ASSESSMENT AND AGROECOLOGY MODEL DEVELOPMENT IN TURKANA COUNTY

Assessment Report

Submitted to:

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LIST OF ABBREVIATIONS

COP	Conference of Parties
DCA	DanChurchAid
DNRC	Drylands Natural Resources Centre
FGD	Focus group discussion
IDPs	Internally Displaced Persons
KIIS	Key Informants Interviews
KNBS	Kenya National Bureau of statistics
NGOs	Non. Governmental Organizations
UNFCCC	United Nations Framework Convention on Climate Change
WEPs	Wild Edible Plants

ACKNOWLEDGMENT

The consultants wish to thank DCA for an opportunity to carry out this assessment and Agroecology model development. We appreciate the DCA team for their logistic assistance, especially in mobilizing the respondents. We are grateful to all individuals and organizations who contributed in one way or another to the success of this assignment. Finally, we acknowledge the hospitality and support from the respondents.

DECLARATION

All the views expressed in this report are the views of the lead consultant, and he bears full responsibility for the contents of this report.

EXECUTIVE SUMMARY

This assessment sought to document existing internal and external evidence, good practices, and lessons learned in advancing the transition toward sustainable, climate-resilient, agroecology-based food production systems in Turkana County. The goal was to enhance food security and household self-reliance in the face of recurring climate shocks and stresses. Drawing on a mixed-methods approach, the study integrated both quantitative and qualitative data collection tools, including household surveys, key informant interviews (KIIs), focus group discussions (FGDs), and field observations. A total of 215 household surveys were administered, alongside 10 KIIs with representatives from the Ministry of Agriculture, Environment, and Livestock, NGOs, DCA staff, and private sector actors. Eight FGDs, each comprising 7–11 participants (men, women, and youth), were conducted. Data analysis was performed using SPSS v2.1 and Stata v15, with results presented through descriptive statistics in graphical and tabular formats.

Findings revealed that most respondents were smallholder farmers with limited formal education, cultivating between 1 to 3 acres of land. Their primary livelihoods included farming, charcoal/firewood selling, and small-scale trade. Key crops grown for sale in Kakuma market included kale, spinach, okra, and amaranth. Most respondents reported annual incomes below KES 50,000. Awareness of agroecology-promoting organizations was widespread, with key services cited including seed provision, training, tools, water access, kitchen gardens, relief food, cash transfers, and mechanized ploughing. However, stakeholders were noted to work in isolation, limiting synergies. Barriers to agroecological transition included income loss, labor demands, water scarcity, lack of technical capacity, increased production costs, and climate-related crop failures. Current agroecological practices included use of manure, mixed farming, permaculture, broadcasting, and basic agroforestry. Key drivers of adoption were access to training, financial support, improved productivity, enhanced food security, and environmental benefits. Constraints included pest and disease pressure, unreliable water supply, and poor market access.

Best practices identified by participants included polyculture, integrated pest management (IPM), composting, permaculture, organic farming, agroforestry, and kitchen gardens. A rapid market scan of Kakuma indicated that most produce sold originates from outside the region, contributing to high food prices. Multivariate probit modelling was used to identify key factors influencing adoption of agroecological practices. Variables with statistically significant positive effects included age, gender, marital status, family size, and access to financial support. Among the practices analysed, mixed farming had the highest probability of adoption and is therefore recommended as a core element of the proposed model. Financial assistance also emerged as a critical enabler for transition and should be prioritized. The proposed model should also emphasize co-creation and participatory learning, training of trainers (ToTs), starting with small-scale intensive efforts, integrating indigenous knowledge with modern science, linking farmers to markets, adopting a holistic approach that includes livestock and agroforestry, enhancing access to water, and ensuring inclusivity of women and youth. The model should be tailored to specific household and site-level contexts to ensure relevance and sustainability.

SECTION 1: INTRODUCTION AND ASSESSEMENT DESCRIPTION

1.1 Introduction

Drylands, home to approximately 2.3 billion people worldwide (COP16), are among the most vulnerable landscapes on the planet, grappling with environmental degradation, erratic rainfall, persistent droughts, and declining land productivity, all of which are intensified by the impacts of climate change (Syano et al., 2022; Jama & Zeila, 2005). In these regions, particularly in Kenya where drylands cover nearly 89% of the national territory, livelihoods are limited and agricultural production is highly precarious, contributing to widespread food and nutrition insecurity. The situation is especially acute in Turkana County, where extreme weather conditions and prolonged climate-induced shocks have left 74% of the population living in poverty and 81% experiencing food poverty (KNBS, 2024), making it one of the most food-insecure regions in the country. Globally, the intersection of climate change and food insecurity is gaining increasing attention, as highlighted during COP29, where it was acknowledged that escalating climate shocks are undermining the resilience of food production systems, particularly in fragile contexts like Turkana.

The strain on global food systems is evident. Nearly 800 million people remain chronically hungry, over two billion suffer from micronutrient deficiencies, and paradoxically, 1.9 billion people are overweight or obese (FAO, 2017; WHO, 2015). In Kenya, food systems face growing challenges including the degradation of critical natural resources, limited access to diverse and nutritious foods, and a sharp rise in food insecurity, which has escalated from 15% in 2016 to 28% in 2022 (Kenya Agroecology Strategy, 2024–2033). In response, the Government of Kenya has launched the National Agroecology Strategy (2024–2037) to foster resilient and sustainable agricultural systems, promote healthy diets, create enabling policy environments, and advance innovation through participatory research and knowledge co-creation. Within this framework, Turkana presents both urgent need and unique potential.

Despite its harsh climate, Turkana holds significant opportunities for transformation through targeted investments in climate-smart agriculture, agri-nutrition, and sustainable livelihoods (Anno et al., 2024). A crucial, yet often overlooked, asset is the rich repository of Traditional Ecological Knowledge (TEK) embedded within local communities. For generations, the people of Turkana have relied on indigenous resilience practices ranging from drought-resistant crops and water conservation methods to holistic livestock management to adapt to extreme environmental stressors (Muragijimana et al., 2020). However, the erosion of these practices due to modernization, inadequate institutional support, and climate pressures calls for urgent documentation and integration of TEK into contemporary agricultural strategies and policy frameworks (Ratemo et al., 2020). The region's agro-pastoral value chains are increasingly under threat from climate-induced hazards such as severe droughts and flooding, which disrupt production, market access, and food availability (Lutta et al., 2023). Meanwhile, underutilized wild edible plants (WEPs) offer untapped potential to enhance food and nutrition security by diversifying diets and providing critical micronutrients, especially during lean periods, but they remain marginalized due to declining knowledge, limited awareness, and lack of integration into formal food systems (Oduor et al., 2020; Oluoch, 2024).

Amid these challenges, agroecology emerges as a promising solution. Defined as a holistic, science-based and people-centred approach, agroecology integrates ecological principles with local knowledge to redesign food systems in ways that are sustainable, inclusive, and climate-resilient. Its ten foundational elements—including diversity, synergies, resilience, recycling, and co-creation of knowledge—serve as guiding pillars for transforming food and agricultural systems (FAO, 2018). Agroecology has gained international recognition through platforms such as the UN Food Systems Summit (2021) and UNFCCC COP28, where it is acknowledged as a viable path toward more just and regenerative food systems. Emphasizing natural processes, reduced dependency on external inputs, and deep community engagement, agroecological approaches are particularly well-suited for regions like Turkana.

In this context, DCA is piloting agroecology-based models in Turkana to explore their capacity to strengthen local food security, build functional markets, and enhance resilience to climate shocks. These pilots aim to connect diverse strands of evidence, test context-specific innovations, and document best practices that can inform future programming. Early insights point to the value of integrating traditional and scientific knowledge, strengthening rural infrastructure, promoting diversified livelihoods, and fostering inclusive, community-led development models. As climate risks intensify, the urgency to build resilient, sustainable, and equitable food systems becomes increasingly clear. Agroecology offers a powerful framework—rooted in local empowerment and ecological balance to address hunger, restore degraded ecosystems, and secure lasting resilience for communities in dryland regions like Turkana.

1.2 Background of the Assessment

Dan church Aid (DCA) which supports the poorest in the world in their struggle for a dignified life and helps people in need. DCA is working with refugee and local communities in Turkana, West Pokot, Baringo, Elgeyo Marakwet, Nyandarua, Nakuru, Busia and Siaya counties of Kenya to enhance peace, livelihoods, and resilience. DCA is piloting agroecology models and documenting their positive effects on local food security and the functionality of local food and market systems in areas severely affected by climate change. While agroecology-based models show significant potential in humanitarian contexts, transitioning to more sustainable, climate-resilient agricultural approaches remains challenging for individual farmers and communities. To better understand how to sustainably address these, DCA is currently running an Agro-ecology Research Project in Turkana County. The aim of the project is to identify critical gaps, synthesize evidence of successes, and develop new models based on a deeper understanding of agricultural systems. DCA seeks to strengthen the evidence base and explore concrete models to ease and de-risk the transition to sustainable, climate-resilient agroecology-based food production. To carry out this assignment, DCA contracted Nicholas Syano et. al. from Drylands Natural Resources Centre (DNRC).

