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VICE PRESIDENT'S OFFICE

REVERSING LAND DEGRADATION TRENDS AND INCREASING FOOD SECURITY IN DEGRADED ECOSYSTEMS OF SEMI-ARID AREAS OF TANZANIA PROJECT

PROJECT CLOSURE REPORT

JANUARY, 2025

EXECUTIVE SUMMARY

The Reversing Land Degradation Trends and Increasing Food Security in Degraded Ecosystems of Semi-Arid Areas of Tanzania (LDFS) Project was designed to address the critical challenges of land degradation, food insecurity, and climate change adaptation in targeted regions of Mainland Tanzania and Zanzibar. Implemented by the Vice President's Office (VPO) and funded by the Global Environment Facility (GEF) through the International Fund for Agricultural Development (IFAD), the project aimed to promote sustainable land and water management practices, enhance agricultural productivity, and strengthen community resilience to climate-related risks. Through several interventions, the project worked with local communities, government institutions, and development partners to reverse environmental degradation, improve food security, and increase economic opportunities for marginalized groups. The project's no-cost extension until 2025 allowed for the consolidation of key achievements and ensured sustainability mechanisms were in place.

Over the years, the project recorded significant achievements that have contributed to reversing land degradation and improving food security in the targeted areas. The project restored over 4,452 hectares of degraded land through reforestation, contour farming, and conservation agriculture, enhancing soil health and increasing agricultural productivity. Adopting climate-smart agriculture practices grew significantly, with farmers implementing improved soil and water conservation techniques, leading to increased crop yields and better management of natural resources. The project also contributed to climate resilience, with carbon monitoring results indicating net sequestration of 1,099,647 tons of CO_2 equivalent, demonstrating the potential of sustainable land management practices in mitigating climate change. Food security improved across project sites, with food-secure households increasing from 68.6 percent in 2019 to 74.2 percent in 2024, while water access and sanitation facilities were also improved in several communities.

In addition to environmental gains, the project contributed significantly to economic empowerment. Thousands of smallholder farmers benefited from income-generating activities, including beekeeping, dairy farming, and seaweed processing, which

improved household incomes and provided sustainable livelihoods. The project supported establishing producer groups and cooperatives, enhanced access to markets, and created opportunities for value addition in agricultural produce. Through targeted training programs, women and youth were empowered to engage in agribusiness and decision-making processes, ensuring that the project's benefits were equitably distributed. As a result, gender and social inclusion improved, with increased female participation in community governance structures and economic activities.

Despite its successes, the project encountered several challenges that affected the full realization of its objectives. Delays in infrastructure development, particularly in water supply systems and processing centres, limited the immediate impact of some interventions. While community engagement and participation were central to the project's approach, certain activities required more substantial local ownership to ensure sustainability beyond the project's lifespan. Climate-related risks, including unpredictable rainfall and prolonged droughts, continued to threaten agricultural productivity, emphasizing the need for continuous climate adaptation efforts. Institutional and policy constraints, particularly regarding land tenure security and enforcement of sustainable land management regulations, also presented challenges that must be addressed in future programming.

Several strategies have been implemented to ensure project outcomes' long-term sustainability. Strengthening local governance structures, including Local Government Authorities (LGAs) and community-based organizations, will ensure that land and water management efforts continue beyond the project's implementation period. Integrating sustainable land management practices into national and district-level development plans will provide policy support for scaling up interventions. The project has also focused on empowering communities through farmer field schools, water management committees, and cooperatives to take ownership of natural resource management initiatives. Market linkages and financial literacy training have been promoted to enable farmers and small-scale entrepreneurs to access credit and investment opportunities, ensuring that economic gains are sustained. Additionally, opportunities for carbon

finance and climate adaptation funding are being explored to support reforestation and land restoration efforts in the long term.

The LDFS Project has laid a strong foundation for reversing land degradation, enhancing food security, and promoting economic resilience in Tanzania's semi-arid regions. Moving forward, future programming should focus on strengthening governance structures and institutional frameworks to ensure effective land and water management. Greater community ownership of natural resource initiatives should be prioritized, fostering long-term sustainability. Expanding financial support mechanisms, particularly for women and youth engaged in agribusiness, will be crucial in scaling up successful interventions. Climate resilience and disaster risk reduction strategies should be integrated into national and regional development plans to safeguard agricultural productivity and livelihoods. Also, fostering private-sector partnerships will enhance market access and create opportunities for value chain development, ensuring that smallholder farmers continue benefiting from sustainable agricultural practices.

With continued government commitment, private sector collaboration, and community-driven initiatives, the achievements of the LDFS Project will be sustained, creating lasting positive impacts on environmental conservation, food security, and economic empowerment. The lessons learned from the project should inform future policy and programmatic approaches, ensuring that sustainable land management remains a priority in Tanzania's development agenda.

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ABBREVIATION AND ACRONYMS

AWPB	Annual Work Plan and Budget
CA	Conservation Agriculture
CCRO	Customary Certificates of Right of Occupancy
COFMA	Community Forest Management Agreement
CSA	Climate Smart Agriculture
DFT	District Facilitation Team
EbA	Ecosystem-Based Approach
FFS	Farmers Field School
FGD	Focus Group Discussion
GEF	Global Environmental Facility
ICRAF	International Centre for research in Agroforestry (World Agroforestry Centre)
IFAD	International Fund for Agricultural Development
IGAs	Income Generating Activities
IGGs	Income Generating Groups
Kg	Kilograms
KII	Key Informant Interview
LDFS	Reversing Land Degradation Trends and Increasing Food Security in Degraded Ecosystems of Semi-Arid Areas of Tanzania Project
LUPs	Land Use Plans
MoU	Memorandum of Understanding
MPAT	Multi Poverty Analysis Tool
NRM	Natural Resource Management
PCU	Project Coordination Unit
PSC	Prpject Steering Committee
SLM	Sustainable Land Management
SOC	Soil Organic Carbon

TAC	Technical Advisory Committee
URT	United Republic of Tanzania
USD	United States Dollar
VLFR	Village Land Forest Reserve
VPO	Vice President’s Office

1.0 INTRODUCTION

1.1 Background of the LDFS Project

The Reversing Land Degradation trends and increasing Food Security in degraded ecosystems of semi-arid areas of Tanzania (LDFS) is one of 12 national child projects under the Integrated Approach Pilot (IAP) program on Fostering Sustainability and Resilience for Food Security in Sub-Saharan Africa (IAP-FS) programme that will contribute to national, regional and global agendas. Anchoring the IAP firmly in local, national and regional policy frameworks will enable the scaling up more sustainable and resilient production systems and approaches across the targeted geographies. The LDFS is a five-year project (2017-2022) funded by the Global Environment Facility (GEF) through IFAD and implemented by the Vice President's Office (VPO). The project was granted a no-cost extension of two years up to 30th September 2024 due to a delay in starting implementation, and officially, the project closed on 31st March 2025.

1.2 Project Goal and Objectives

The project's goal was to improve food and nutrition security in the targeted villages, and the development objective was to reverse land degradation trends in central Tanzania and Pemba (Zanzibar) through sustainable land and water management and ecosystem-based adaptation (EbA).

1.3 Project Rationale and Justification

Reversing land degradation trends in Tanzania's semi-arid ecosystems is crucial for ensuring sustainable food production, enhancing food security, and strengthening climate resilience. These regions face significant environmental and socio-economic challenges, including soil erosion, deforestation, declining soil fertility, and unpredictable climatic conditions that threaten agricultural productivity. Unsustainable land management practices, such as overgrazing, slash-and-burn agriculture, and excessive deforestation, exacerbate land degradation, reducing the capacity of ecosystems to support livelihoods and biodiversity.

To address these challenges, the project focuses on promoting sustainable land and water management practices that restore soil fertility, enhance biodiversity conservation, and mitigate the adverse effects of climate change. The project empowers smallholder farmers and pastoralists with the knowledge and resources needed to improve productivity while preserving natural resources by integrating climate-smart agriculture, agroforestry, and ecosystem-based adaptation strategies. Strengthening land tenure security, facilitating participatory land-use planning, and enhancing access to climate adaptation technologies contribute to long-term resilience. Through these interventions, the project not only safeguards food availability, accessibility, and quality but also ensures that communities can withstand climate shocks, sustain their livelihoods, and contribute to national and global environmental goals.

1.4 Project Scope and Geographical Coverage

The project area covered semi-arid areas, selected in five districts of Kondoa, Mkalama, Nzega, and Magu in Mainland Tanzania and Micheweni in Zanzibar (Pemba Island); see Figure 1 below. Each district's project area covered one or two wards with two or more villages (23 villages and Shehias) sharing the same resources in a landscape. The estimated population in the five districts was 1.9 million people or about 247,000 households (URT 2022). The total population of the selected villages was over 69,000 individuals. The project’s interventions are expected to reach 30,000 direct beneficiaries and turn 4,500 hectares into conservation, climate-smart farming, sustainable management and 500 hectares of degraded land into reforested areas.

2.0 PROJECT DESIGN AND IMPLEMENTATION

2.1 Institutional Framework and Governance

During the project's implementation, IFAD acted as the GEF implementing agency for the GEF funding of this project. IFAD provided technical and financial supervision and

implementation support of the project and support on issues affecting timely and quality project implementation from the IFAD office in Dar es Salaam. IFAD undertook the roles of implementation support, supervision, mid-term review, and completion missions.

Given that the project focused on land degradation and food security and that the Environment Division is housed under the Vice President's Office (VPO), the VPO was a Lead Execution Agency during the project's implementation. On behalf of the Ministry of Finance, the Recipient and VPO led the project and liaised with IFAD throughout the implementation.

A Project Steering Committee (PSC) chaired by the Permanent Secretary of the VPO and representing the relevant sector ministries was established to provide oversight and strategic guidance for the project, mainly when the Project Coordination Unit required it.

A Technical Advisory Committee (TAC) was established to advise the PCU and the PSC on the quality of progress reports, Annual Work Plans and Budgets (AWPBs), and any technical issues. The TAC assisted the PCU in establishing potential linkages with relevant Ministries for technical support and Implementing Districts. The VPO Director of Environment chaired it.

The Project Coordination Unit (PCU), housed under the VPO office, is responsible for day-to-day project management and implementation. The PCU consists of a National Project Coordinator (seconded by the VPO staff), a Senior Accountant (seconded by the VPO), a full-time Monitoring and Evaluation Officer (seconded by the VPO/recruited externally), and a Natural Resource Management Officer.

Project implementation at the district level followed the guidelines for decentralization by devolution (D by D). District Facilitation Teams (DFT) were set up in the selected districts, and their offices were equipped. The DFT was at the front line of the project, engaging with communities and their leaders at the village level; therefore, they had the responsibility to implement the project activities as per their mandate and to monitor and report on implementation and financial progress directly to PCU and to their Regional Secretariat. The District Council Management Team approved the district-level AWPB

and monitored the implementation progress. The quarterly reports of all five districts were reviewed and consolidated by the PCU and submitted to the TAC for approval and then to PSC and IFAD for clearance.

Planning, M&E, Learning and Knowledge Management. The PCU coordinated the preparation of District AWPBs to structure the implementation process and consolidate it into an overall Annual Work Plan and Budget (AWPB). LDFS undertook baseline surveys and data assessment exercises that traced Global Environmental Benefits supported by the Project, such as less degraded land, higher biodiversity in protected areas, crop and range lands, and higher resilience to climate change. LDFS also supports national learning and knowledge management processes through its third Component.

Financial management, procurement and governance. LDFS was governed by the financial management and procurement procedures agreed upon with the VPO office during the design following an external assessment of their Fiduciary Standards. The procedures defined for the Project considered the government procedures and IFAD and GEF requirements. This was reflected in the Project Implementation, Financial Management, and Procurement Manual accordingly.

2.2 Project Components, Outcomes, and Expected Outputs

In line with the project goal, the LDFS project was structured into four components with four outcomes and eight outputs, as summarized below: -

Component 1: Institutional capacity building for sustainable land management and biodiversity conservation at landscape level

Outcome 1: Institutional capacity in place at district and local village levels to support SLM practices and conservation of ecosystem services at the landscape level.

