during the survey (continued)

County Governments of Murang'a, Nyeri, Laikipia & Nyandarua



The county governments of Murang'a, Nyeri, Laikipia & Nyandarua, played a facilitative and coordinating role, particularly in mobilising farmers, promoting public participation, and coordinating field services. Their support was primarily technical, though some counties also provided capacity-building and logistical support.

Collaboration with the UTNWFT was rated from good to exceptionally good. Counties observed that interventions, including water pans, agroforestry, drip irrigation, grass strips, and riparian conservation, contributed to improved livelihoods, better farming practices, and enhanced environmental protection.

Private Sector Partners

Private sector partners participated in planning, implementing, and monitoring interventions such as agroforestry, terraces, water pans, and riparian conservation.

They highlighted strong collaboration with the UTNWFT and noted positive economic, social, and environmental outcomes, including increased food production, formation of farmer associations, improved hygiene, better school attendance, and reduced soil erosion. NGOs also received capacity strengthening through training and funding.



Appendix II: Perceived Changes Attributable to UTNWFT Interventions



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1. Water Resource Availability, Quality, and Use

Across stakeholder groups, there was broad agreement that UTNWFT interventions led to significant to incredibly significant improvements in water resource availability and quality.

- WRA and WRUA informants reported a noticeable increase in water levels and improved water quality in catchment areas.
- NCWSC confirmed that improvement in riparian protection and reduced sediment loads had directly contributed to lower treatment costs.
- County governments noted increased access to water for irrigation, especially where water pans and drip kits were introduced.

Perceived Changes Attributable to UTNWFT Interventions (continued)

2. Agricultural Productivity and Livelihoods

Respondents observed improvements in crop yields, diversification, and farming methods, driven by interventions such as drip irrigation, agroforestry, and water harvesting structures. UTNWFT activities contributed to:

- Increased milk production and livestock numbers due to improved fodder availability;
- Higher incomes from horticulture and fruit production, especially from Hass avocado and vegetable farming; and
- Expanded employment opportunities arising from community projects, nursery establishment, and increased demand for farm labour.

Socioeconomic impacts included youth empowerment, creation of income-generating opportunities, and strengthened community cohesion through WRUA structures.

3. Inclusion of Youth, Women, and Persons with Disabilities

All stakeholder categories affirmed that UTNWFT interventions created spaces for youth, women, and PWDs through roles in training, data collection, technical assistance, and water resource management. Despite these efforts, structural barriers remain, such as:

- Limited land ownership;
- Inadequate capital;
- Insufficient awareness of opportunities; and
- Inconsistent technical expertise.

These challenges restricted full participation and called for targeted strategies to enhance inclusivity.

4. Environmental and Soil Conservation Outcomes

Stakeholders consistently highlighted positive environmental gains attributable to UTNWFT activities, particularly:

- Reduced soil erosion and surface runoff due to grass strips, terraces, and agroforestry;
- Increased soil fertility;
- Riparian land recovery; and
- Enhanced vegetation cover.

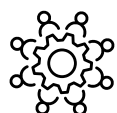
5. Key Challenges Identified Across Stakeholders

Common challenges reported in the implementation of UTNWFT activities included:

- Multifaceted problems linked to pollution, climate change impacts, and illegal abstraction (WRA);
- Road construction leading to erosion (WRUAs);
- Youth and women's limited access to land and capital (county government); and
- Gaps in maintenance and appropriate use of water pan liners, leading to damaged dam liners, limited community awareness, and distribution challenges (private sector players).

Appendix III: Approach & Methodology

The following tasks were identified as part of the methodology:



Phase 1: Mobilisation and Inception

- Mobilisation and kick-off meeting
 - Preliminary desk review
 - Preparation of data collection tools
 - Preparation of inception report
- Inception Report



Phase 2: Data Collection and Analysis

- Planning: Stakeholder meetings, request for documents, participant identification
- Clean data sets from impact assessment

Secondary Data

- Literature review of relevant documents
- Data verification



Data Collection/Needs Assessment Workshop

- Pre-testing of data collection tools (questionnaires and KIIs)
- Data collection (interviews and questionnaire administration)



Data Analysis

- Data management and quality assurance, exploration
- Identification of key variables and indicators



Phase 3: Reporting

- Preparation and presentation of draft impact assessment report
 - Preparation of final impact assessment report
- Draft impact assessment report
- Final impact assessment report

Figure 28: Graphical Representation of the Approach and Methodology

Data Collection and Analysis

Data Collection Tools

Household surveys and key informant interviews (KIIs) were selected as the best tools for field data collection.

Based on consultations, data collection tools were developed based on the target respondents.

County-based enumerators and key stakeholders were trained in survey instruments and interviewing protocols and then pre-tested to assess interviewer competence, data quality, and device reliability.

During fieldwork, each county team had an embedded field supervisor for daily on-the-spot support and quality control. KIIs were conducted by the consultant's expert with support from a research assistant.

All data were captured using KoboCollect, enabling real-time entry and basic quality checks (e.g., validations, timestamps, GPS) and reducing transcription errors.

Households/Farmers[4]	Person-to-Person Interviews
Water Resource Users Associations	Key Informant Interviews
County Government Representatives	
Water Resources Authority	
Non-Governmental Organisations/Community-Based Organisations	
Nairobi City Water and Sewerage Company	
KENGEN	

Table 7: Survey Respondents

[4] See Table 8.