1.3 Objectives of the assessment and development of agroecology model

Overall goal: The proposed project aims at strengthening the evidence and exploring concrete models for easing and de-risking the transition to sustainable, climate resilient agroecology-based food production and protect local food and market system functionality for enhanced food security and self-reliance in the face of climate shocks and stresses in humanitarian settings

Objective 1: Assess existing external and internal evidence, good practices and lessons learnt on the transition to sustainable, climate resilient agroecology-based food production for enhanced food security and self-reliance in the face of climate shocks and stresses in three different humanitarian settings.

Objective 2: Develop/propose agroecology models for easing and de-risking the transitioning to agroecology systems as well as forecasting and anticipatory action to protect local food and market systems from climate shocks and stresses.

Objective 3: Synthesize and anchor learning in the humanitarian work of DCA, with local humanitarian partners and international and local knowledge partners

SECTION 2: MATERIALS AND METHODS

2.1 Study Area

The assessment was carried out in Turkana County, focusing specifically on Turkana West and Turkana Central sub-counties. Located in northwestern Kenya, Turkana borders Marsabit County to the east, Samburu to the southeast, and Baringo and West Pokot counties to the south and southwest, respectively. Turkana West is classified as an arid and semi-arid sub-county and comprises seven wards: Lokichoggio, Nanaam, Lopur, Songot, Kalobeyei, Kakuma, and Letea. According to the 2019 Population Census, Turkana West has a population of 239,627 and spans an area of approximately 16,779 km², resulting in a population density of 14.28 people per square kilometer.

Given that the project targets both refugee and host communities engaged in irrigated and rain-fed farming, four wards were purposively selected for the assessment. These wards were chosen to ensure representation of both populations and farming systems, as illustrated in Figure 1 below.

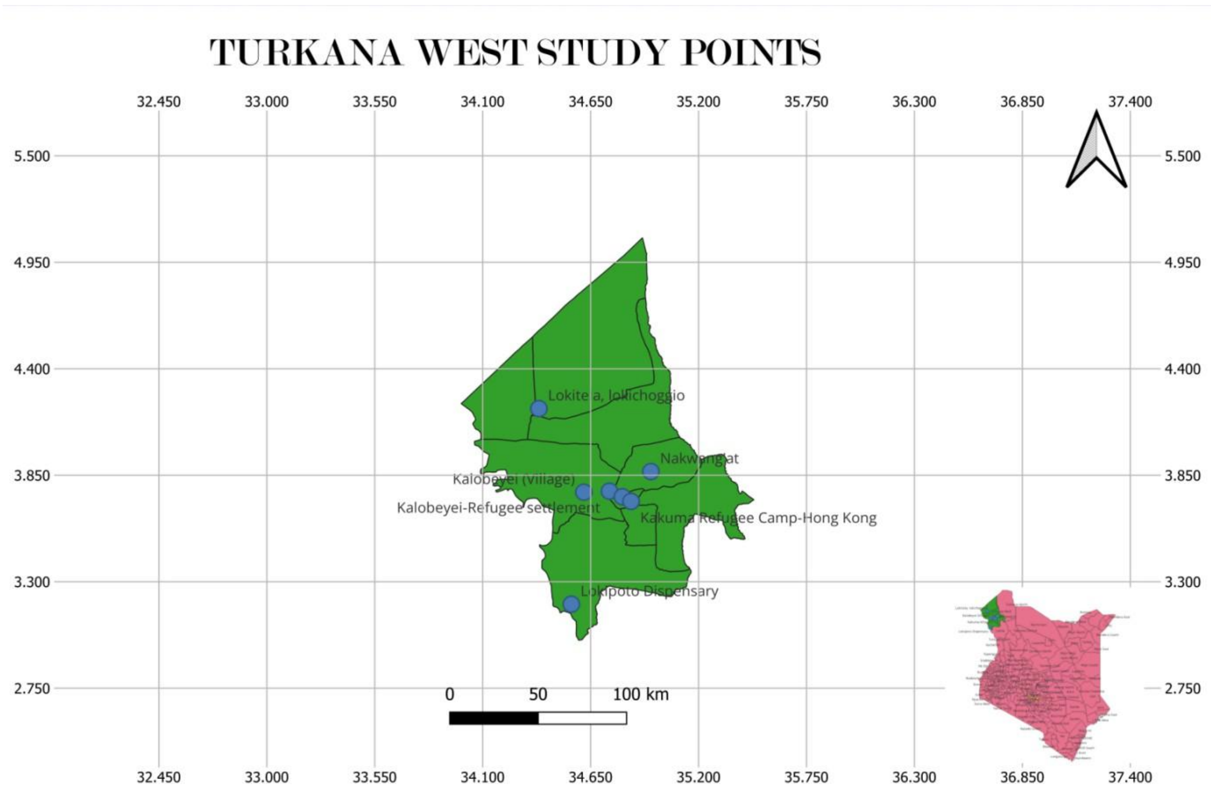


Figure 1: Sampled areas

2.2 Survey Design

The assessment employed a mixed-methods approach, integrating both quantitative and qualitative data collection techniques. To ensure comprehensive and inclusive findings, the study targeted both refugee and host community farmers. Data collection tools included semi-structured questionnaires for household surveys, Focus Group Discussions (FGDs), direct observations, and Key Informant Interviews (KIIs). KIIs were conducted with representatives from the Ministry of Agriculture, Ministry of Environment and Forestry, Department of Livestock, DCA staff, NGOs, and private sector actors involved in agroecology.

2.3 Sampling method

Six wards were purposively selected from Turkana West, Turkana Central, and Lokichoggio, based on their relevance to DCA's ongoing interventions and strategic focus on expanding support to rain-fed farmers beyond Kakuma ward. Survey respondents were selected randomly, while FGD participants were purposively identified to ensure representation of adult men, adult women, and youth. Key informants were also purposively selected, based on their expertise and experience in agroecology, as identified by DCA. A total of 215 household surveys were conducted. In addition, 10 key informants aged between 18 and 70 years were interviewed, and 8 FGDs—each comprising 7 to 11 participants—were held across the selected wards. The sample size was determined using the formula developed by Mariano et al. (2012).

$$n = \frac{N \cdot p(1-p)}{d^2 \cdot (N-1) + p(1-p) \cdot z_{\alpha/2}^2}$$

Where:

- n = the estimated sample size
- N = total population size of households
- p = assumed population proportion (set at 0.5 for maximum variability)
- d = margin of error (approximately 0.09)

- z = z-score corresponding to the desired confidence level
- α = level of significance (typically 0.05)

2.4 Data Collection Methods

Semi-Structured Interviews

A combination of quantitative and qualitative data was collected using semi-structured interviews targeting refugees, host community members, irrigation farmers, and rain-fed farmers. The interviews aimed to document best practices, lessons learned, and existing agroecological models.

Key Informant Interviews (KIIs)

Qualitative data were collected through KIIs with key stakeholders, including officials from the County Departments of Agriculture, Livestock, and Environment. Snowball sampling was used to identify informants with relevant expertise in agroecology. The KIIs captured insights on effective practices, challenges, and policy implications.

Focus Group Discussions (FGDs)

Five FGDs were conducted across the study areas, each consisting of 7–12 participants purposively selected to represent men, women, and youth. One youth-specific FGD was conducted per ward. Discussions focused on current agroecological practices, challenges to adoption, and recommendations for improvement.

Market Survey

A rapid one-day market assessment was carried out in Kakuma to identify key market challenges and commonly traded agricultural products, providing contextual insights into market dynamics affecting agroecology.

Field Observations

Naturalistic observation was used to complement interviews, enabling the research team to document farming practices and respondent behavior through field notes and photographs.

2.5 Data Analysis

Quantitative data were analyzed using SPSS (v2.1) and Stata (v15). Descriptive statistics were used to identify trends, best practices, and lessons learned, and results were presented in tables and graphs for clarity and ease of printing.

2.6 Enumerator Orientation

Eight enumerators were recruited with support from DCA and trained on data collection tools and protocols. Training covered interviewing techniques, probing, accurate recording, and quality control procedures. The lead consultant conducted all FGDs and KIIs and oversaw the overall data collection process.

2.7 Quality Assurance Measures

To ensure data integrity and reliability, the following quality control and ethical procedures were applied:

- Validation of data collection tools by DCA and all stakeholders.
- Obtaining informed voluntary consent from all respondents.
- Pre-testing of questionnaires to refine clarity and usability.
- Daily supervision and debriefing of enumerators to minimize errors.
- End-of-day reviews of completed questionnaires by the consultant to ensure completeness and accuracy.
- Comprehensive desk review of relevant project documents to strengthen contextual understanding.

SECTION 3: STUDY RESULTS, DISSCUSSION AND RECOMMENDATIONS

3.1 Results

3.1.1 Social Demographic Characteristics of respondents

The results presented in Table 1 indicate that most respondents (73.5%) are female, with most falling within the 40–50 age bracket. Youth aged 20–30 years constituted the second-largest group. Most respondents (68.9%) are married, with 33.3% of these in polygamous unions. Additionally, a significant proportion (65%) of the respondents reported having no formal education.