- ***Output 1.1***: Local and district-level institutional capacity strengthened in participatory joint land-use mapping, planning and access and use regulation supporting SLM, forest conservation and sustainable agro-pastoralism.
- ***Output 1.2***: Governance instruments in place to support integrated landscape management and SLM practices.

Component 2: Up-scaling of sustainable and climate-smart agriculture, land, water and pastoral management systems

Outcome 2: Reduced land degradation, improved soil health, and increased productivity and income generation from agro-pastoral ecosystems.

- ***Output 2.1*****:** The Farmer's capacities strengthened in experimental learning and adopting conservation, climate-smart farming, and SLM practices.
- ***Output 2.2***: Improved management of dry land agro-pastoral and woodland landscapes.

Component 3: Monitoring and Assessment

- ***Outcome 3***: Diversified and climate-resilient production systems that increase all-season income generation through producer groups and better market linkages.
- ***Output 3.1***: Households adding value and accessing markets with a diversified produce basket.

Component 4: Project Coordination

Outcome 4: Improved evidence-base for joint village land-use planning and improvement of ecosystem services and up-scaling at district, region and national level

- **Output 4.1**: Strengthening District and National M&A capacities to document progress in ecosystem services and household resilience and report on GEBs are strengthened
- **Output 4.2**: Monitoring and assessment results and knowledge products available for policy development and decision support for landscape-level resources management
- **Output 4.3**: The project is linked to the regional program

2.3 Partnerships and Stakeholder Engagement

The LDFS Project ensured effective partnerships and stakeholder engagement throughout its lifespan by adopting a decentralized implementation approach and fostering collaboration among key actors. The project established District Facilitation Teams (DFTs) in selected districts, equipping them with the necessary resources to engage with communities and local leaders at the village level. These teams were crucial in implementing project activities, monitoring progress, and reporting directly to the Project Coordination Unit (PCU) and Regional Secretariats. The District Council Management Teams were also actively involved in approving annual work plans and budgets while monitoring progress, ensuring local government alignment with project objectives.

Furthermore, the project engaged stakeholders through structured planning, monitoring, and knowledge management. The PCU facilitated the preparation of District Annual Work Plans and Budgets (AWPBs), consolidating them into an overall implementation framework. Partnerships with institutions such as the Institute of Rural Development Planning (IRDP), Tanzania Forest Service Agency (TFS), the National Land Use Planning Commission (NLUPC), and the Ministry of Water strengthened technical expertise and resource mobilization. The private sector was also engaged through collaborations with companies like Central Park Bee Limited, Dodoma Halisi, and ASAS Dairies, ensuring market access and value addition for agricultural and livestock products. The project also promoted participatory decision-making by involving community-based organizations, cooperatives, and producer groups in planning and implementation, enhancing ownership and sustainability of interventions.

3.0 BASELINE AND ENDLINE ASSESSMENT (2019–2024)

This section presents a comparative analysis of the baseline (2019) and endline (2024) findings of the Reversing Land Degradation Trends and Increasing Food Security in Degraded Ecosystems of Semi-Arid Areas of Tanzania (LDFS) Project. The analysis highlights key methodological approaches, socioeconomic and environmental conditions before project implementation, key comparative findings, and impact on food security, land degradation, gender, and climate adaptation. Additionally, the section assesses changes in household income, agricultural productivity, and climate resilience while drawing lessons from the project's implementation.

3.1 Methodology and Key Indicators

The baseline and endline surveys employed a multi-method approach to assess the effectiveness of the LDFS project interventions. Both surveys used the Multidimensional Poverty Assessment Tool (MPAT) to collect socioeconomic and environmental data through household surveys, key informant interviews, and focus group discussions (VPO, 2019[1]; VPO, 2024[2]). Additionally, documentary reviews of project reports, government policies, and local development strategies complemented the analysis.

The sampling framework covered five districts: Nzega, Magu, Mkalama, Kondoa, and Micheweni (Zanzibar), ensuring representation of various agro-ecological conditions. The baseline survey sampled 850 households, whereas the endline survey involved 778 households (VPO, 2024). The study focused on 11 core indicators, including food and nutrition security, domestic water supply, sanitation, housing, health care access, agricultural productivity, and adaptation to climate change (VPO, 2019).

[1] VPO. (2019). *LDFS Household Socio-Economic Baseline Survey Report.* Vice President's Office, Tanzania.

[2] VPO. (2024). *LDFS Household Socio-Economic Endline Survey Report.* Vice President's Office, Tanzania.

3.2 Socioeconomic and Environmental Conditions Before Project Implementation

Before project implementation, food insecurity, environmental degradation, and poor agricultural productivity were widespread in the target areas. The baseline survey (2019) revealed that 68.6% of households faced food shortages, and many relied on rain-fed agriculture, which was highly vulnerable to droughts. In Micheweni, more than 19% of households practised open defecation, while access to clean drinking water was limited to 56.8% of households.

Additionally, land degradation was a primary concern, with significant soil erosion, deforestation, and declining soil fertility recorded across project sites. Limited adoption of climate-smart agriculture (CSA) practices was evident, as only 3% of households had implemented soil and water conservation techniques (LDFS Baseline Report, 2019). The findings underscored the need for interventions focusing on sustainable land management, climate resilience, and improved food security strategies.

3.3 Comparative Analysis of Baseline and Endline Findings

The endline survey (2024) demonstrated notable improvements across multiple indicators, highlighting the effectiveness of the project's interventions in addressing key socioeconomic and environmental challenges. Household food security improved from 68.6% in 2019 to 74.2% in 2024, while access to clean water increased from 56.8% to 60.1% (VPO, 2024).

Moreover, participation in climate-smart agriculture (CSA) practices increased from 3% to 28%, reflecting greater awareness and adoption of soil and water conservation measures (LDFS Endline Report, 2024). Similarly, households engaged in farmer field schools (FFS) grew from 2.8% to 32.5%, demonstrating improved agricultural training and knowledge dissemination (VPO, 2024).

The adoption of renewable energy technologies, particularly solar lighting, expanded significantly, with solar-powered households rising from 24% in 2019 to 38.3% in 2024 (VPO, 2024). Additionally, the land under sustainable land management (SLM)

practices increased from 18% to 45%, indicating more substantial community involvement in conservation efforts (VPO, 2024).

These improvements are summarized in Table 1, which presents a comparative analysis of key indicators from the baseline (2019) and endline (2024) surveys. The data presented in **Table 3.1** reinforce the overall impact of the LDFS Project, showcasing significant progress in food security, climate-smart agriculture adoption, land conservation, and renewable energy usage. However, while substantial improvements were observed, continued investments are needed, particularly in water access, sanitation, and sustainable agricultural expansion, to consolidate these gains further.

Table 3.1 Comparative Analysis

S.No	Indicator	Baseline (2019) (%)	Endline (2024) (%)	Change (%)
1	Food secure households	68.6	74.2	+5.6
2	Households with access to clean water	56.8	60.1	+3.3
3	Households practising open defecation	19.9	12.6	-7.3
4	Households Adopting Climate-Smart Agriculture	3.0	28.0	+25,0
5	Households participating in Farmers Field Schools (FFS)	2.8	32.5	+29.7
6	Land under Sustainable Management Practices	18	45	+27
7	Average crop yield per acre (Kg)	400	650	+250
8	Households using solar Energy for Lighting	24	38.3	+14.3

3.4 Key Findings: Food Security, Land Degradation, Gender, and Climate Adaptation

3.4.1 Food Security and Nutrition

The project significantly improved household food security, particularly in Nzega, Kondoa, and Micheweni. Households with reliable food access increased by 5.6%, and diet diversity improved, with higher consumption of vegetables, legumes, and dairy products (LDFS Endline Report, 2024). However, Micheweni faced food sufficiency challenges, requiring targeted interventions (VPO, 2024).

3.4.2 Land Degradation and Soil Management

The project facilitated the widespread adoption of erosion control measures, including contour farming, agroforestry, and sustainable soil restoration (VPO, 2024). Soil organic carbon (SOC) levels improved, and deforestation rates declined, particularly in Kondoa and Micheweni, where tree-planting initiatives were introduced (VPO, 2024).

3.4.3 Gender and Social Inclusion

Significant strides were made in gender equality, with the gender and social inclusion index rising from 74.6% in 2019 to 82.6% in 2024 (VPO, 2024). More women engaged in decision-making, particularly in producer groups, farmer field schools, and water management committees (VPO, 2024).

3.4.4 Climate Adaptation and Resilience

Climate adaptation efforts were widely embraced, with 28% of farmers adopting CSA techniques, compared to only 3% in 2019 (VPO, 2024). Weather forecasts for farm planning have increased, leading to better crop production and risk management (VPO, 2024).

3.5 Changes in Household Income, Agricultural Productivity, and Climate Resilience

3.5.1 Household Income and Economic Well-being

Household income from agricultural sales increased, particularly for paddy, legumes, and cassava (VPO, 2024). Participation in income-generating activities, such as beekeeping and spice agroforestry, expanded significantly, especially in Pemba (VPO, 2024).

3.5.2 Agricultural Productivity

Crop yields improved from an average of 400 kg per acre in 2019 to 650 kg in 2024, mainly due to the adoption of conservation agriculture, improved seeds, and irrigation techniques (VPO, 2024).

3.5.3 Climate Resilience and Sustainability

Greater adoption of rainwater harvesting, irrigation ponds, and drought-resistant crops enhanced community resilience to climate shocks (VPO, 2024). Community-led tree planting and reforestation improved carbon sequestration and ecosystem restoration (VPO, 2024).

4.0 ASSESSMENT OF LAND DEGRADATION, SOIL HEALTH, AND CARBON BALANCE (2023-2024)

4.1 Overview of the Land Degradation Surveillance Framework (LDSF)

The LDFS project deployed the Land Degradation Surveillance Framework (LDSF) tool, which measures ecosystem health. The LDSF was developed by the World Agroforestry (ICRAF) in response to the need for consistent field methods and indicator frameworks

to assess land health in landscapes. This methodology was applied in five districts: Magu, Nzega, Mkalama, Kondoa, and Micheweni.

4.2 Soil Health Indicators and Findings

The key indicators in LDSF methodology tested using this methodology were Soil Organic Carbon (SOC), soil pH and Exchange Bases. Project site soil samples were collected and tested in the ICRAF soil laboratory in Nairobi. Laboratory findings indicated that the Magu district had the lowest average carbon values, and the Micheweni (Pemba) site had the highest SOC values. The second indicator that was tested was soil pH. The findings of Soil pH reveal that the most alkaline site was Mkalama, while Kondoa and Nzega were the most acidic. **Table 4.1** summarizes findings on SOC and soil pH from project sites. The Mkalama site had more exchangeable bases than the other four sites.

4.3 Erosion Prevalence and Soil Water Conservation Measures

Erosion was the most widespread form of land degradation. Haubi in Kondoa has the highest overall erosion prevalence, while Sigili in Nzega District and Maziwa Ng'ombe in Micheweni have the lowest (VPO, 2023a). **Plate 1.1** depicts the extent of soil erosion in Haubi village Kondoa district, where erosion has reduced topography levels by leaving a stand-alone hard rock.

The LDFS Project deployed Soil Water Conservation (SWC) Measures to address soil erosion: stone/soil bunds, Jembe la Mzambia pit, Mbegu Tisa, Alley cropping, and Tie ridge. Nzega had the highest number of SWC measures, and Kondoa had the lowest. **Plate 1.2** indicate SWC measures in Nzega and Kondoa.

Plate 4.1 Evidence of Soil Erosion in Haubi Kondoa.