Sampling

The impact assessment employed a stratified random sampling approach to ensure the sample was representative of the population across sub-watersheds. The target population was 266,325 farmers who directly benefited from the Trust's activities.

The total sample size for the final data collection exercise was 1,107 (2.95% margin of error at a 95% confidence level), as illustrated in the table below.

Value Chain	Target Number of Farmers
Avocado	321
Drip Irrigation Kits	165
Fodder Grass	313
Water Pans	308
Total	1,107

Table 8: Sample Size Across the Value Chains



Data Analysis and Impact Assessment

The data collected was analysed as per the data analysis plan:

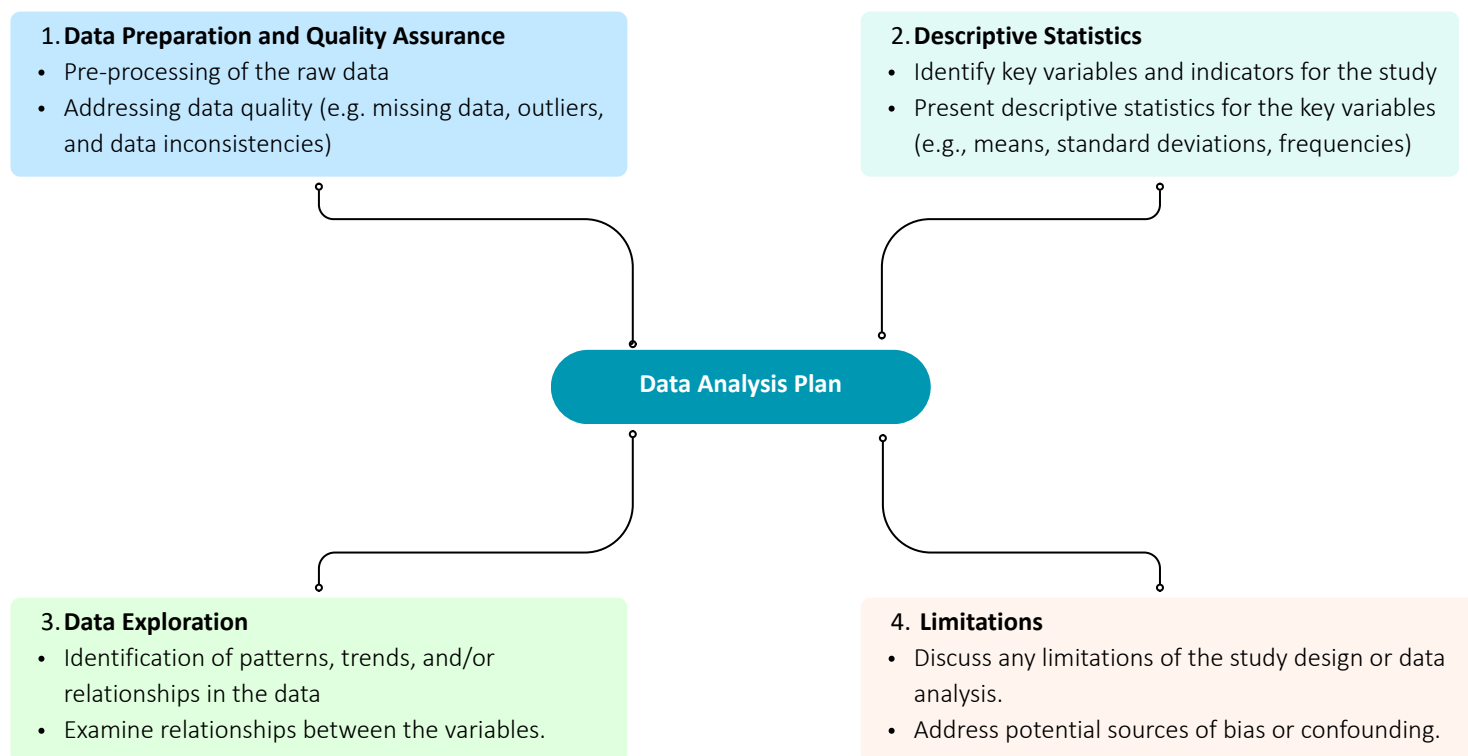


Figure 29: Data Analysis Plan

The assessment was conducted for each identified value chain.

The quantitative data collected through the household survey were analysed descriptively using measures of central tendency: mean, standard deviation, minimum, and maximum. Additionally, trend and association analyses were conducted to identify growth dynamics and nuances in linkages using scatter plots. The qualitative data, collected mainly through KIIs, were analysed thematically to identify key themes and establish the primary thoughts of the smallholder farmers. The key analyses, results, and associated discussions are presented in Chapter 3.

Acknowledgements

Our Partners

The achievements highlighted in this Economic Impact Survey would not have been possible without the generous support, collaboration, and commitment of the many stakeholders dedicated to conserving the Upper Tana catchment. To all our partners and supporters, we say *Asante sana*.

We extend our sincere appreciation to the farmers across Murang'a, Nyeri, Nyandarua, and Laikipia counties whose dedication continues to drive sustainable land and water management across the watershed.

Our founding trustees; The Nature Conservancy (TNC), Pentair limited, Nairobi City Water and Sewerage Company (NCWSC), who pioneered Africa's first water fund & laid the strong foundations which have served us well for a decade.

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