Table 1: Social demographic characteristics of the respondents (refugees and host community)

Frequency			
Variable	**Category**	**N**	**%**
Gender of Respondent	Female	144	73.5
	Male	52	26.5
Respondent's disability	No	178	91.8
	Yes	16	8.2
Age of Respondent	40-50	57	30.0
	20-30	51	26.8
	30-40	47	24.7
	> 50	28	14.7
	< 20	7	3.7
Age of Household head	40-50	53	34.2
	> 50	43	27.7
	30-40	35	22.6
	20-30	23	14.8
	< 20	1	0.6

Gender of Household head	Male	134	72.4
	Female	51	27.6
Household head's disability	No	175	93.1
	Yes	13	6.9
Marital status of Household head	Married	126	68.9
	Widowed	34	18.6
	Single	13	7.1
	Divorced	10	5.5
If polygamous, how many wives	2.8	42	33.3
Level of Education of Household head	Non-formal	128	65.0
	Primary	25	12.7
	Secondary	16	8.1
	Primary dropout	10	5.1
	University	7	3.6
	Tertiary	6	3.0
	Adult Education	4	2.0
	Secondary dropout	1	0.5

3.1.2 Family size of respondents

The results indicate that most households consist of 5 to 10 members, accounting for 70% of respondents. A smaller proportion, 15.3%, reported larger family sizes of 11 to 15 members, as illustrated in Figure 2 below.

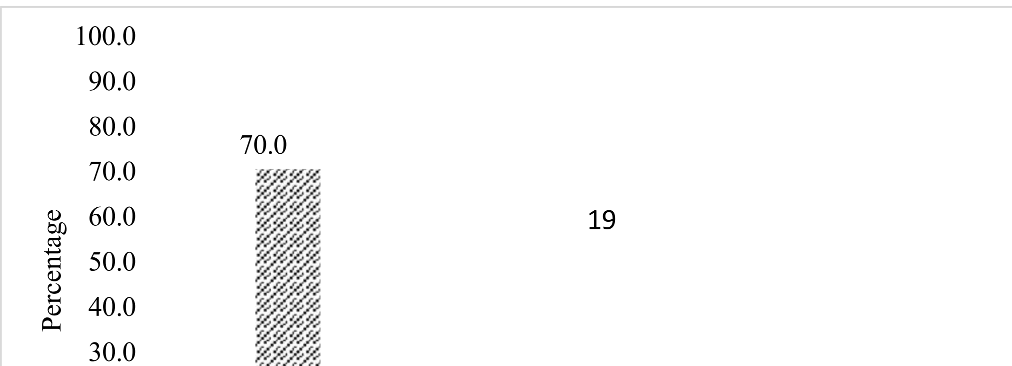


Figure 2: Household size

3.1.3 Occupation of respondents

The primary occupation of respondents is farming, representing 70% of the sample. Additionally, 21.9% engage in firewood selling, 17.7% in charcoal selling, and 11.5% are involved in small-scale businesses, as presented in Table 2 below.

Table 2: Occupation of respondents (refugees and host communities)

Frequency		
Occupation	N=192	%
Farmer	171	89.1
Firewood seller	42	21.9
Charcoal Seller	34	17.7
Businessperson	22	11.5
Casual worker	16	8.3
Formal employment	7	3.6

3.1.4 Land ownership

As shown in Figure 3 below, the majority of farmland (88%) is communally owned, while only 12% of respondents reported owning private land.

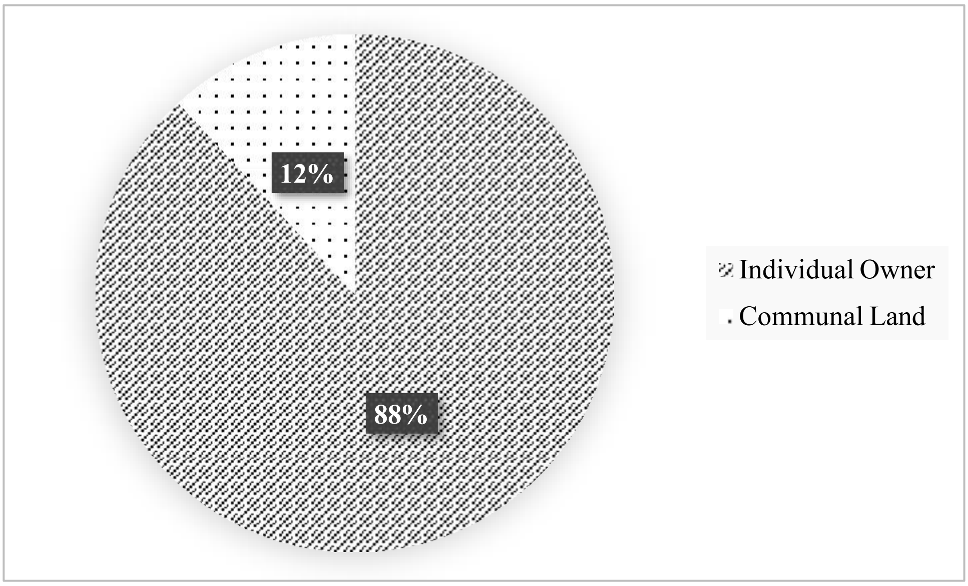


Fig 3. Land ownership

3.1.5 Farm size.

As illustrated in Figure 4 below, most farmers cultivate individual plots within a shared communal farm. The majority (48.8%) of these plots range between 1 to 3 acres in size.

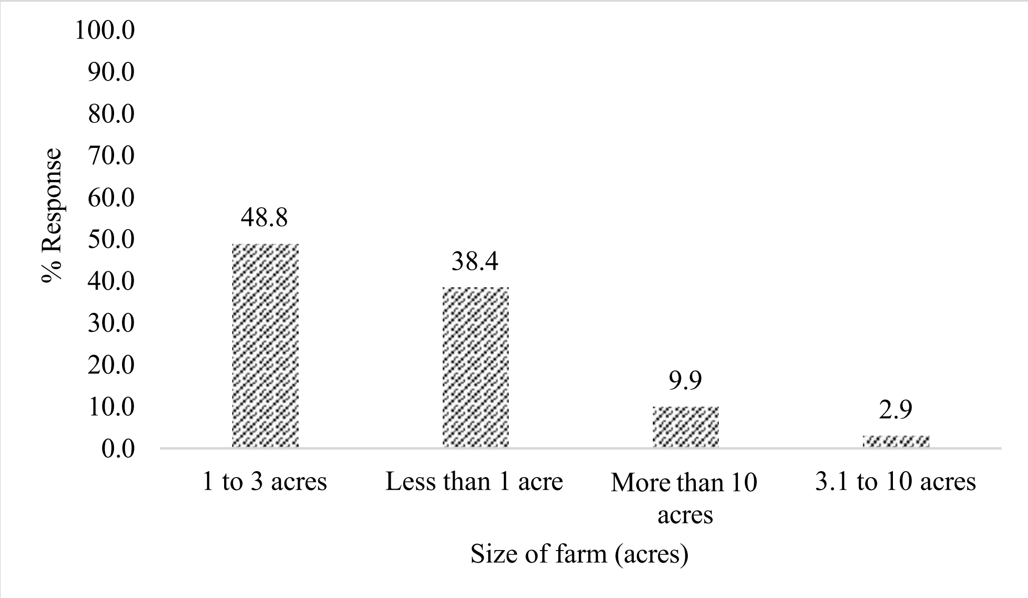


Fig 4: Farm size

3.1.6 Types of Crops Managed

Most of the crops grown by the respondents were kale (682 %,) spinach (65.1%), Okra (52.6%) and Dodo (51.6%) as shown in table 3. below.

Table 3: Common crops grown

Frequency		
Crop	**N=192**	**%**
Kales	131	68.2
Spinach	125	65.1
Okra	101	52.6
Dodo (amaranth)	99	51.6
Maize	93	48.4

Watermelon	74	38.5
Sorghum	48	25.0
Cowpeas	45	23.4
Beans	42	21.9
Tomatoes	23	12.0
Onions	16	8.3
Mrenda (Jute mallow)	12	6.3
Green grams	7	3.6
Pawpaw	5	2.6
Chillies	4	2.1
Sweet potatoes	4	2.1
Pumpkin	3	1.6
Butter nut	2	1.0
Wheat	2	1.0
Lemon grass	2	1.0
Carrot	1	0.5
Akaedeit	1	0.5
Millet	1	0.5
Bananas	1	0.5
Pineapple	1	0.5
Green peas	1	0.5
Ground nuts	1	0.5
Oranges	1	0.5