Plate 4.2 Soil bunds for water conservation in rice growing fields in Sigili, Nzega and Haubi, Kondoa

Table 4.1 SOC and soil pH for Project Sites

Source: VPO (2023)

LDSF Site	District	Depth code	Count	Mean SOC	sd SOC	Mean pH	sd pH	Mean Sand	sd Sand	Mean ExBas	sd ExBas
				g kg^{-1}	g kg^{-1}			%	%	cmol kg^{-1}	cmol kg^{-1}
Iseni	Magu	Topsoil	157	7.40	3.24	6.84	0.49	58	15	12.64	8.15
Kondoa	Kondoa	Topsoil	162	8.50	7.09	6.26	0.55	50	16	7.01	4.90
Mkalama	Mkalama	Topsoil	159	7.24	3.46	8.20	0.59	45	12	39.13	20.05
Pemba	Micheweni	Topsoil	162	34.21	27.55	6.57	0.70	38	24	32.57	29.95
Sigili	Nzega	Topsoil	160	6.29	1.88	6.50	0.61	55	13	10.59	7.58
Iseni	Magu	Subsoil	152	6.65	2.90	7.02	0.68	53	16	15.92	12.57
Kondoa	Kondoa	Subsoil	142	6.35	4.47	6.29	0.55	47	17	7.09	4.84
Mkalama	Mkalama	Subsoil	156	6.38	3.05	8.32	0.54	44	12	41.77	20.46
Pemba	Micheweni	Subsoil	147	28.81	25.04	6.47	0.70	38	25	27.46	25.21
Sigili	Nzega	Subsoil	160	4.97	1.44	6.85	0.82	50	14	14.13	9.98

4.4 Tree Densities and Land Use Analysis

The findings from the LDSF show variability in the tree species across the sites. Haubi in Kondoa had 67 species, Iseni in Magu 31, Mpambala in Mkalama 22, Maziwa Ng'ombe in Micheweni 49 and Sigili Magu only 28. The analysis of land use in the project sites revealed that the key land use entails cultivation, which cultivation occupied 46% in Haubi, Kondoa, 54% in Mpambala, Mkalama, 58% in Maziwa Ng'ombe, Micheweni, and 81% in Sigili, Nzega.

4.5 Carbon Balance Analysis and Climate Impact (2024)

4.5.1 Objectives of Carbon Balance Monitoring

The objective of the carbon monitoring was to estimate the impact of project activities on greenhouse gas emissions and carbon sequestration, demonstrating that the LDFS project provides additional environmental benefits by helping to mitigate climate change.

The specific tasks were Receiving Ex-Ant Carbon Balance Tool (EX-ACT) input data from the Executive Agency (Implementing Districts), Conducting data cleaning and exploration, Providing a general description of the project (geographic area, climate, soil characteristics, duration), Identifying changes in land use and technologies foreseen by the project and computing carbon balance, training staff from line ministries, districts, and inter-village natural resources management groups/ committees on EX-ACT application to assess and monitor project performance and sustain tool use for decision support post-project (VPO, 2024c).[3]

4.5.2 Carbon Sequestration and Greenhouse Gas Emission Reduction Results

The results of carbon monitoring in the LDFS project indicate that the project surpassed expectations by sequestering 1,085,594 tons of CO_2 eq against 14,052 tons of CO_2 eq emissions, achieving a net mitigation potential of 1,099,647 tons of CO_2 eq of the project target of 915,247 tons CO_2 eq (VPO, 2024c).

The training of staff from line ministries, districts, and inter-village natural resources management groups/ committees on EX-ACT application to assess and monitor project performance and sustain tool use for decision support post-project was 30 participants from Micheweni, Nzega, Kondoa, Magu, and Mkalama Districts participants.

4.5.3 Changes in Land Use and Vegetation Cover and adoption of climate-smart practices and agroforestry practices

The LDFS project played a key role in ensuring sustainable land management and reversing changes in vegetation cover. During 2017-2024, the project targeted managing 9,000 hectares of degraded lands sustainably. The end-review assessment showed that the project implementation covered over 4,452 hectares, or 50% of the goal (VPO, 2024c).

[3] *VPO, 2024c Monitoring and Assessment of Carbon Balance Analysis Report*

Further, adopting climate-smart agricultural practices and agroforestry systems was key to reversing land degradation and increasing carbon sequestration in semi-arid areas. The project enhanced agricultural productivity by integrating conservation farming, minimal tillage, and soil fertility management while promoting environmental restoration.

Agroforestry systems, including alley cropping, silvopasture, and intercropping with nitrogen-fixing trees, reduced soil erosion, improved water retention, and diversified income sources for farmers. These interventions significantly contributed to reducing carbon sequestration and greenhouse gas, demonstrating a sustainable approach to land rehabilitation. The success of these initiatives underscores the potential for scaling up climate-smart agroforestry models to enhance resilience and sustainability in similar degraded ecosystems. Plate 1.3 indicates the Adoption of Climate-Smart Practices and Agroforestry Systems.

Plate 4.3 Adoption of Climate-Smart Practices and Agroforestry Systems
(copied from URT, VPO LDFS Carbon Monitoring Report 16th June 2024)

4.5.4 Lessons Learned and Future Opportunities for Scaling Carbon Mitigation

4.5.4.1 Lessons Learned from the Carbon Balance Analysis Report

Integration of Climate-Smart Practices is Effective: The integration of climate-smart agricultural practices proved to be highly effective in mitigating greenhouse gas emissions while promoting sustainable land management. Adopting conservation farming, agroforestry, and improved land use practices demonstrated significant success in reversing land degradation and increasing carbon sequestration. The project highlighted how targeted interventions, particularly those enhancing soil fertility and vegetation cover, can yield long-term environmental and socio-economic benefits.

Forest Regeneration and Tree Planting are Key Strategies: Forest regeneration and tree planting emerged as essential strategies for carbon sequestration and environmental restoration. Expanding forest cover through regeneration and native tree plantations significantly contributed to carbon mitigation, while agroforestry provided an additional advantage of integrating agricultural productivity with climate resilience. The project demonstrated that maintaining and expanding tree cover is crucial in improving ecosystem services and reducing climate-related vulnerabilities in semi-arid areas.

Project Monitoring and Evaluation Improve Climate Outcomes: Project monitoring and evaluation played a critical role in ensuring the effectiveness of carbon mitigation interventions. The EX-ACT tool enabled precise measurement of the project's impact on carbon sequestration and greenhouse gas emissions, allowing for data-driven decision-making and adaptive management. Systematic tracking of land use changes and emission reductions provided valuable insights, ensuring implemented activities aligned with carbon mitigation goals and sustainable land management practices.

Capacity Building Strengthens Sustainability: Capacity-building initiatives strengthened local expertise and ensured the sustainability of climate mitigation efforts. Training sessions on carbon monitoring and sustainable land management practices equipped local stakeholders with the necessary skills to maintain and expand conservation activities beyond the project’s duration. The engagement of district officials, local communities, and technical experts enhanced the adoption of climate-smart agriculture and contributed to the long-term viability of the interventions.

Challenges in Achieving Targeted Land Restoration: Despite the project's success in reducing carbon emissions and rehabilitating degraded lands, challenges remained in achieving the targeted restoration area. The project initially aimed to rehabilitate 9,000 hectares, but only 4,452 hectares (50%) were sustainably managed by the end of implementation. This shortfall was largely due to persistent land degradation, climate variability, and socio-economic constraints that hindered the full realization of planned interventions. Addressing these challenges requires greater resilience-building strategies and expanded financial and technical support for local communities.

Carbon Sequestration Potential Exceeded Expectations: The project's carbon sequestration potential exceeded initial expectations, demonstrating the feasibility of integrating carbon mitigation strategies into land restoration programs. The project sequestered 718,220 tons of CO_2eq while emitting only 11,624 tons, achieving a net mitigation potential of 729,844 tons of CO_2eq, 80% of the original target. These results underscore the importance of well-designed land management initiatives in tackling climate change and provide a strong foundation for scaling similar projects across other degraded ecosystems.

4.5.4.2 Future Opportunities for Scaling Carbon Mitigation

Expanding Agroforestry and Forest Regeneration: Expanding agroforestry and forest regeneration presents a significant opportunity to scale carbon mitigation efforts. Increasing the scope of tree planting and natural regeneration programs in degraded landscapes can further enhance carbon sequestration while improving soil fertility and water retention. Encouraging private-sector investment in agroforestry projects can also play a key role in funding and sustaining these initiatives, ensuring long-term ecological and economic benefits.

Strengthening Policy Support for Carbon Mitigation Projects: Strengthening policy support for carbon mitigation projects is essential for scaling up successful interventions. Aligning national policies with global carbon mitigation strategies can create an environment enabling the expansion of sustainable land management initiatives. Establishing financial incentives, such as subsidies or tax benefits for farmers

and landowners practising carbon-sequestering activities, could further accelerate the adoption of climate-smart agricultural practices.

Leveraging Carbon Markets and Financing Mechanisms: Leveraging carbon markets and financing mechanisms can provide a sustainable funding source for scaling mitigation efforts. Exploring carbon credit mechanisms and linking project activities to voluntary and compliance carbon markets could generate additional revenue streams to support afforestation, reforestation, and land rehabilitation. Engaging with international climate finance institutions, such as the Green Climate Fund (GCF) and the Global Environment Facility (GEF), can further strengthen financial sustainability and facilitate the replication of successful carbon mitigation models.

Enhancing Community Participation and Ownership: Community participation and ownership of carbon mitigation projects is crucial for long-term sustainability. Strengthening local governance structures and ensuring that communities have a stake in the success of interventions will help maintain momentum beyond the project's lifespan. Providing technical support, capacity-building programs, and financial incentives for local communities can drive greater adoption of sustainable practices and enhance the resilience of local ecosystems.

Replication in Other Degraded Ecosystems: Replication of the project's successes in other degraded ecosystems offers a promising avenue for scaling carbon mitigation efforts. The methodologies and lessons learned from this initiative can be applied to other semi-arid and degraded regions across Tanzania and beyond. Adapting interventions to fit the specific socio-ecological contexts of different project sites will be critical to maximizing impact and ensuring sustainable land management at scale.

Advancing Research and Innovation: Advancing research and innovation in carbon sequestration and sustainable agriculture will further enhance the effectiveness of future mitigation projects. Investing in research to identify more efficient carbon sequestration techniques, improve soil health, and develop sustainable farming methods can strengthen the impact of climate-smart initiatives. Collaborating with academic and

research institutions to refine carbon monitoring tools and methodologies will provide a scientific basis for scaling up successful interventions.

Improving Water Resource Management for Climate Resilience: Improving water resource management is another critical area for strengthening climate resilience and carbon mitigation efforts. Integrating water conservation measures, such as rainwater harvesting and irrigation systems, into carbon mitigation projects can enhance agricultural productivity while reducing the vulnerability of farming systems to climate variability. Expanding irrigation infrastructure in drought-prone regions can further support conservation farming practices and enhance the overall sustainability of mitigation efforts.

By leveraging these opportunities, future carbon mitigation initiatives can achieve a more significant impact in reversing land degradation, enhancing food security, and supporting Tanzania's climate resilience goals. Ensuring continued stakeholder engagement, adaptive management, and policy integration will be key to sustaining and scaling these successes in the long term.

5.0 KEY ACHIEVEMENTS OF THE PROJECT

The project successfully implemented various interventions to reduce land degradation and improve food security. The following are the key achievements;

5.1 Component 1: Institutional capacity building for sustainable land management and biodiversity conservation at landscape level

The LDFS project significantly strengthened institutional capacity for sustainable land management and biodiversity conservation. The project established a strong foundation for long-term land use and environmental protection sustainability through governance reforms, community engagement, and policy development. Institutional structures were enhanced at district and village levels, enabling effective natural resource governance and improving land tenure security.

District Land Use Planning Committees were established in all five implementing districts to facilitate structured land management. These committees played a crucial role in coordinating land-use activities and ensuring the implementation of sustainable land management practices. At the community level, 23 Village and Shehia Land Use Planning Committees and 23 Village and Shehia Natural Resource Management Committees were formed across the project sites. These committees were instrumental in promoting participatory decision-making on land use, biodiversity conservation, and conflict resolution. In addition, the project supported the development of 15 Village Land Use Plans (VLUPs) and eight Shehia Land Use Plans (SLUPs) in Micheweni, Pemba, ensuring equitable resource allocation and long-term sustainability as shown in Plate 5.1.