Moringa oleifera	1	0.5
Matembele (sweet potato leaves)	1	0.5

3.1.7 What types of livestock do you primarily manage

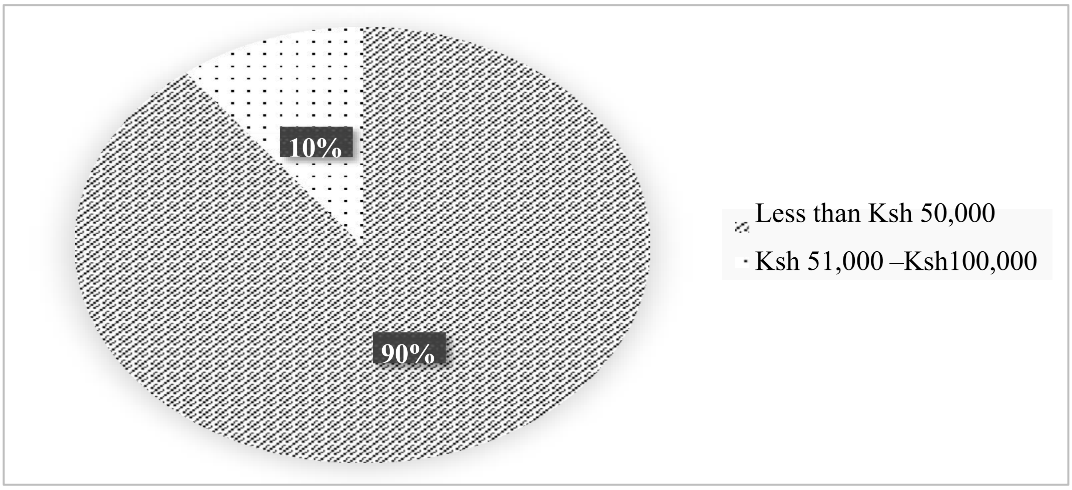
Most of the livestock kept are goats, (71.4 %,) followed by poultry 34.5% according to the respondents surveyed as shown in table 4 below.

Table 4: Types of livestock kept by the respondents

Frequency		
Livestock	**N=84**	**%**
Goats	60	71.4
Poultry	29	34.5
Sheep	25	29.8
Cattle	13	15.5
Donkey	8	9.5
Camel	2	2.4

3.1.8 Agricultural sales income per year

Most of the yearly income from the sale of agriculture produce per household was less than Kshs.



50,000 as shown in the **fig** 5 below:

Fig 5: Yearly earnings from agricultural sales

3.2 EVIDENCE, GOOD PRACTICES, LEARNT LESSONS

3.2.1 Respondents awareness of any key stakeholders promoting sustainable, climate resilient agroecology- based food production in the project site.

As shown in Figure 6 below, the majority of respondents (80%) reported being aware of key stakeholders involved in promoting sustainable, climate-resilient agroecology-based food production practices.

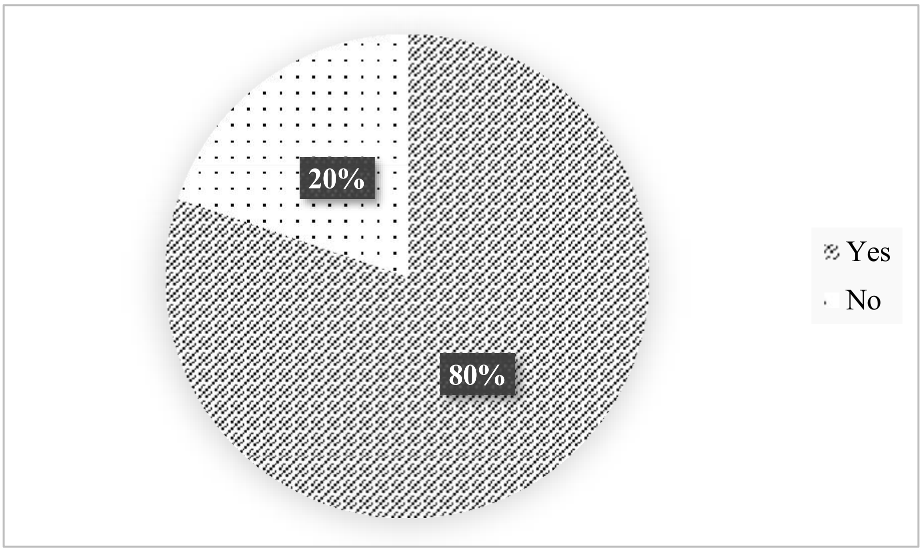


Fig. 6. Awareness of Organization promoting sustainable Agriculture

3.2.2 Stakeholders promoting agriculture.

The results presented in Table 5 highlight the main organizations actively involved in agriculture at the project site, along with their respective roles. According to key informant interviews, a total of 126 organizations are currently operating in the area.

Table 5: List of Stakeholders and their roles at the project site

Frequency			
Stakeholder	**Role**	**N=157**	**%**
Abeker	Baking of food	1	0.6

	Provision of certified seeds	1	0.6
ADRA	Provision of certified seeds	7	4.5
	Kitchen garden	2	1.3
	Planting vegetables	2	1.3
	Watering cans	2	1.3
	Business (Entrepreneurship)	1	0.6
	Training	1	0.6
Boma	Planting vegetables	1	0.6
Chief Daniel Losil	Training	5	3.2
	Agricultural ideas	1	0.6
County government (Ministry of Agriculture)	Provision of certified seeds	5	3.2
	Training	3	1.9
	Drilling boreholes	2	1.3
	Farm tools	2	1.3
	Water supply	2	1.3
	Financial support (cash transfer)	1	0.6
	Furrowing	1	0.6
	Relief food	1	0.6
	Water tanks	1	0.6
DCA	Provision of certified seeds	39	24.8
	Farm tools	20	12.7

Frequency			
Stakeholder	Role	N=157	%
	Training	15	9.6
	Financial support (cash transfer)	10	6.4
	Green house construction	6	3.8
	Relief food	5	3.2
	Water supply	5	3.2
	Drilling boreholes	2	1.3
	Fencing forest side	2	1.3
	Provision of manure	2	1.3
	Provision of pesticides	2	1.3
	Water tanks	2	1.3
	Construction materials	1	0.6
	Kitchen garden	1	0.6
	Poultry farming	1	0.6
FAO	Provision of certified seeds	1	0.6
IOM	Provision of certified seeds	4	2.5
	Solar system installation	2	1.3
	Water pump	2	1.3
ISRA Aid	Training	2	1.3
KDR Deep /Dr. Dip	Uprooting prosopis (clearing bushes)	5	3.2
	Farm tools	1	0.6
	Relief food	1	0.6

	Table banking	1	0.6
Lokado	Provision of certified seeds	10	6.4
	Training	4	2.5
	Farm tools	2	1.3
	Irrigation	2	1.3
	Drilling boreholes	1	0.6
	Financial support (cash transfer)	1	0.6
	Grass	1	0.6
	Kitchen garden	1	0.6
	Nets	1	0.6
	Planting vegetables	1	0.6
	Provision of pesticides	1	0.6
	Solar system installation	1	0.6
LWF	Provision of certified seeds	1	0.6
NARIG	Training	1	0.6
Nawiri	Business (Entrepreneurship)	3	1.9
	Training	1	0.6
Peace Winds of Japan	Provision of manure	1	0.6
	Training	1	0.6
	Water supply	1	0.6
Sapcone	Fencing forest side	1	0.6
Team Ruto	Provision of certified seeds	1	0.6
UN	Provision of certified seeds	1	0.6
Well hunger life (WHH)	Provision of certified seeds	25	15.9

	Farm tools	11	7.0
	Uprooting prosopis (clearing bushes)	3	1.9
Stakeholder	**Role**	**N=157**	%
	Financial support (cash transfer)	2	1.3
	Establishment of seed beds	1	0.6
	Relief food	1	0.6
	Training	1	0.6
Welthungerhilfe	Provision of certified seeds	6	3.8
	Training	2	1.3
	Uprooting prosopis (clearing bushes)	2	1.3
	Financial support (cash transfer)	1	0.6
	Relief food	1	0.6
WFP	Relief food	15	9.6
	Farm tools	3	1.9
	Employment	2	1.3
	Provision of certified seeds	2	1.3
	Training	2	1.3
World Vision	Farm tools	11	7.0
	Provision of certified seeds	6	3.8
	Training	5	3.2
	Financial support (cash transfer)	1	0.6

3.2.3 Challenges of implementing Agroecology and reported solutions.

The results presented in Table 6 outline the key challenges reported by surveyed respondents, along with their suggested solutions for addressing these issues.

Table 6: Challenges of Agroecology implementation and how the Organizations address them

Frequency			
Challenge/constraint faced	**How addressed**	**N=166**	**%**
Conflicts	Initiating peace talks	6	3.6
Cultural barriers	Awareness creation	1	0.6
Degraded soils	Use of fertilizers	1	0.6
High population	Food aid to the locals	1	0.6
	Provision of certified seeds	1	0.6
Hunger and poverty	Alternative sources of livelihood	24	14.5
	Food aid to the locals	12	7.2
	Financial support	1	0.6
	Increase food production	1	0.6
	Provision of certified seeds	1	0.6
	Use of locals in implementation	1	0.6
	Using jerricans for watering	1	0.6
Inadequate farmland	Clearing of vegetation cover	4	2.4
	Provision of farm tools	2	1.2
	Fragmentation of land	1	0.6
Inadequate skills/training/knowledge	Farmers training	13	7.8
	Awareness creation	6	3.6
Insecurity	Farmers training	3	1.8

Frequency			
Challenge/constraint faced	**How addressed**	N=166	**%**
	Avoiding very insecure places	2	1.2
	Awareness creation	2	1.2
	Fencing	2	1.2
	Employment of guards	1	0.6
	Financial support	1	0.6
Lack of capital	Provision of capital	1	0.6
Lack of irrigation tools	Using jerricans for watering	4	2.4
Lack of market	Use of locals in implementation	1	0.6
Lack of policies	Enhanced policies	1	0.6
Language barrier	Use of locals in implementation	42	25.3
	Alternative sources of livelihood	1	0.6
	Avoiding very insecure places	1	0.6
Pests and diseases	Provision of pesticides	4	2.4
	Increase food production	1	0.6
Ploughing	Use of tractors	1	0.6
Poor infrastructure	Infrastructure development	6	3.6
	Limiting areas of intervention to those that are reachable	1	0.6
	Provision of certified seeds	1	0.6
Proximity of water supply	Provision of watering cans	1	0.6
Rejection/anger/resistance	Awareness creation	4	2.4

	Farmers training	1	0.6
	Initiating peace talks	1	0.6
	Introduction of incentives	1	0.6
Seeds shortage	Provision of certified seeds Clearing of vegetation cover	24 1	14.5 0.6
Shortage of farm tools	Provision of farm tools	4	2.4
	Clearing of vegetation cover	2	1.2
Water scarcity	Drilling boreholes	39	23.5
	Dependence on rainwater	4	2.4
	Fetching water from streams	3	1.8

3.2.4 Financial risks of transitioning/ adopting to climate resilient agroecology- based food production practices

Most of the respondents (58%) said that adoption of agroecology poses financial risks at farm level as shown in fig.7 below.

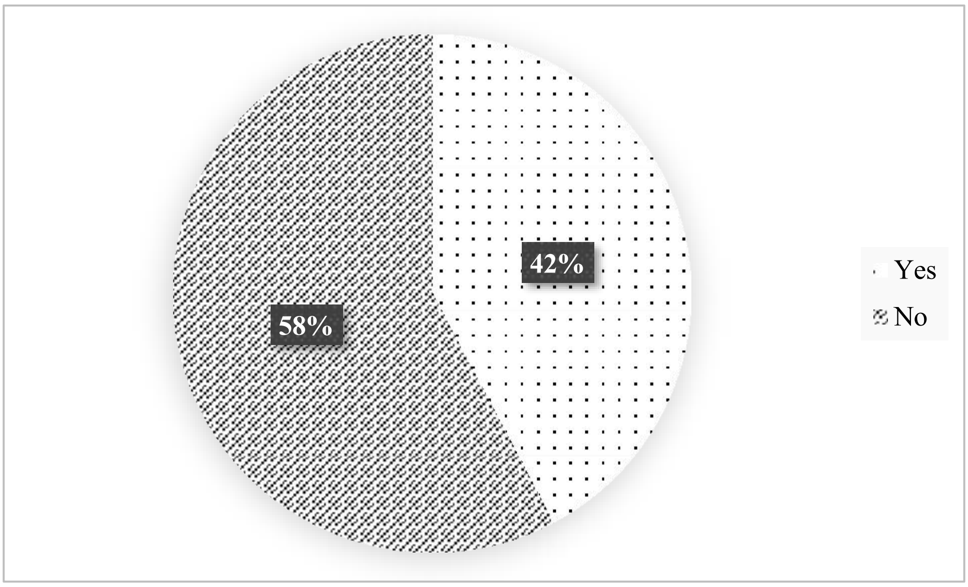


Fig. 7. Financial risks in transitioning

3.2.5 Major financial risks on transitioning.

As shown in Table 7 below, the main financial risks perceived during the transition to agroecology include increased input costs (65.9%), potential crop failure (53.7%), and unpredictable market prices (37.8%).

Table 7: Major Financial risks on transition

Frequency		
Non-financial risk	**N=173**	**%**
None	25	14.5

Frequency		
Financial risk	**N=82**	**%**
Increased cost of inputs	54	65.9
Potential crop failure	44	53.7
Unpredictable market prices	31	37.8
Labor	5	6.1
Training costs	4	4.9
Cost of farm tools	4	4.9
Water purchase	2	2.4

3.2.6. Non-financial risks associated with transitioning to climate resilient agroecology- based food production practices

Table 8: Non-financial risks associated with transitioning to Agroecology

The non-financial risks the respondents felt they would face when transitioning to Agroecology were mainly Lack of skills (55.5%), labor demands (46.2%) and changes in yield (28.3%) as shown on table 8 above.

Water scarcity	7	4.0
Shortage of seeds	4	2.3
Pests and diseases	4	2.3
Soil infertility	3	1.7
Lack of farm tools	3	1.7
Scarcity of farmland	2	1.2

3.2.7 Which Agricultural practices are they currently practicing

As shown in Table 9 below, the most commonly used farming practices in the project areas include the use of farmyard manure (65.8%), fertilizer application (41.3%), and broadcasting methods (39.1%).

Table 9: Current Agricultural practices at project site

Frequency		
Agricultural practice	**N=184**	**%**
Use of Farmyard Manure	121	65.8
Fertilizer application	76	41.3
Broadcasting during planting	72	39.1
Drying food for preservation	69	37.5
Mono cropping	53	28.8
Flooding Irrigation	35	19.0
Mechanization	19	10.3
Routine irrigation	1	0.5

3.2.8 Perceived best sustainable climate resilient agroecology-based food production practices at study site

As shown in Table 10 below, mixed farming was ranked as the most preferred sustainable, climate-resilient agroecology-based food production practice (79.4%), followed by organic farming at 69.4%.

Table 10: Best Agroecology practices

Frequency		
Sustainable Climate resilient agroecology-based food production practices	**N=180**	**%**
Mixed farming	143	79.4
Organic Farming	125	69.4
Agroforestry	89	49.4
Permaculture	72	40.0
Agroecology	64	35.6
Climate smart	52	28.9
Polyculture	30	16.7

3.2.9 **Practices which could be incorporated into modern agro-ecological approaches for synergy**

As presented in Table 11 below, the use of farmyard manure was identified as one of the most effective practices to adopt during the transition to agroecology.

Table 11. Practices to enrich Agroecology approaches

Frequency		
Incorporation	**N=135**	**%**
Use of farmyard manure to replace fertilizer to enrich the soil	47	34.8
Embracing modern farming techniques	18	13.3
Farmers training	16	11.9

Through training on the use of new farm technology	12	8.9
Diversifying crops	10	7.4
Drying food for later use	9	6.7
Implement organic farming	8	5.9
Using pesticides	8	5.9
Drilling boreholes	5	3.7
Drip irrigation to be employed in farms that are far from water sources	5	3.7
Reduced food wastage	4	3.0
Nutrient retention by drying food	3	2.2
Supplying farms with enough water	3	2.2
Sustainable land use	3	2.2
Mixing neem and aloe Vera solutions as pesticide	2	1.5
Use of ash for pests	2	1.5
Crop rotation	2	1.5
Use of compost manure	2	1.5

3.3.0 Motivating factors to the adoption to the Climate resilient agroecology-based food production practices

As shown in Table 12 below, access to training and support on agroecology was identified as the leading factor influencing the adoption of climate-resilient agroecology-based food production practices (70.7%). This was followed by perceived increases in productivity (64.9%) and improved adaptation to climate change (61.7%).

Table 12: Motivating factors to adopt agroecology

Frequency		
Motivation	**N=188**	**%**
Access to training and support	133	70.7
Increasing Productivity	122	64.9
Adapting to Climate Change	116	61.7
Reducing dependency on chemical inputs	94	50.0
Reducing dependency on relief food	6	3.2
Peer farmers	2	1.1
Hunger	2	1.1

3.3.1 Environmental factors that support successful implementation of sustainable, climate resilient agroecology-based food production

As shown in Table 13 below, the key environmental factors supporting the implementation of agroecology include soil health, water availability, favorable climate conditions, and reduced pest and disease pressure.

Table 13. Environmental factors favoring adoption of agroecology

Frequency		
Factor	**N=191**	**%**
Soil Health	169	88.5
Water Availability	132	69.1
Favorable climate	112	58.6
Moderate pest and diseases pressure	80	41.9

3.2.2 Practices to enhance Agroecology implementation

As per results, water reservoirs were considered as major practice (38.8%) to enhance agroecology implementation. See table 14 below.

Table 14: Practices enhancing agroecology implementation

Frequency		
Enhancement	**N=152**	**%**
Construction and filling of water reservoirs	59	38.8
Provide natural pesticides	44	28.9
Construction of boreholes/piped water	26	17.1
Routine soil treatment	21	13.8
Use of organic manure/organic fertilizers	15	9.9
Training/capacity building	15	9.9
Cover cropping	8	5.3
Use of organic manure	7	4.6
Use of irrigation	6	3.9
Crop rotation	6	3.9
Farms to be provided with enough water	5	3.3
Maintaining good drainage	5	3.3
Reduce land tillage	4	2.6
Mixing manure and fertilizer	4	2.6
Mulching	4	2.6
Planting trees	3	2.0
Avoid activities that pollute the environment	2	1.3
Use of green houses	2	1.3
Financial support	2	1.3
Repairing tanks for water storage	2	1.3
Reduce chemical usage	2	1.3

3.3.3 Challenges/constraints affecting the adoption of sustainable, climate resilient Agroecology-based food production practices in Turkana County

As presented in Table 15 below, pest and disease pressure was identified as the most significant constraint to agroecology adoption (90.4%), followed by water scarcity (86.8%) and limited market access (60.9%).