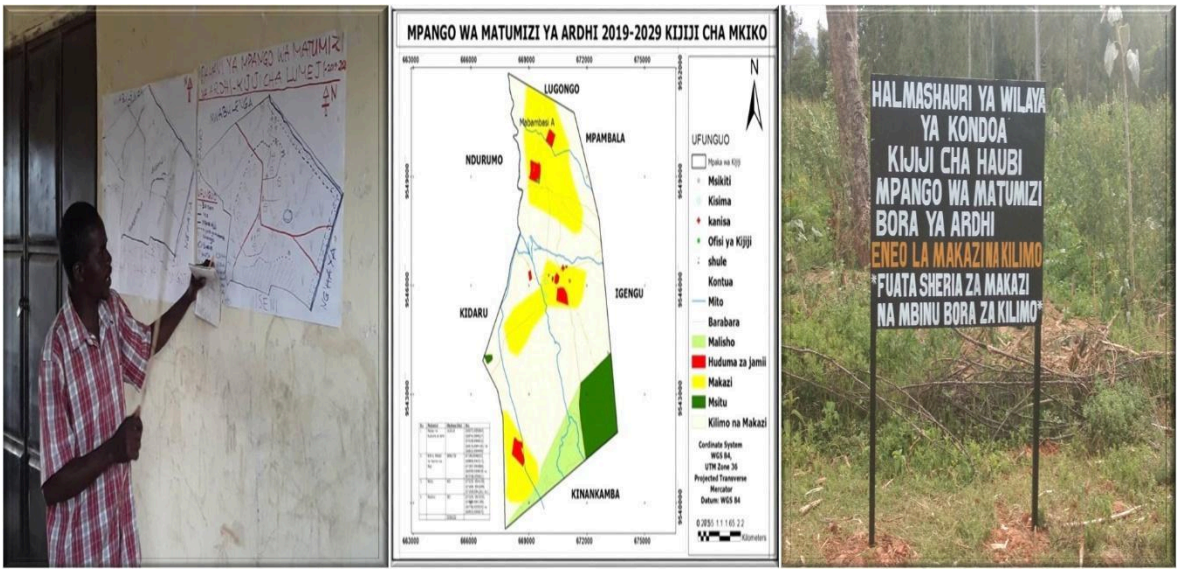

Plate 5.1 Land use plans for 15 villages and 8 Shehia

A significant success of the project was enhancing land tenure security by issuing 2,674 Certificates of Customary Rights of Occupancy (CCROs) in four implementing districts in Tanzania's mainland. The land tenure formalisation reduced land disputes and safeguarded smallholder farmers from land grabbing and forced evictions. Additionally, the project ensured that village land boundaries were demarcated, mitigating conflicts and enhancing the sustainable management of forests, grazing lands, and farmlands.

Capacity-building efforts played a key role in the project's success. 92 district officials received training on land use planning, sustainable resource management, and biodiversity conservation, exceeding the initial target of 50 officials. At the village level, 9,867 individuals, including 4,706 men, 2,466 women, and 2,695 youth, participated in capacity-building programs to enhance their understanding of land governance, climate-smart agriculture, and conservation strategies. These training sessions, conducted in collaboration with the Tanzania Forest Services Agency (TFS), Tanzania Forest Research Institute (TAFORI), and the National Land Use Planning Commission (NLUPC), covered critical topics such as climate-smart agriculture, integrated pest management (IPM), integrated soil fertility management (ISFM), financial literacy, business skills, value addition, market linkages, and operation and maintenance of water infrastructure. In total, 7,172 community members received training, surpassing the target of 3,000, further reinforcing sustainable land management (SLM) and biodiversity conservation practices.

Despite these successes, land conflicts remained a significant challenge, with disputes increasing from 55.8% at baseline to nearly 90% at project completion. Most of these conflicts arose from competition over land and pasture, particularly in districts such as Nzega and Magu. The project addressed these issues through participatory land-use planning, clear land demarcation, and conflict resolution mechanisms. In Mkalama District, the Hadzabe community benefited from improved land security and targeted conflict-resolution strategies, ensuring continued access to natural resources.

Efforts to enhance gender and social inclusion in natural resource governance yielded mixed outcomes. While women's participation in Village Natural Resource Management Committees (VNRMCs) and Village Land Use Management Committees (VLUMs) increased significantly in Magu and Mkalama (reaching 88.9% and 93.9%, respectively), lower engagement was reported in Kondoa and Micheweni. Structural and cultural barriers continued to limit women's involvement in decision-making processes. Although 83.7% of households acknowledged women's participation in VNRMCs and 71.9% in VLUMs, many women still faced restrictions in leadership roles. The project integrated gender-sensitive strategies to promote women's engagement, but additional efforts are needed to overcome socio-cultural constraints and ensure their full participation in governance structures.

The project also played a key role in strengthening policy development and legal frameworks for sustainable land management. The enforcement of by-laws on land use and forest conservation provided communities with a structured legal framework for managing natural resources. Additionally, the project supported the Land Use Planning Commission in developing a comprehensive training manual on land management and administration, which was widely used for institutional capacity-building initiatives.

Overall, the LDFS project made substantial progress in institutional capacity building, land governance, and community participation in sustainable land management. Establishing VNRMCs, VLUMs, participatory land-use planning frameworks, legal reforms, and gender-inclusive policies contributed to a strong foundation for biodiversity conservation and ecosystem resilience. However, rising land conflicts and persistent gender disparities remain challenges that require continued intervention. Strengthening institutional capacity, legal enforcement, and inclusive decision-making will ensure the sustainability and impact of these efforts beyond the project's implementation period.

5.2 Component 2: Up-scaling of Sustainable and Climate-Smart Agriculture, Land, Water and Pastoral Management Systems

To enhance agricultural productivity and resilience, 204 farmer field schools (100 for crops and 104 for income-generating groups) have been established. To improve access to water, 27 wells have been drilled and installed with water pumps, solar panels, and 48 domestic water distribution points. Best agronomic practices, including conservation agriculture and climate-smart techniques such as Jembe la Mzambia, Mbegu Tisa, agroforestry, tie ridges, and mixed cropping, have been implemented across all project sites to improve soil fertility and ensure sustainable land use.

Rehabilitation efforts have included the restoration of 2,450 meters of earth bunds and the construction of two spillways, with one additional spillway rehabilitated to control seawater intrusion and protect agricultural lands. Forest restoration has been a key intervention, with biological measures covering 1,948 hectares of woodlands and 2,932 hectares of mangrove conservation. A total of 2,124,428 tree seedlings, suckers, cuttings, mangrove propagules, and fruit seedlings have been planted across 1,529 hectares. Physical restoration measures include constructing 42 gabion lines, 159 loose stone lines, eight brushwood sets, and a 20-meter-long retaining wall to prevent soil erosion and enhance ecosystem stability.

To reduce reliance on traditional biomass fuel, 257 improved cooking stoves as shown in **Plate 5.2** have been installed in seven institutions and 250 households, promoting energy efficiency and reducing deforestation. The Beekeeping initiatives have been strengthened by procuring 5,315 modern beehives, four sets of honey processing machines, and protective beekeeping equipment, supporting producer groups to enhance the quality and quantity of bee products.

Water resource management has been prioritized by rehabilitating and constructing 10 charco dams and 14 livestock troughs in Mkalama, Magu, and Nzega Districts, ensuring water availability for domestic use, livestock, and irrigation. Three micro-supplementary irrigation systems have been developed, including three plastic dam liner water reservoirs and three concrete irrigation canals to support climate-resilient farming.

Livestock management has improved by rehabilitating one dip tank and constructing seven new dip tanks in Nzega, Magu, and Mkalama, reducing disease outbreaks and enhancing livestock productivity (as shown in **plate 5.3**). Value addition and processing infrastructure have also been developed, including four honey processing centres, two seaweed processing centres, one milk storage and collection centre, one godown, and two rice milling machines and poultry-keeping buildings.

Plate 5.2 Improved cooking stoves for households and institutions

Plate 5.3 Photo showing Dip tanks

To further enhance livestock and aquaculture production, the project has facilitated the construction of 40 cow sheds, four goat sheds, two sheep sheds, five chicken sheds, and 19 seaweed drying facilities, ensuring better management and productivity in the respective value chains. These integrated interventions collectively contribute to scaling up sustainable and climate-smart agricultural practices while enhancing resilience in land, water, and pastoral management systems.

5.3 Component 3: Monitoring and Assessment

The Monitoring and Assessment component played a crucial role in evaluating the effectiveness of project interventions, tracking progress in reversing land degradation and ensuring accountability in financial and environmental performance. Through baseline studies, carbon monitoring, outcome surveys, and knowledge management initiatives, the project established a strong evidence base to inform decision-making, enhance adaptive management, and support the long-term sustainability of interventions.

5.3.1 Baseline Survey

The Household Socio-economic Baseline Survey results provided critical insights into the socio-economic conditions, land use patterns, and environmental challenges

communities face in the project districts. The baseline data served as a foundation for assessing the impact of interventions, helping to track progress in reversing land degradation and improving food security.

5.3.2 Carbon Monitoring Survey

The project exceeded expectations by sequestering 1,085,594 tons of CO_2eq, while emissions were recorded at only 14,052 tons of CO_2eq, achieving a net mitigation potential of 1,099,647 tons of CO_2eq. This remarkable achievement highlights the effectiveness of reforestation, agroforestry, and climate-smart agriculture interventions. Expanding woodlands, sustainable rangeland management, and adopting conservation farming practices were crucial in enhancing carbon sequestration. The application of the EX-ACT Tool facilitated precise measurement of these gains, ensuring that project outcomes were aligned with global carbon reduction targets.

5.3.3 Outcome Survey

In collaboration with IFAD, the Project Coordination Unit (PCU) developed an action plan to address challenges such as delays in implementing key activities. The capacity-building initiatives to strengthen existing village committees for natural resources management (forests and land) were a notable success. These efforts improved governance structures and community participation in sustainable land use planning. The outcome survey further revealed increased adoption of climate-resilient practices, which enhanced agricultural productivity, soil conservation, and livelihood diversification in the project areas.

5.3.4 Endline Survey

The endline survey confirmed substantial progress in household resilience, food security, and sustainable land management. A key finding was the increased community awareness and adoption of sustainable agricultural techniques, leading to improved crop yields, reduced soil erosion, and better farmland water retention. The survey also documented the positive impact of land-use planning interventions, significantly reducing land conflicts and facilitating resource-sharing among communities.

Additionally, the endline assessment underscored the growing role of women and youth in decision-making processes, a critical milestone in promoting inclusivity and social equity in natural resource management.

5.3.5 Socio-economic Market Survey

A dedicated training and dissemination session was conducted to share the socioeconomic and market analysis findings, focusing on the potential of semi-arid areas for agricultural development. The survey identified key crops and livestock products that thrive in the targeted regions, highlighting market opportunities, financial access mechanisms, and post-harvest management strategies. Additionally, the assessment provided valuable insights into supply chain gaps, price trends, and value chain integration, enabling farmers to make informed decisions regarding production and marketing.

5.3.6 Knowledge Management

The project made significant strides in knowledge management, ensuring that lessons learned and best practices were systematically documented and disseminated. This included the development of training manuals, policy briefs, and community resource guides that provided stakeholders with practical tools for sustainable land management. The establishment of knowledge-sharing platforms facilitated the exchange of experiences among farmers, extension officers, and policymakers, enhancing the replication of successful interventions. Furthermore, the project strengthened district and national monitoring and assessment capacities, enabling real-time environmental and socio-economic indicators tracking.

5.3.7 Assessment of Land Degradation

The project's reports revealed high erosion prevalence across all sites, underscoring the urgency of implementing soil and water conservation measures. Findings indicated low soil infiltration capacity, low species diversity, and poor soil quality, emphasizing the need for enhanced restoration efforts. Through targeted interventions such as reforestation, contour farming, and gully rehabilitation, significant improvements were

recorded in vegetation cover, soil moisture retention, and overall ecosystem resilience. The data collected through satellite imagery, field surveys, and participatory assessments informed adaptive strategies to combat land degradation effectively.