Table 15: constraints affecting adoption

Frequency		
Challenge/constraint	**N=197**	**%**
Pest and disease constraints	178	90.4
Water constraints	171	86.8
Market access	120	60.9
Soil erosion	113	57.4
Conflict	37	18.8
Thieves	3	1.5
Insecurity	2	1.0
Competition in the market	2	1.0
Lack of incentives to volunteers	2	1.0
Low crop yield	2	1.0
Birds	2	1.0

3.3.4 Ways of mitigating agroecology adoption challenges/constraints be mitigated

As shown in Table 16 below, the results present the various strategies respondents use to mitigate the challenges they perceive as barriers to adopting agroecology.

Table 16: Mitigation measures

Frequency		
Mitigation	**N=166**	**%**
Provision/use of pesticides	71	42.8
Construction of boreholes/piped water	48	28.9
Market linkages	29	17.5
Training/capacity building	22	13.3
Piping of water to farms	21	12.7
Peace talks	14	8.4
Provision of certified seeds	11	6.6
Patrolling/employing watchman	9	5.4
Construction of dams/more water storage facilities	9	5.4
Fencing/building boundaries	8	4.8
Chasing away birds physically by throwing stones at them or shouting	5	3.0
Provision of financial support	5	3.0
Provision of water tanks	4	2.4
Use of solar machine to pump water	3	1.8
Alternative treatment for pests and diseases	3	1.8
Supply additional farm tools	3	1.8
Practicing agroforestry	3	1.8
None	2	1.2
Use of scare craws to scare away birds	2	1.2
Hand picking of pests	2	1.2
Planting crops during the right season	2	1.2

Planting drought resistant crops/ fast maturing crops	2	1.2
Introduction/adoption of organic farming techniques	2	1.2
Use of raised nursery beds to prevent erosion	2	1.2
Reducing chemical use	2	1.2
Build terraces	2	1.2
Bush clearing/ removal of prosopis	2	1.2
Infrastructure development	2	1.2
Provision of farm tools	2	1.2
Build terraces	2	1.2

3.3.5 Envisioned social, economic and environmental impacts of sustainable climate resilient, agroecology-based food production interventions in Turkana County

As shown in Table 17 below, respondents identified several key impacts of adopting agroecology. Socially, increased farm productivity and reduced reliance on food aid were highlighted as the most significant benefits. Economically, the primary impact reported was increased household income. Environmentally, a greener landscape and improved soil health were viewed as the most notable outcomes of embracing agroecological practices.

Table 17: Social, economic and environmental impacts of agroecology

Frequency		
Impact	**N=166**	**%**
Social		
Increased farm produce/food security	80	48.2
Reduced dependency on food aid	23	13.9
Enhanced knowledge	16	9.6

Improved nutrition	14	8.4
Enhanced community integration/unity	10	6.0
Economical		
Increased income	76	45.8
Improved living standards	32	19.3
Created self-employment	7	4.2
Environmental		
Enhanced ample and green environment	14	8.4
Improved soil health	7	4.2
Biodiversity conservation	4	2.4

3.3.6 Best Agroecology Based food productions intervention

As presented in Table 18 below, respondents identified polyculture as the most preferred agroecology practice, followed by the use of organic fertilizers and integrated pest management (IPM), respectively.

Table 18: Best Agroecology Based food production intervention

Frequency		
Practice	**N=192**	**%**
Crop Rotation and Polyculture	136	70.8
Composting and Organic Fertilizers	120	62.5
Integrated Pest Management (IPM)	93	48.4
Agroforestry Systems	90	46.9
Kitchen Gardens	80	41.7
Permaculture	77	40.1
Cover Cropping and Green Manures	72	37.5
Drip Irrigation and Water Harvesting	61	31.8
Soil and Water Conservation Techniques (e.g., contour ploughing, terracing)	31	16.1
No-Till or Reduced-Till Farming	23	12.0

3.3.7 Best ways to replicate/spread agroecology practices in Turkana

As shown in Table 19 below, respondents identified several strategies for scaling up agroecology in Turkana. Capacity building and training emerged as the most significant factor, cited by 50.3% of respondents as key to promoting wider adoption.

Table 19: Best ways for replication of agroecology

Frequency		
Replication of best practices	**N=165**	**%**
Capacity building/training	83	50.3
Use of organic fertilizers	22	13.3
Stored/harvested water to enable irrigation	21	12.7
Continued farming	14	8.5
Need for financial resources	13	7.9
Site planning	12	7.3
Diversifying crops	12	7.3
Use of pesticides	7	4.2
Need for shed nets	7	4.2
Research and development	6	3.6
Knowledge sharing among farmers/experts	5	3.0
Building own garden beds	4	2.4
Demonstrations	4	2.4
Modern farm tools	4	2.4
Policy support	4	2.4
Copying from someone who already has the knowledge	3	1.8
Shifting cultivation	2	1.2
Fencing	2	1.2
Extension services	2	1.2
Working together as a community	2	1.2
Kitchen garden	1	0.6

Provision of certified seeds	1	0.6
Timely planting	1	0.6
Participating in decision making	1	0.6
Address erosion	1	0.6

3.3.8 Main factors affecting the adoption and successful implementation of agroecology-based food production technologies practices in Turkana

As shown in Table 20 below, water availability was identified as the most critical factor influencing the adoption of agroecology (78.2%), followed by income levels (70.5%) and soil quality (50.8%).

Table 20: Factors affecting agroecology adoption

Frequency		
Factor	**N=193**	**%**
Water	151	78.2
Income	136	70.5
Soil	98	50.8
Education Level	93	48.2
Land size	75	38.9
Family size	48	24.9
Age	13	6.7
Culture	11	5.7
Marital Status	10	5.2
Market availability	7	3.6

3.3.9 Benefits of agroecology-based food production methods by individual farmers and the communities in the project site

As shown in Table 21 below, respondents identified several perceived benefits of adopting agroecology-based food production methods. The most mentioned benefits included increased yields (71.9%), enhanced income (17.3%), and improved nutrition (15.1%).

Table 21: Benefits of adopting agroecology

Frequency		
Enhancement	**N=139**	**%**
Increased crop yield/enhanced food production	100	71.9
Enhanced income generation	24	17.3
Helped reduce diet monotony and boosted nutrition	21	15.1
Reduced dependence on food aid	16	11.5
Enhanced knowledge	10	7.2
Improved living standards	9	6.5
Led to self-employment	7	5.0
Reduced hunger	3	2.2

3.4.0 Socio-economic, cultural, environmental and institutional factors that enhance/support agroecology-based models

The results showed that there are several factors that support or enhance adoption of Agroecology-based production methods as shown on table 22 below. Indigenous knowledge and training were higher in ranking.

Table 22: Factors enhancing adoption of agroecology

Frequency		
Factor	**N=152**	**%**
Indigenous knowledge	34	22.4

Training/capacity building	34	22.4
Financial aid	24	15.8
Use of organic manure/soil treatment	19	12.5
Availability of water	16	10.5
Market access/linkages	16	10.5
Good/productive soils	16	10.5
Favorable climatic conditions	15	9.9
Government policies	14	9.2
Community involvement	10	6.6
Access to land resources	10	6.6
Peace enhancement	7	4.6
Biodiversity	7	4.6
Mixed farming	5	3.3
Bench-marking	5	3.3
Demonstrations	2	1.3
Collaboration with partners and other stakeholders	2	1.3
Provision of farm tools	2	1.3
Human resource	2	1.3

3.4.1 Agroecology approaches that are currently working well in Turkana County

There are several practices or approaches, which were considered as agroecological happening in Turkana County. Organic farming and permaculture were mentioned as the highest as shown in table 23 below.

Table 23: Current agroecology methods in Turkana

Frequency		
Approach	**N=191**	**%**
Organic farming	160	83.8
Permaculture	113	59.2
Agroforestry	95	49.7
Regenerative agriculture	36	18.8
Mixed farming	3	1.6

3.4.2 Environmental factors that support successful implementation of sustainable, climate resilient agroecology-based food production

Table 24 below presents the environmental factors that respondents identified as influencing the successful implementation of agroecology. Soil health, water availability, and climate change emerged as the most significant factors affecting adoption and sustainability of agroecological practices.

Table 24: Environment factors supporting successful implementation of Agroecology

Frequency		
Factor	**N=193**	**%**
Soil Fertility and Health	183	36.0
Water Availability and Quality	128	25.1
Moderate Climate and Weather Patterns	121	23.8
Biodiversity and Ecosystem Balance	72	14.1

3.4.5 Environmental factors that hinder successful implementation of sustainable, climate resilient agroecology-based food production

Results showed that extreme weather (83.1%) is the main factor affecting agroecology followed by and water scarcity (72.5%).

Table 25: Environmental factors hindering agroecology implementation

	Frequency	
Factor	**N=189**	**%**
Extreme Weather Events (e.g., droughts, floods)	157	83.1
Water Scarcity and Inefficient Distribution	137	72.5
Soil Erosion and Degradation	117	61.9
Limited Biodiversity and Pest Pressure	115	60.8

3.4.6 Proposed mitigation measures

As shown in Table 26, respondents proposed several mitigation measures to enhance the implementation of agroecology. The most frequently suggested intervention was drilling more boreholes and improving water provision, cited by 47.8% of respondents.

Table 26: Proposed mitigation measures

Frequency		
Mitigation	**N=161**	**%**
Drilling more boreholes	77	47.8
Use of pesticides	37	23.0
Capacity building training	24	14.9
Installation of water tanks for rainwater harvesting and storage	22	13.7
Piping water	18	11.2
Planting cover crops	16	9.9
Efficient irrigation	14	8.7
Embracing modern farming methods	10	6.2

Financial aid	9	5.6
Digging terraces	7	4.3
Planting drought resistant/short term crops	7	4.3
Agroforestry	5	3.1
Fencing	3	1.9
Build water tunnels that stream water during floods	3	1.9
Use of compost/organic fertilizer	3	1.9
Infrastructure development	2	1.2
Planting trees	2	1.2
Timely planting of crops	2	1.2

3.4.7 On a scale of 1 – 5, to what extent do you feel that climate change is affecting your farm operations?

As illustrated in Figure 8 below, the majority of respondents reported that climate change has significantly impacted their farming operations.

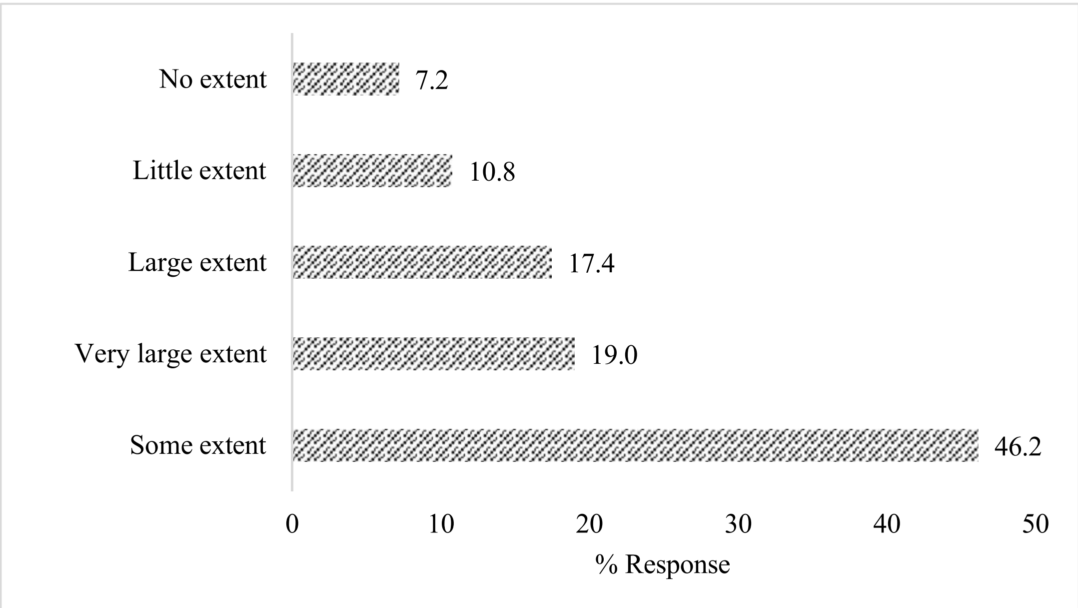


Fig. 8: Extend of effects of climate change on farm operations

3.4.8 Climate-related events experienced by respondents in the past five years

As shown in Figure 9 below, nearly all respondents reported experiencing the impacts of climate change over the past five years, including events such as droughts, floods, and other related challenges..

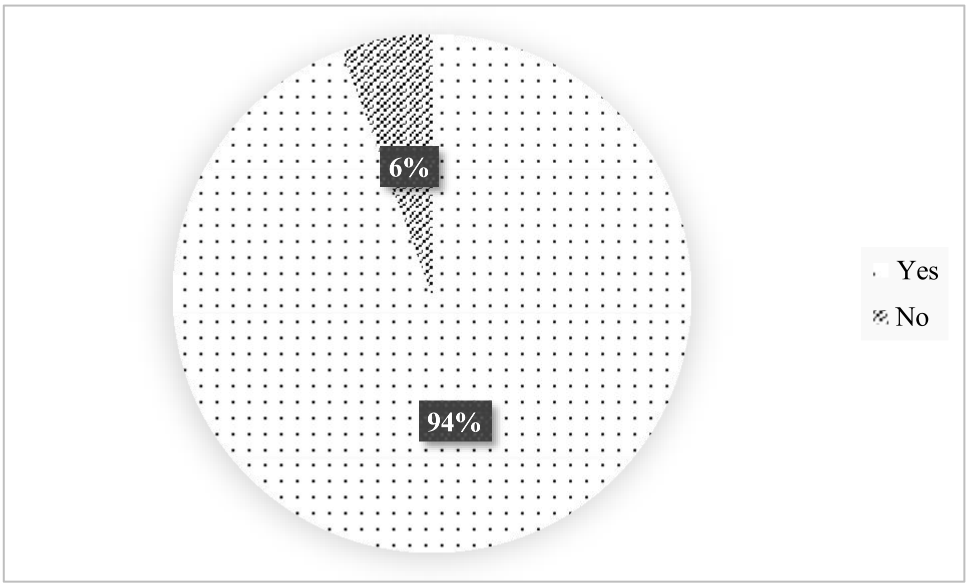


Fig 8. Climate experiences in the last 5 years

3.4.9 What climate-related events did you experience

As shown in Table 27 below, respondents reported experiencing various climate-related events, with droughts (90.8%) and floods (56.0%) being the most common.

Table 27: What-climate related events did you experience

Frequency		
Event	**N=184**	**%**
Drought	167	90.8
Floods	103	56.0
Extreme temperatures	17	9.2

Pests and diseases	10	5.4
Soil erosion	3	1.6

3.5.0 Do you believe climate resilient agroecology- based food production practices can help mitigate climate-related risks on your farm

As illustrated in Figure 9 below, the majority of respondents (92%) believe that agroecology has the potential to mitigate climate-related risks.

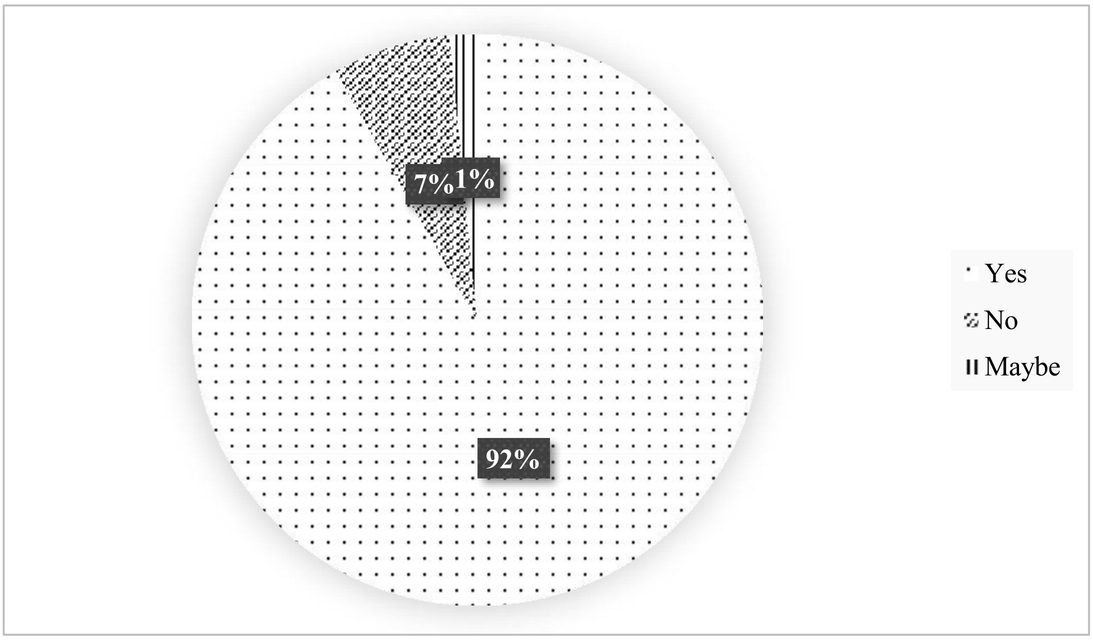


Fig 9. Agroecology and climate change mitigation

3.5.1 Do you have access to climate resilient agroecology- based food production practices information or training

As shown in Figure 10 below, nearly half of the respondents reported having no access to information or training on climate-resilient, agroecology-based food production practices.