5.3.8 Project Auditing

The project maintained strong financial accountability and transparency, as evidenced by the seven consecutive Unqualified Opinions issued by the Controller and Auditor General (CAG) from 2017/2018 to 2023/2024. This consistent adherence to financial management procedures and guidelines reflects the project's commitment to good governance, efficient resource utilization, and compliance with international financial standards. The robust auditing framework further enhanced donor confidence and laid the groundwork for future funding and scale-up opportunities.

6.0 OUTCOME SURVEY AND PROJECT IMPACT ASSESSMENT (2023-2024)

The LDFS Outcome Survey (2023) was conducted to assess the extent to which the project interventions achieved their intended results, as outlined in the project’s log frame. The survey provided valuable insights into the participation of beneficiaries in

project activities, economic and social benefits, environmental outcomes, and progress in gender, youth, and social inclusion. This section presents a synthesis of findings from the Outcome Survey Report (2023) and the Project Report (2017-2024), highlighting the project's impact on Kondoa, Mkalama, Nzega, Magu, and Micheweni communities.

6.1 Methodology and Data Collection Approach

The outcome survey employed a cross-sectional, non-experimental study design, comparing the conditions before and after project implementation. Data were collected through household surveys, key informant interviews (KIIs), focus group discussions (FGDs), and documentary reviews (VPO, 2023). The survey covered 433 households across eleven (11) villages on the Tanzania mainland and three Shehias in Zanzibar, ensuring representation from different agroecological zones. A participatory random sampling strategy was applied to select beneficiaries from a database of project participants, guaranteeing an unbiased representation of project outcomes.

To complement the household surveys, additional qualitative data were obtained through KIIs with 28 village leaders, 56 farmers, and 10 district staff, while 112 farmers participated in FGDs to provide further insights (VPO, 2023). Data was collected using structured questionnaires, interview guides, and thematic analysis of qualitative responses. Quantitative data were analyzed using Excel, SPSS, and STATA for statistical analysis, while qualitative responses were categorized into key themes to identify trends and patterns. This rigorous methodology ensured that the findings of the outcome survey were evidence-based and comprehensive.

6.2 Participation in Project Activities: Farmers' Field Schools, Producer Groups, and Income-Generating Activities

Participation in Farmers' Field Schools (FFS), producer groups, and income-generating activities (IGAs) played a crucial role in the LDFS project, with significant community engagement across the project districts. According to the outcome survey, 39.9% of surveyed beneficiaries participated in FFS, with the highest engagement recorded in Kondoa (50.7%) and Mkalama (53.8%) (VPO, 2023).

Another key intervention was forming producer groups, with 14.3 percent of households actively involved. Notably, Nzega recorded the highest participation in producer groups

(41.1 percent), where collective marketing of agricultural products was a major focus (VPO, 2023). This approach enabled smallholder farmers to access better markets, negotiate fair prices, and improve their overall income.

Income-generating activities such as beekeeping, seaweed farming, and agro-processing also gained traction, particularly in Micheweni, where 57.8 per cent of households engaged in seaweed farming. This demonstrated the potential of coastal-based livelihoods in diversifying income sources for communities (VPO, 2024a). The project facilitated the formation of 192 producer user groups, which fostered cooperative production, improved access to inputs, and strengthened market linkages. These institutions provided training and knowledge-sharing opportunities that enhanced the resilience of farming communities.

6.3 Economic and Social Benefits for Households and Communities

The LDFS project positively impacted household income and community livelihoods, with a significant proportion of beneficiaries reporting increased earnings. According to the outcome survey, 62.4 percent of households experienced increased income due to improved crop yields, better market access, and participation in income-generating groups (VPO, 2023). Farmers who engaged in project-supported investments saw notable improvements, with 30.8 percent of households earning revenue from such investments, while 33.6 percent benefited from increased crop sales through FFS interventions.

In Micheweni, income-generating groups contributed significantly to household earnings, accounting for 32.1 percent of total household income in the district. The project also played a key role in improving financial literacy and microfinance accessibility, allowing more beneficiaries to access credit for business expansion. However, challenges such as climate-related income fluctuations, limited access to improved seed varieties, and traditional farming practices continued to hinder productivity (VPO, 2023). Addressing these constraints through enhanced financial support, agricultural extension services, and climate-resilient farming techniques will be crucial for sustaining economic gains.

6.4 Environmental and Natural Resource Management Outcomes

The Reversing Land Degradation Trends and Increasing Food Security in Degraded Ecosystems of Semi-Arid Areas of Tanzania (LDFS) project has significantly contributed to sustainable land management (SLM), reforestation, and climate-resilient agriculture, thereby reversing land degradation and improving ecosystem health. According to the 2023 Outcome Survey, 75.9% of respondents reported declining deforestation and forest degradation, primarily attributed to sustainable forest management, improved cooking stoves, and modern beekeeping techniques (VPO, 2023)[4]. These interventions have reduced the dependence on unsustainable wood harvesting and improved forest regeneration.

Through its implementation, the project successfully restored 4,480 hectares of degraded land by integrating afforestation, soil conservation practices, and conservation agriculture (VPO, 2024a)[5]. Notably, the carbon sequestration potential exceeded initial expectations. The project was initially projected to sequester 915,247 tons of CO_2equivalent, but final assessments revealed a total sequestration of 1,085,594 tons of CO_2equivalent, a 19% increase over the initial target (VPO, 2024b)[6]. This significant achievement demonstrates the impact of afforestation, agroforestry, and sustainable land-use planning in enhancing carbon storage capacity and mitigating climate change effects.

Coastal ecosystem restoration in Micheweni played a pivotal role in carbon sequestration and climate resilience, mainly through mangrove conservation. Studies show that mangrove ecosystems store carbon at rates up to four times higher than terrestrial forests (VPO, 2024a). The project's restoration efforts have reduced coastal

[4] Vice President's Office. (2023). *Final Report Outcome Survey September 29, 2023*. Dodoma, Tanzania.

[5] Vice President's Office. (2024a). *Project Report November 2017 to September 2024*. Dodoma, Tanzania.

[6] Vice President's Office. (2024b). *Monitoring and Assessment of Carbon Balance Analysis*. Dodoma, Tanzania.

erosion, enhanced marine biodiversity, and strengthened climate adaptation measures in Zanzibar.

Adopting soil conservation techniques, such as *Jembe la Mzambia* and *Mbegu Tisa*, has significantly improved water retention, increased soil organic matter, and boosted crop productivity (VPO, 2023). These agricultural interventions also reduced greenhouse gas emissions from soil degradation and traditional farming practices, reinforcing their importance for climate-smart agriculture.

Despite these positive environmental outcomes, several challenges remain. Charcoal production and unsustainable agricultural expansion threaten reforested and protected areas (VPO, 2024b). To address these challenges, enhanced enforcement of land use policies, community education on sustainable practices, and the promotion of alternative livelihoods will be crucial in sustaining the project's environmental gains.

The LDFS project has significantly contributed to carbon sequestration, emissions reduction, and sustainable natural resource management. These findings provide strong evidence for scaling up similar interventions in other semi-arid regions of Tanzania, promoting environmental resilience and improved rural livelihoods.

6.5 Gender, Youth, and Social Inclusion Outcomes

The project actively promoted gender equality, youth engagement, and social inclusion, resulting in notable improvements in women's participation and youth empowerment. The outcome survey revealed that female participation in project activities increased to 53.3 percent, reflecting greater involvement of women in decision-making and economic opportunities (VPO, 2023). Youth engagement also improved, with 24.1 per cent of surveyed participants under 35 actively involved in FFS, IGGs, and training on climate-smart agriculture.

A key milestone was training 575 community leaders on gender-sensitive approaches, contributing to higher female representation in village decision-making (Project Report, 2017-2024). However, the level of participation varied across districts, with women's influence in Natural Resource Management (NRM) committees being more pronounced in Magu and Nzega. At the same time, Kondoa and Micheweni still recorded lower

levels of female participation. The study also found that the top-down approach in forming village institutions limited community ownership and empowerment, suggesting a need for more inclusive governance structures in future interventions (VPO, 2023).

7.0 LAND RESTORATION AND SUSTAINABLE AGRICULTURE TECHNOLOGIES

A brief description of appropriate sustainable agricultural land management technologies to address land degradation is provided below;

7.1 Contour farming for erosion Control (Kondoa)

Contour farming involves ploughing along the land's natural contours rather than up and down slopes. This method helps to reduce soil erosion and water runoff, enhance soil moisture retention, and promote sustainable land use. Key benefits include Reduced soil loss and nutrient depletion, improved water infiltration and retention, and Increased crop yield and soil stability.

7.2 Cereal-Legume Intercropping (Kondoa and Magu)

Cereal-legume intercropping is an agroecological approach that involves growing cereals (e.g., maize and sorghum) alongside legumes (e.g., beans, pigeon peas). This practice enhances soil fertility through nitrogen fixation and improves agricultural productivity. Key advantages include Increased nitrogen levels in the soil through biological fixation, Improved soil structure and reduced dependency on synthetic fertilizers, and Enhanced biodiversity and resilience against pests and diseases.

7.3 Conservation Agriculture for Soil Moisture Retention (Magu, Nzega, Kondoa, Micheweni and Mkalama)

Conservation agriculture integrates minimal soil disturbance, permanent soil cover, and crop diversification to improve soil health and water retention. Key advantages include No-till or minimum tillage to maintain soil structure, Cover crops and crop residue retention to prevent erosion and moisture loss, and Crop rotation and diversification to improve soil nutrients and reduce pest pressure.

7.4 In-Situ Rainwater Harvesting (Mbegu Tisa and Jembe la Mzambia) - Magu, Nzega, Kondoa and Mkalama

In-situ rainwater harvesting techniques focus on maximizing water retention within farmlands. **Mbegu Tisa** and **Jembe la Mzambia** are traditional methods used in Tanzania and project sites to enhance moisture conservation and soil fertility. Key advantages include Increased soil water availability for crops during dry periods,

improved soil fertility through organic matter accumulation, and Enhanced resilience against drought and erratic rainfall.

7.5 Earth bund farming technology improved crop production and mangrove forest management

Earth bund technologies have been instrumental in controlling saltwater intrusion into agricultural lands, enhancing farming practices in the Micheweni district. By preventing seawater encroachment, the technology has enabled local farmers to cultivate crops sustainably, improving food security and community livelihoods. Additionally, the technology has significantly contributed to mangrove conservation along the coastal areas. By maintaining the balance of freshwater and saltwater dynamics, earth bunds create favourable conditions for mangrove regeneration and reduce the degradation of these critical ecosystems. Plate 7.1 shows Earth Bund technology in Micheweni indicating how it has sustained land restoration from saltwater intrusion

Plate 7.1 Earth Bund technology in Micheweni for controlling sea water intrusion

The success of this integrated approach highlights the importance of combining traditional knowledge with modern conservation techniques. Strengthening community engagement in sustainable mangrove management and expanding earth bund initiatives will further enhance resilience against coastal erosion and climate change impacts in Micheweni and other vulnerable coastal areas.

8.0 PROJECT BEST PRACTICES AND SUCCESS STORIES

8.1 Success Stories

8.1.1 Climate-smart agriculture (Mbegu Tisa and Jembe la Mzambia pits)

The *Mbegu Tisa* and *Jembe la Mzambia* pits, part of the Climate Smart Agriculture (CSA) technologies, have proven to be a game-changer in the semi-arid region where the Reversing Land Degradation Trends and Increasing Food Security in Tanzania's Semi-Arid Areas project is implemented.

The Raha Leo Farmer Field School at Mafai village, In the Kondoa district, which experienced a severe drought in 2021/2022, with seasonal rainfall of 624 mm observed in 41 days, adopted these technologies and witnessed a remarkable transformation in production and increased maize yields as well as community resilience to climate change.

The Mbegu Tisa pits technology **(Plate 8.1)** has improved soil water conservation, making it preferable in dry areas with poor rainfall distribution. It has also enhanced soil fertility and reduced the costs of weeding. Most notably, it has significantly increased productivity - from 500 -1000 kg per acre in traditional practice to 5000 - 6000 kg per acre.

Plate 8.1*:* Left Preparation of Mbegu Tisa pits technology. Right: maize plants at an early stage

8.1.2. Jembe la Mzambia preparation and plants

For Jembe la Mzambia, the technology uses manure fertilizers. Each pit requires 5 - 6 Kg of manure, making a total of 4 Tons per acre. Despite the initial high cost of land preparation and the requirement for manure, the benefits far outweigh the disadvantages.

Jembe La Mzambia pits technology has improved soil water conservation, making it preferable in dry areas with poor rainfall distribution. It has also enhanced soil fertility and reduced the costs of weeding. Most notably, it has significantly increased productivity - from 5-10 bags per acre in traditional practice to 30 bags per acre.

Farmers at Raha Leo FFS have taken an active role in evaluating maize produce. They measure the length of cobs and count seeds per collected sample to determine the weight and size of the cob produced. This hands-on approach has given them a deeper understanding of how Mbegu Tisa and Jembe la Mzambia contribute to climate-smart agriculture. The measurement results are shown in **Table 8.1**, where Mbegu Tisa has the highest of 7,848.8 Kg per acre compared to tradition, with only 82.9 Kg/acre.

Table 8.1: Results of Measure for comparison of Mbegu Tisa, Jembe la Mzambia and Traditional farming

MEASUREMENT	MBEGU TISA	JEMBE LA MZAMBIA	TRADITIONAL
The average length of the cob (cm)	18.75	19	7
The average number of seeds per cob	463.25	421.6	123.41
Yield Average. (Kg/acre)	7,848.8	2,902.9	82.7

In conclusion, the success story of Mbegu Tisa and Jembe la Mzambia pits at Farm Field School demonstrates how innovative agricultural practices can address climate change challenges and ensure food security for small-scale farmers in Tanzania's semi-arid areas.

8.1.3 Tie-ridges and integrated improved cassava varieties and leguminous plants

The degraded and marginalized land requires the application of good agricultural practices to boost soil fertility and water conservation in the soil to improve productivity and combat climate change impact. Climate-Smart Agriculture practices such as conservation and climate-smart farming are being introduced in Tanzania through the Climate Smart Agriculture Programme. The selected project areas still lack capacity and efficient extension services, preventing communities from benefiting from conservation agricultural practices.

Through the LDFS project, the land suitable for agriculture was identified both at the village level on landscape and through research done by recommended institutions like *ICRAF -Soil Health Report v1, Undertaking a Biophysical Baseline Survey of Land and Soil Health* on 17 April 2023, The report recommends on land restoration technologies on promotion of integrated soil fertility management practices to enhance soil health, soil carbon and soil moisture to build the resilience of farming systems and farmers to use. The report included appropriate interventions such as Agroforestry, Intercropping and Conservation Agriculture. The village selected land suitable for agriculture as suggested in the plan, using appropriate technology and suitable crops. The project, through using the FFS model, lets the farmers select the practice they wish to learn in conservation farming and experiment in the field school.

Plate 8.2: Tie-ridges and integrated improved cassava varieties and leguminous farmer field school at Nyang'hanga village, Magu district.

In Magu District, farmers through FFS selected experimental learning using tie-ridges intercropping technology, using cassava crops by integrating leguminous plant jack beans and beans **(Plate 8.2).** The experimental learning was done in Nyang'hanga village; however, crops grown in Nyang'hanga village are used for food and business. The abundant crops are cotton, maize, rice, cassava, sorghum, peanuts, sweet potatoes, sorghum and pulses. The choice of intercropping of an improved variety of Cassava and jack bean legumes is the best agronomic practice. Intercropping has been reported to perform very successfully in improving marginalized land and increasing productivity per unit area.

A farmer on behalf of FFS members explained that "*formally they were harvesting 500 kilograms-1000 kilograms of cassava per 1 acre by using unimproved cassava variety*". In the FFS, they cultivated 1.5 acres of improved cassava using tie ridge intercropping jack beans, which were harvested 5000 kilograms. After that result, 345 adapters (241 males and 104 females) from Lumeji, Iseni and Nyang'hanga villages practised and adopted these technologies.

In conclusion, applying climate-smart agricultural practices has shown promising results in improving degraded and marginalized lands in Tanzania. The Climate Smart

Agriculture Programme, despite some capacity and extension service challenges, has introduced effective conservation farming techniques. The LDFS project identified suitable agricultural land and recommended integrated soil fertility management practices. Experimental learning through FFS models, like the tie-ridges intercropping of cassava and legumes in Magu District, has significantly increased productivity. The success has led to local farmers' widespread adoption of these technologies, demonstrating their potential to enhance soil health, water conservation, and resilience against climate change.

8.1.4 Community participation in forest conservation approaches

Community engagement in forest conservation was successfully reported in Munguli Village Land Forest Reserve in Mkalama District, Intella Village Land Forest Reserves in Kondoa District and five Shehias in Micheweni District (Zanzibar). The community received technical assistance in preparing sustainable forest management plans for the miombo woodland and Community Forest Management Agreements (CoFMA) for mangrove forests in Micheweni district Pemba. The Hadzabe community in Munguli Village was furnished with over 1,125 bee hives by the LDFS Project. Before the project intervention, the Hadzabe people in the Munguli area mainly hunted wild animals and harvested honey, indigenous fruits and roots to secure food. After project intervention, modern beekeeping will be done using modern hives, beekeeping gears, and equipment in their honey collection and processing building. Modern bee hives are more beneficial than traditional bee hives because they produce more honey than the traditional one. Another advantage is that honey harvesting is easy, less destructive to the environment and the chances of controlling swarms. Modern bee hives are depicted in **Plate 8.3** and harvesting gears to protect from swarms (**Plate 8.4**).

Plate 8.3: Modern Beehives in Munguli Village (Photo credit IFAD, 2023)

Plate 8.4: Honey Harvesting gear to protect from swarms. (Photo credit PCU 2023).

Jacob Lubumba, a project beneficiary, expressed that “the promotion of cultural tourism and ecotourism has taken off, providing opportunities that enable beneficiaries to pay for school fees and health costs”, as shown in **Plate 8.5**.

Plate 8.5: Cultural Tourism in Munguli Village: Credit Facebook page of Full Mapicha accessed online on 17th August 2024.

The income generated from forest-based tourism and ecotourism has transformed the lives of the Hadzabe Community in the education, housing, transport and health sectors. Community engagement in forest conservation is also manifested in the Kondoa district for beautification and conservation of gullies and in the Micheweni district in preparation for the Community Management Agreement (CoFMA) to sustain mangroves. Similarly, tourism and ecotourism practices are underway in Micheweni District, Zanzibar, and Kondoa, adding value to the forest regarding biodiversity and anticipation of future payments for ecosystem services.

In conclusion, community engagement in forest conservation has led to significant positive impacts. The Hadzabe community in Munguli Village transitioned from traditional hunting to modern beekeeping, increasing honey production and environmental sustainability. In Micheweni and Kondoa, sustainable forest management plans and agreements have enhanced biodiversity and prepared for future ecosystem service payments. Additionally, cultural tourism and ecotourism have provided financial

benefits, improving local communities' access to education, housing, transportation, and healthcare.

8.1.5 Enforcement of bylaws for sustaining land use plans

Setting and enforcing bylaws ensures the sustainability of prepared individual or joint village land use plans. One of the key steps in preparing land use plans is convening the village assembly, in which key issues in the land use plans are agreed upon. **Plate 8.6** depicts the Haubi Community in Kondoa District taking part in the village assembly to approve the village land use plan.

Plate 8.6: Village assembly meetings to agree on plan use plans and resource management in Haubi community, Kondoa District Tanzania. (Credit: National Land Use Planning Commission- Tanzania)

According to the Land Use Planning Act of 2007, every village council should be a village land use planning authority for the respective village. Furthermore, it stipulates subject to approval by the respective Village Assembly, the village land use planning authority shall, in that capacity, prepare detailed land use plans for implementation in its respective area of jurisdiction, ensure that the objectives of the Village Land Act, are achieved; secure the orderly and environmentally sustainable development in the village; ensure productive use of village land; preserve village land resources including forests and wildlife; and review or evaluate all applications for land within the village to

determine the extent of its conformity with approved land use plans and to advice the Village Assembly accordingly.

Therefore, establishing a robust mechanism for enforcing bylaws related to land use plans has proven to empower communities to manage their land and natural resources effectively. This approach has created a positive environment that reduces conflicts, attracts investments, and improves livelihoods within the village.

The participatory approach used in preparing the land use plans is reported to be successful because it contributes to sustainability and actual implementation of the land use plans as they reflect the needs and interests of local stakeholders. **Plate 8.7** depicts the participatory land use planning approach in preparing land use plans of Munguli Village Land Forest Reserve in Mkalama District.

Plate 8.7: Participatory Land use planning (Photo credit: National Land Use Planning Commission- Tanzania).

The LDFS project has facilitated the preparation of 23 village and Shehia land use plans in Mkalama, Magu, Micheweni, Kondoa and Nzega Districts. The land use plans are reported to be key in reducing land use conflicts, increasing community accessibility to financial loans and improving land use management.

In Nyang'hanga village of Magu District, the community enforces bylaws to ensure land use practices align with approved plans. Violators face penalties, which can include

monetary and material fines. For example, when a cattle herd entered agricultural land in the Mwamakanza sub-village, members mobilized and requested the herders to remove their cattle. Upon their refusal, they were penalized according to the bylaws established during land use planning. These bylaws have facilitated the issuance of Customary Certificates of Right of Occupancy (CCRO) to marginalized groups, particularly women and youth as shown in **plate 8.8**.

The CCRO is reported to have increased accessibility of community to land, especially for women and youth, by owning pieces of land like men. 2,674 CCROs have been issued to beneficiaries of the project in four districts in Mainland Tanzania. Anecdotal evidence indicates that the CCRO has enabled beneficiaries to access financial loans, diversify their economic activities, and reduce pressure on natural resources, positively impacting ecological restoration.

Plate 8.8 The handing of Customary Certificates of Right of Occupancy (CCRO)

In conclusion, effectively enforcing bylaws related to land use plans plays a vital role in empowering communities to manage their land sustainably, reduce conflicts, attract investments, and improve livelihoods. Through participatory approaches and strict

adherence to approved land use plans, communities can achieve sustainable land management, enhance economic activities, and contribute to ecological restoration.

8.1.6 Improved seaweed farming system and value addition

The Micheweni District in Pemba-Zanzibar has experienced prolonged problems of poor soil conditions due to climate change and overfishing by multinational companies, reducing income. In addressing the dwindling community income, the LDFS project intervened by furnishing the marginalized women in Micheweni with financial support to execute the seaweed farming project. The financial support was used to purchase seaweed equipment.

Seaweed farming is practised underwater, where seaweed is tied to ropes stretched across designated plots. These plots provide an optimal environment for the seaweed to grow to maturity. This method supports sustainable aquaculture by utilizing underwater space and contributes to the livelihoods of coastal communities. **Plate 8.9** illustrates the process of seaweed farming, showing the underwater setup and the mature seaweed ready for harvest.

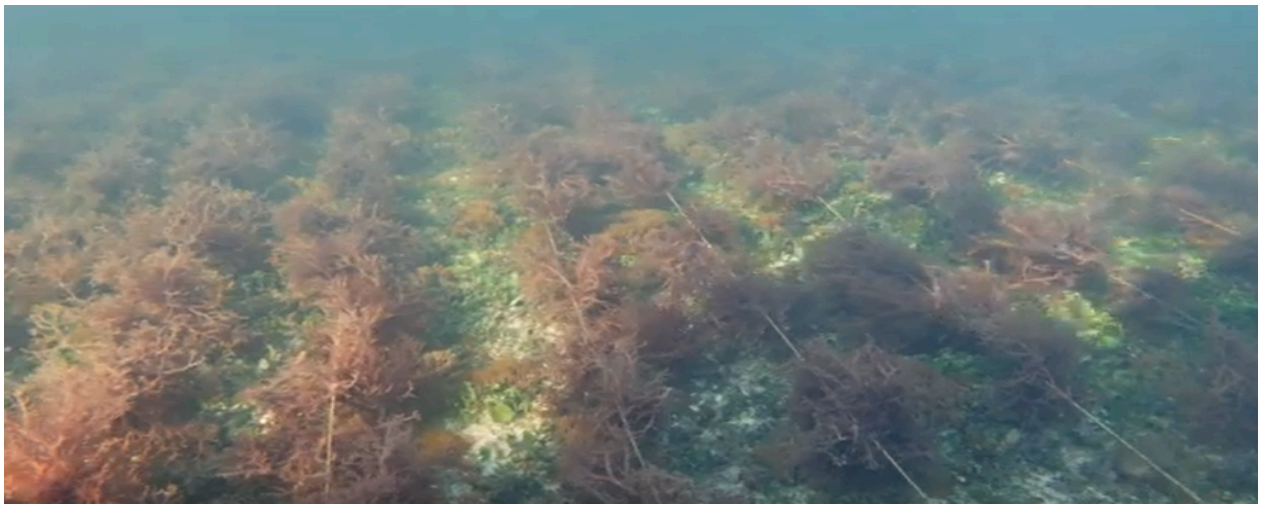

Plate 8.9: Seaweed farming (Photo credit IFAD, 2023)

After reaching maturity, the seaweed is harvested and dried on ventilated mats. It is then processed to create personal care, pharmaceutical, and cleaning products. These

products (Plate 8.10) are sold locally and internationally, including in Europe, America, and the Middle East.

Plate 8.10: Selling Seaweed product (Photo credit IFAD, 2023)

Seaweed farming is an important income-generating activity practised mainly by women in the Michweni district. It is one of the priority crops promoted by the government of Zanzibar under the current blue economy development initiatives. So, the importance of seaweed farming in the economic development of Zanzibar cannot be overemphasized.

"The revenue from seaweed farming has transformed most women's lives in Micheweni. Seaweed yield is incremental, and the revenue accrued has enabled me to buy iron sheets for my home. This is just one example of how seaweed farming empowers women and improves lives in our community," said Saumu Mzume Juma, a seaweed farmer in Micheweni, as shown in **Plate 8.11**.

Plate 8.11: Saumu Mzume Juma - Seaweed farmer
(Source: https://youtu.be/AzuVq4L4pOc?si=FcwhufB4NxuQPoRc (Photo credit IFAD, 2023)

In conclusion, implementing an improved seaweed farming system and adding value to the Micheweni District has provided a sustainable income source. Still, it has empowered women, enhanced economic development, and contributed to the community's well-being. The success of seaweed farming underscores its importance in Zanzibar's economic development initiatives, emphasizing its role as a priority crop in the blue economy development agenda.

8.2 Lessons Learnt

8.2.1 Empowering Communities for Accelerated Adoption and Impact

The project learnt that engaging a group of beneficiaries (Farmers Field School (FFS), Income Generating Groups (IGGs) and Champion farmers) has a multiplier impact in speeding up the rate of adopting appropriate technologies/best practices in the implementation of project activities.

Tangible output realized in the aspect of the restoration of degraded land is through land use planning in 15 villages in the four districts of Kondoa, Mkalama, Nzega and Magu in Mainland Tanzania and 8 Shehia of Micheweni in Pemba – Zanzibar, preparation of Sustainable Village Land Forest Management Plans for Mpambala Village Land Forest

(VLF) 47ha and Munguli Village Land Forest Reserve (VLFR) 1,627ha in Mkalama district, Intela VLFR 279ha and Makungulwi VLF 119ha in Kondoa district, Bulambuka VLF 33ha and Lyamalagwa VLF 6ha in Nzega, Lumeji 5.2ha Nyahanga 1.45ha and Iseni 3.91ha in Magu. In contrast, 1,749ha of mangrove forest have been demarcated as the Community Forest Management Agreement in Micheweni.

8.2.2 Collaboration with Public Institutions for Enhanced Project Outcomes

The project learnt that engaging public institutions in project activities yields good quality work, reduces the cost of investment and enhances the project's sustainability compared to engaging individuals or private firms. The project collaborated with the following stakeholders: i) The Institute of Rural Development Planning for conducting training on gender, Household Baseline Survey, Outcome Survey and endline survey; ii) the Sokoine University of Agriculture for conducting socioeconomic and market analysis; and iii) The Zanzibar Land Commission in collaboration with National Land Use Planning Commission for conducting Shehia land use planning in Micheweni district, iv) The Institute of Rural Development Planning as part of a team to conduct outcomes survey, v) Other institutions that have been engaging are SIDO/SIMIDA, TBS/ZBS, RUWASA/ZAWA and TFS and Forestry Department in Zanzibar.

8.2.3 Participatory Land Use Planning Fosters Conservation and gender equality

The project learnt that participatory land use planning has catalyzed the conservation of natural resources. After land use planning, the conservation of areas demarcated was intensified. For example, in Munguli village in Mkalama district, the Munguli Village Land Forest was declared a village forest reserve, involving human activities such as pastoralism and farming within the forest. There is a high respect for forests, which are now used for modern beekeeping, culture and eco-tourism investments, which are nature-based solutions. Additionally, land use planning has enhanced gender equality as inclusivity has been at the centre of the project activities

8.2.4 Demand-Driven Approach Through Participatory CAPs: A Catalyst for Project Success

The project learnt that the D-by-D approach through participatory Community action plans (CAPs) has been a good tool for the smooth implementation of project activities since all planned project activities were demand-driven by the project beneficiaries.

8.2.5 Integrating Land-Use Planning with Broader Development and Ongoing Management

The project learnt that land-use planning should not be a stand-alone activity but must be part of broader development planning; VLUP should not stop with the development of the plans but requires ongoing investment of time and resources. Prepared Village Land Forest (VLF) management plans and Community Management Agreements (CoFMA) and Rangeland management plans should activate the preparation of other Management plans of different sectors (i.e., agriculture, livestock and water catchment) and operational to add value for sustainable land use resources.

8.2.6 Community Cost-Sharing: Scaling Up CCROs and Promoting Sustainability

The project learnt that cost sharing for CCRO preparations has helped scale up to other beneficiaries not supported by the project. In the Nzega district, 600 beneficiaries of CCROs contributed TZS 20,000/=, which was used to prepare 79 CCROs for other villagers whom the project could not reach. This has both reduced investment costs and the sustainability of the project

8.2.7 The Impact of Gender Training on Seaweed Farming Participation

Seaweed farming has witnessed a shift towards increased participation of men and youth following gender training, leading to a rise in revenue from 3000 Tshs/kg (1.17 USD) unprocessed to 12,000 Tshs/kg (USD 4.7) processed and broader societal impacts on coastal communities. This diversification challenges traditional gender roles, enhances economic opportunities, and improves livelihoods. The low costs and technical requirements of seaweed farming make it an attractive income-generating activity that complements other livelihoods in rural coastal areas. Gender training initiatives have successfully diversified participation in seaweed farming, positively impacting revenue generation and community development, emphasizing the

importance of inclusive practices and sustainable economic opportunities for growth within coastal regions.

8.2.8 Knowledge Transfer and Adoption: Farmers Empowered through Study Visits

The project learnt that exposing project beneficiaries to study visits organized by the project has increased the adoption rate of agricultural practices like "*Jembe la Mzambia*" and *"Mbegu Tisa"* from Kondoa to other districts where the project is being implemented.

Magu District, through LDFS, organized 67 extension officers and farmers (41 male and 26 female) to attend the study tour at **Musoma Vi Agroforestry Centre.** Farmers visited and learnt from demonstratives with over 30 plots demonstrating different agroforestry techniques on even the smallest plot of land, including kitchen gardens, climate-smart agriculture, and conservation agriculture technologies. The technologies visited were Tie ridge, soil cover, mixed crops, agroforestry, legume plants, push and Pull mixed farming like dairy cattle (zero-grazing), poultry keeping, beekeeping and Integrated Pest Management.

Kondoa (Visited “Model farmer” to learn about soil and water conservation technologies and beekeeping). Mkalama (The study was conducted in which 35 Hadzabe community members visited Yaleda Chini village in Babati district to learn the benefits of CCRO and carbon trade accrued from Sustainable Village Land Forest Reserve).

8.2.9 Gullies Conservation and Beautification Initiatives in Intela VLFR, Haubi Village: A Collaborative Learning Platform

The project learnt that gullies conservation and beautification by using physical and biological measures in Intela VLFR in Haubi Village had brought the interest of people from outside such as IFAD team, GEF, Technical Advisory Committee (TAC) members, Regional ALAT members of Dodoma, District Councilors, antiquities, Academia (Dodoma and Dar-Es-salaam Universities) and nearby villagers to learn fast recovery of massive gullies.

8.3 Knowledge Management, Communication and Learning

The Knowledge Management and Communication Plan was developed to provide a structured framework for implementing partners and stakeholders. It ensured efficient communication and the creation of tools and materials for effective knowledge and information sharing. This framework was crucial in disseminating project-related information, facilitating learning, and promoting best practices among stakeholders.

During the project implementation, LDFS produced various knowledge management and communication materials that raised awareness and enhanced understanding of key agricultural and land-related issues. 14 television programs were developed, focusing on agriculture, producer groups, and Certificates of Customary Rights of Occupancy (CCROs). Additionally, two project documentaries were produced, highlighting the progress and impact of interventions in agriculture and beekeeping.

The project also engaged with the public through print media, publishing 32 newspaper articles that promoted best agricultural technologies, strengthened producer groups, and increased awareness of CCROs. To further disseminate essential information, key documents such as the Fact-Sheet (2017–2023) and the Policy Project Brief were made accessible through the Vice President's Office website (www.vpo.go.tz), along with a collection of project success stories.

Visual communication materials, including banners and flyers, were designed and distributed to enhance outreach efforts. The project also contributed to land management by developing 23 Village Land Use Plan Reports and preparing eight business model guidelines for running project-related investments.

Comprehensive consultancy reports were prepared to document research findings and assessments conducted during the project. These reports included the Baseline and Endline Survey Report, the Carbon Monitoring Report, the Socio-Economic Market Analysis, and the Assessment of Land Degradation and Soil Health in Semi-Arid Areas of Tanzania. The Ministry of Water also produced a hydrogeological and geophysical survey report in 2020, guiding locating borehole drilling sites to support water access initiatives.

By systematically generating and disseminating these knowledge products, the project enhanced stakeholder engagement, improved access to valuable information, and fostered learning opportunities for sustainable agricultural and land management practices.

9.0 SUSTAINABILITY AND EXIT STRATEGY

9.1. An overview

The Reversing Land Degradation Trends and Increasing Food Security in Degraded Ecosystems of Semi-Arid Areas of Tanzania (LDFS) Project has played a crucial role in restoring degraded lands and improving food security in targeted regions. As the project approaches its closure, a well-structured sustainability and exit strategy is necessary to ensure that the achievements and interventions continue benefiting communities

beyond the project's lifespan. This strategy focuses on institutionalizing key interventions, ensuring long-term funding mechanisms, and fostering community ownership of project resources and activities.

9.2. Key Strategies for Sustainability

Institutional Capacity and Stakeholder Commitments: The sustainability of the LDFS Project relies on the active participation of local governments, community groups, and private sector stakeholders. Local Government Authorities (LGAs) will oversee and integrate project activities into their development plans and budgets. The Rural Water and Sanitation Agency (RUWASA) will manage and maintain water infrastructure, including boreholes, to ensure continued access to clean water. The Tanzania Forest Service Agency (TFS) will continue supporting community forestry initiatives, enforcing land use plans, and overseeing sustainable forest management practices. Community-based organizations and cooperatives will facilitate continued agricultural, livestock, and beekeeping activities. Additionally, partnerships with Central Park Bee Limited, Dodoma Halisi, and ASAS Dairies will ensure market access, value addition, and capacity building.

Institutionalization of Land Use and Environmental Conservation: The Village Land Use Management Committees (VLUMs) and Participatory Land Use Management (PLUM) teams will continue to oversee land governance and conservation initiatives. Land Use and Environmental Conservation: Implementing Customary Certificates of Right of Occupancy (CCROs) ensures sustainable land management and long-term investments in conservation agriculture. Restoration of degraded forests, establishing community forest management agreements, and enforcing conservation laws will be sustained through local governance structures.

Water Infrastructure Management: RUWASA and the Community-Based Water Supply Organizations (CBWSOs) will manage boreholes, ensuring routine maintenance and cost recovery through user fees. Local water committees will oversee daily operations, ensuring equitable water access and sustainable usage.

Farmer Field Schools (FFS) and Agricultural Development: Agricultural extension officers, trained through the project, will continue disseminating knowledge on

climate-smart agriculture and sustainable land management. Farmer Field Schools (FFS) will remain operational as knowledge exchange centres, fostering best practices in soil conservation, crop diversification, and agroforestry.

Livestock and Dairy Development: The Milk Collection Center in Kondoa will be integrated into local dairy value chains, with ongoing technical support from Dodoma Halisi and ASAS Dairies. Livestock keepers will operate under contract-based systems to ensure sustainable dairy production and market access.

Beekeeping and Honey Processing: Honey processing centres will be managed by trained cooperatives, ensuring quality production and market linkages with Central Park Bee Limited and Tabora Beekeeping College. Beekeepers must expand their hives by reinvesting profits, ensuring industry growth.

Economic Empowerment and Market Linkages: Producer groups will access financing through local government 10% loan allocations for women, youth, and people with disabilities, as per local regulations. Market linkages will be strengthened through participation in trade fairs such as Nane Nane and Environment Week Exhibitions. By improving financial literacy and business skills, groups will be encouraged to transition from project dependency to self-reliance.

Climate Resilience and Carbon Finance: Integrating carbon trading mechanisms into the sustainability strategy will provide long-term financial incentives for reforestation and land restoration efforts.

Private Sector and Market Linkages: Partnerships with Dodoma Halisi, ASAS Dairies, Central Park Bee Limited, and Tabora Beekeeping College will enhance market access for honey, dairy, and horticultural products.

Governance and Policy Integration: The LDFS Project's best practices will be mainstreamed into district development policies, ensuring continued implementation through District Development Plans (DDPs). The Vice President's Office will provide policy guidance and oversee adherence to sustainability commitments through regional administrative structures.

Monitoring and Evaluation Framework: District Councils will establish monitoring systems to track the performance of post-project interventions. Participatory community assessments will evaluate the effectiveness of land restoration and food security interventions. Data collection and reporting mechanisms will be maintained to inform decision-making at national and regional levels.

10.0 FINANCIAL OVERVIEW AND BUDGET PERFORMANCE

10.1 Planned Budget vs. Actual Expenditure

During its 5-year implementation period (Extended to 7 years), the LDFS Project Planned Budget was USD 7,155,963. During its implementation from July 2017 to September 2024, the Project spent a total of USD 7,036,276.17, leaving the balance of USD 119,686.83 to be spent during the project closure period from October 2024 to March 2025. The project managed to spend the remaining balance of USD 119,686.83 during the closure period, making total project expenditure USD 7,155,963 as it was initially planned to make expenditure 100% of the project budget.

10.2 Key Variances and Reasons for Budget Deviations

During its implementation, the LDFS Project's total expenditure was USD 7,155,963, the same as its budget (100%). In totality, there was no significant variance of expenditure to its budget except for minor variance in some expenditure categories with the excess expenditure of USD 50,000 which is 2.45% (Budget USD 2,039,963 and Actual Expenditure USD 2,089,963) to the budget of Workshop, Training and Consultancies

category which was deducted from the budget of Equipment and Materials category (Budget USD 2,043,000 and Actual Expenditure USD 1,993,000) making variance of 2.45%. The main reason behind this deviation is the emergency of the new activity to capacitate the Income Generation Groups (IGG) on the management and monitoring of Honey Collection Centres, Milk Collection Centres, Paddy Processing and Seaweed Processing facilities constructed by the project for sustainability of the facilities beyond the project life. The other reason was the increased cost of some activities due to the nature of the workshop, training, and consultancies category.

10.3 Breakdown of Major Cost Components

LDFS Project had four project components, namely: (1) Institutional Capacity Building, (2) Upscaling of sustainable and climate-smart agriculture, land, water and pastoral management systems, (3) Monitoring and Assessment and (4) Project Management. The major cost components of the project were Component 2, with a budget of USD 4,994,463 and an actual expenditure of USD 4,911,076.13 (98.33%) and Component 1, with a budget of USD 1,001,000 and an actual expenditure of USD 1,044,642.79 (104.34%). Component 2 expenditure of USD 4,911,076.13 forms 68.62% of the total project expenditure of USD 7,155,963, and Component 1 expenditure of USD 1,044,642.79 forms 14.60% of the total project expenditure of USD 7,155,963. Most of the project investments and infrastructures were done through Component 2, and most of the project training and community interventions were done through Component 1.

Also, the LDFS Project had six project categories, namely: (1) Equipment and Materials, (2) Civil Works, (3) Workshop, training and Consultancies, (4) Vehicles, goods, services and inputs, (5) Operating Costs and (6) Salaries. The primary cost categories of the project were Category 1, with a budget of USD 2,043,000 and actual expenditure of USD 1,993,000 (97.55), Category 2, with a budget of USD 1,700,000 and actual expenditure of USD 1,700,000 (100%) and Category 3 with the budget of USD 2,039,963 and actual expenditure of USD 2,089,963 (102.45%). Category 1 expenditure of USD 1,993,000 forms 27.85%, Category 2 expenditure of USD 1,700,000 forms 23.76% and Category 3 expenditure of USD 2,089,963 forms 29.21% of total project expenditure of USD 7,155,963 respectively. Most of the project investments and

infrastructures were done through Category 1 and Category 2, and most of the project training and community interventions were done through Category 3.

10.4 Outstanding Balance and Financial Accountability

LDFS Project, from its inception to closure, managed to spend 100% of its budget of USD 7,155,963. Therefore, there is no outstanding balance as of 31 March 2025.

10.5 Recommendations for Future Budget Planning

It is recommended that for future project budget planning, human resource personnel be included in the project planning process to enable employee welfare to be further taken into consideration by including issues like health insurance, leave travels and social security contributions during project implementation and gratuity payments to employees by the end of the project as LDFS Project only considered salaries in the project budget.

11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusion

The LDFS Project has demonstrated the effectiveness of integrated approaches in addressing land degradation, food security, and climate resilience in Tanzania's semi-arid regions. Over the years, the project has successfully restored degraded land, improved agricultural productivity, and strengthened institutional capacities at local and national levels. The project has enhanced community resilience to environmental and economic challenges through interventions such as Farmer Field Schools (FFS), climate-smart agriculture, sustainable land management, and alternative income-generating activities. The project's outcome assessment highlights significant progress in food security, income generation, environmental restoration, and social inclusion, benefiting thousands of households in Tanzania and Zanzibar.

Despite these notable achievements, several challenges remain. Delays in infrastructure development, limited financial resources, and climate variability have posed risks to sustainability. While community participation in decision-making has improved, further strengthening is needed to ensure long-term ownership of

interventions. Transitioning from project-based support to self-sustaining local initiatives is critical to maintaining impact beyond the project's implementation period.

To sustain these gains, future interventions should prioritize strengthening local governance structures, promoting community ownership of natural resource management, enhancing climate adaptation strategies, and expanding financial support for women and youth in agribusiness. Embedding successful interventions into district and national development plans will ensure long-term sustainability and scalability. The lessons from this project provide valuable insights that can be applied to similar regions facing environmental and socioeconomic challenges, further reinforcing Tanzania's commitment to sustainable land management and climate resilience.

11.2 Recommendations

To further strengthen the sustainability and impact of the LDFS Project, the following recommendations should be considered:

i. Strengthening Institutional and Policy Support: Integrating sustainable land management and climate adaptation strategies into district and national policies should be prioritized. Government institutions should enhance coordination and resource allocation to support long-term interventions. Strengthening legal frameworks related to land use planning, resource governance, and climate adaptation will ensure policy continuity and effectiveness.
ii. Enhancing Community Participation and Ownership: Future programs should deepen community engagement by promoting participatory decision-making, strengthening local governance structures, and facilitating capacity-building initiatives. Empowering community-based organizations and cooperatives will ensure continued stewardship of natural resources. Additionally, providing incentives for local communities to take the lead in implementing sustainable land management practices will foster greater ownership and responsibility.
iii. Expanding Climate-Resilient Agriculture and Land Restoration Practices: Given the ongoing threats of climate change, increased investment in climate-smart agriculture, agroforestry, and sustainable water management is essential. Promoting conservation farming techniques, soil fertility improvement, and

reforestation programs will further strengthen resilience. Expanding training programs on modern farming techniques, irrigation systems, and post-harvest management will enhance agricultural productivity and reduce post-harvest losses.

iv. Promoting Economic Sustainability and Market Linkages: Strengthening value chain integration and facilitating market access for agricultural and livestock products will enhance economic opportunities for communities. Support for smallholder farmers, particularly women and youth, in agribusiness development should be expanded to ensure financial sustainability. Developing agro-processing industries, storage facilities, and cooperative marketing strategies will improve profitability and reduce the wastage of agricultural produce.

v. Leveraging Sustainable Financing Mechanisms: Exploring opportunities for carbon finance, donor engagement, and private sector partnerships will provide long-term financial support for land restoration and sustainable agriculture initiatives. Establishing revolving funds or microfinance schemes will also help communities sustain project gains. Promoting innovative financing models such as blended finance, payment for ecosystem services (PES), and conservation trust funds can attract more investments into sustainable land management.

vi. Establishing a Robust Monitoring and Evaluation System: Continuous assessment of project impacts on land degradation, agricultural productivity, and socioeconomic well-being should be institutionalized. Strengthening data collection, reporting mechanisms, and adaptive management practices will improve future programming and decision-making. Establishing community-based monitoring networks will allow for real-time tracking of environmental changes and project outcomes.

vii. Scaling Up Successful Interventions to Other Regions: Given the proven success of the LDFS Project, efforts should be made to replicate and scale up similar initiatives in other regions particular in semi arid areas experiencing land degradation and food insecurity. Lessons learned from this project should be

used to design future interventions that address specific local needs while ensuring flexibility for adaptive management.

viii. Strengthening Water Resource Management: Given the increasing frequency of droughts and unreliable rainfall patterns, investments in water conservation infrastructure such as rainwater harvesting systems, small-scale irrigation, and watershed management should be prioritized. Promoting integrated water resource management approaches will enhance agricultural productivity and reduce dependence on rain-fed farming.

ix. Enhancing Gender and Social Inclusion: Strengthening gender-responsive policies and interventions will ensure that women, youth, and marginalized groups have equal access to resources, training, and decision-making processes. Capacity-building programs should address gender-specific challenges and provide targeted support for women-led agribusinesses and community development initiatives.

x. Promoting Alternative Livelihoods and Diversification: Encouraging communities to engage in alternative income-generating activities such as ecotourism, sustainable fisheries, and non-timber forest products will reduce overreliance on unsustainable land-use practices. Supporting entrepreneurship and vocational training programs will provide additional economic opportunities for rural populations.

xi. Strengthening Research and Innovation in Sustainable Land Management: Collaborating with research institutions and universities to develop innovative solutions for soil conservation, reforestation, and climate-smart agriculture will enhance knowledge sharing and technological advancement. Encouraging community-led experimentation and using indigenous knowledge in sustainable land management will ensure locally adaptable solutions.

xii. Improving Access to Renewable Energy Solutions: Promoting adopting renewable energy technologies such as solar-powered irrigation systems, energy-efficient cooking stoves, and biogas solutions will reduce pressure on natural resources and improve environmental sustainability. Incentivizing the

private sector to invest in rural energy access will enhance economic development and community resilience.

Appendices

- Project Logical Framework and Performance Indicators

Log framework.zip

- List of Beneficiaries and Interventions Implemented

Beneficiries Data base.zip

- Financial Summary and Budget Breakdown

- Key Reference Documents (Baseline, Endline, Outcome, Land Degradation, and Carbon Balance Reports)

Final Report for LDFS Baseline Survey.pdf

FInal Endline Household Servey Re|

OUTCOME SURVEY FINAL REPORT.pdf

Assessment of Land Degradation and Soil

REPORT_FINAL_MONITORING_AND_ASS|