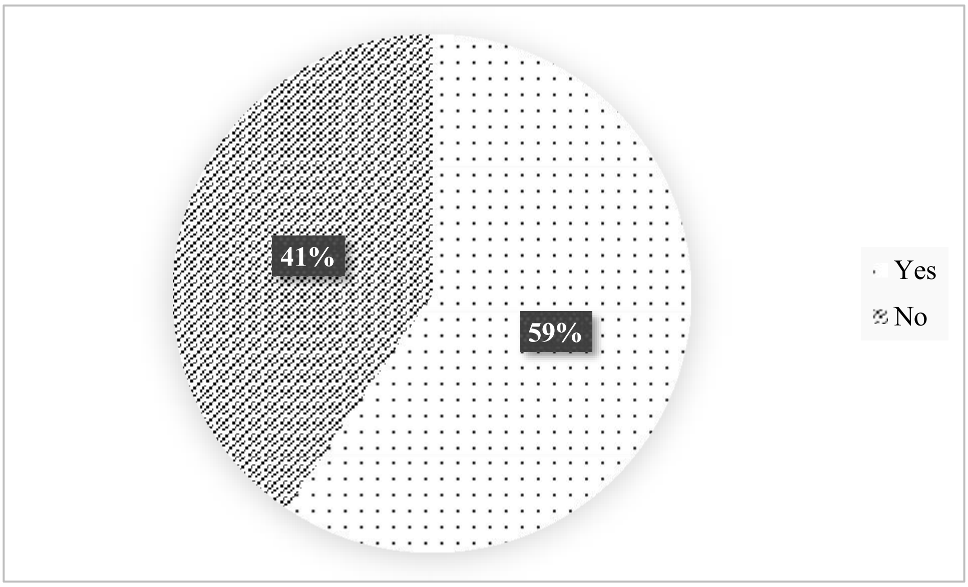


Fig. 10: information access

3.5.2 What sources of information climate resilient agroecology- based food production practices do you rely mostly

The results indicated that most of the respondents (74.9%) relied on the NGO for agricultural related information as shown in table 28 below.

Table 28. Sources of information

Frequency		
Information source	**N=175**	**%**
NGOs	131	74.9
Peer farmers	64	36.6
Ministry of Agriculture	6	3.4
Extension services	6	3.4

3.5.3 Financial support or incentives for climate resilient agroecology- based food production practices

The results indicated that majority of the respondents (59%) did not receive any financial or incentives support as seen in the **fig** 11 below.

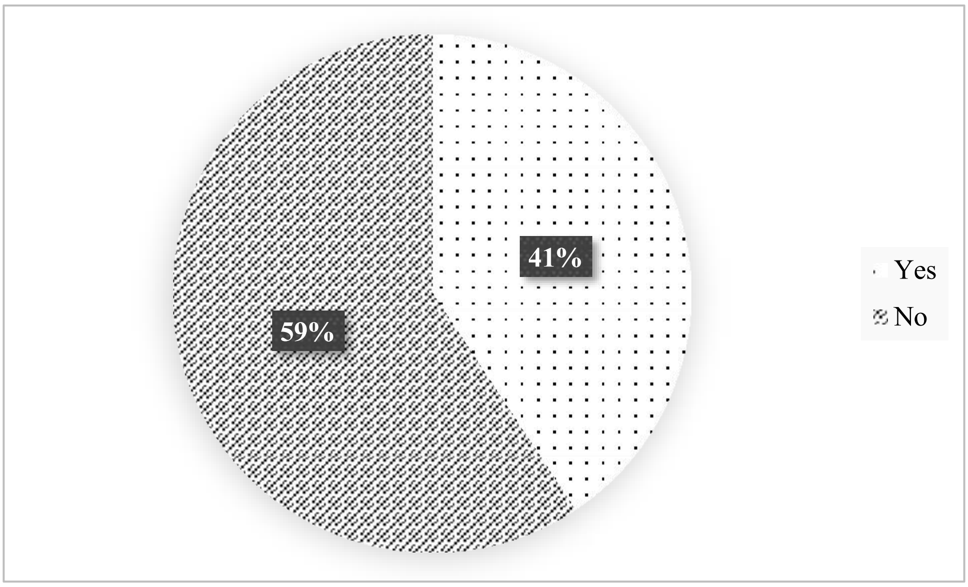


Fig 11. Financial support

3.5.4 Additional support that would help transition to Agroecology

When asked what kind of support they would need for them to transition to Agroecology smoothly, majority (64.7%) said financial aid followed by training (49.5%) as shown in table 29 below

Table 29: Support for smooth transitioning

Frequency		
Additional support	**N=184**	**%**
Financial aid	119	64.7
Training	91	49.5
Market linkages	63	34.2
Farm tools	31	16.8
Farm inputs (certified seeds...)	24	13.0
Water	21	11.4
Provision of pesticides	7	3.8
Fencing	4	2.2

Storage facilities	3	1.6
Transport	3	1.6
Poultry farming	2	1.1
Solar	2	1.1

3.5.5 How would you describe the current state of food security in this community?

The results in **fig**.12 showed that the majority (48.2% of the respondents describe the current state of food security as food insecure.

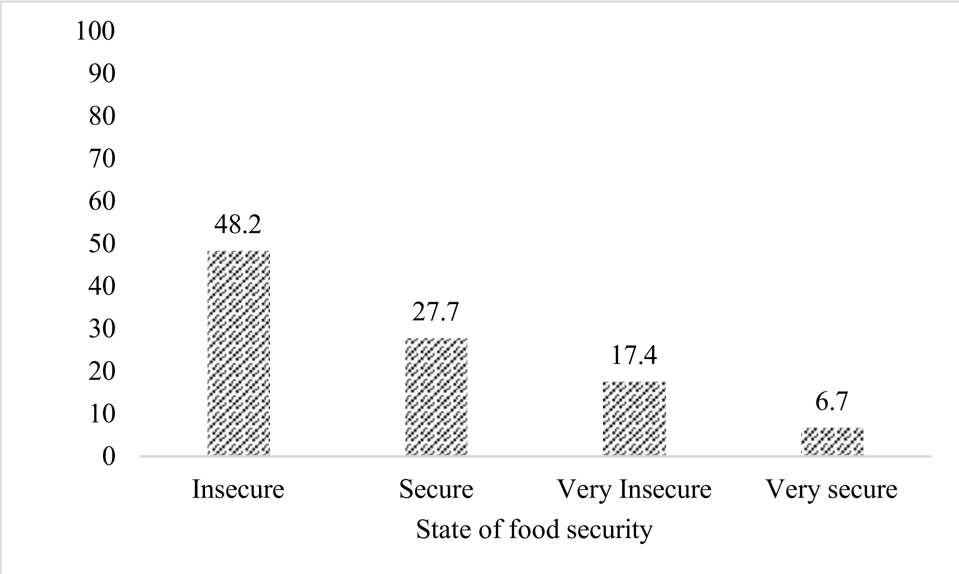


Fig 12: State of food security in the study area

3.5.6 How satisfied are you with the impact of climate resilient agroecology- based food production practices on your farm?

The results on satisfaction of agroecology impacts among the farmers showed that the majority (62%) are not satisfied with the current impacts of agroecology as shown in **fig** 13.

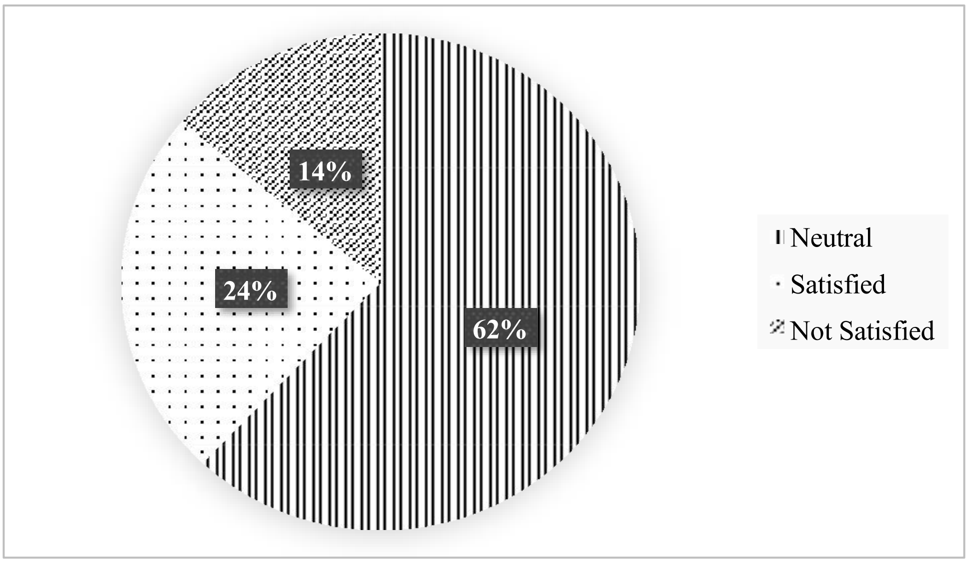


Fig. 13. Impacts/satisfaction

3.5.7 Do you plan to continue or expand climate resilient agroecology- based food production practices on your farm?

The results on if the respondents would love to transition to Agroecology, almost all said yes as shown in the fig. 14 below

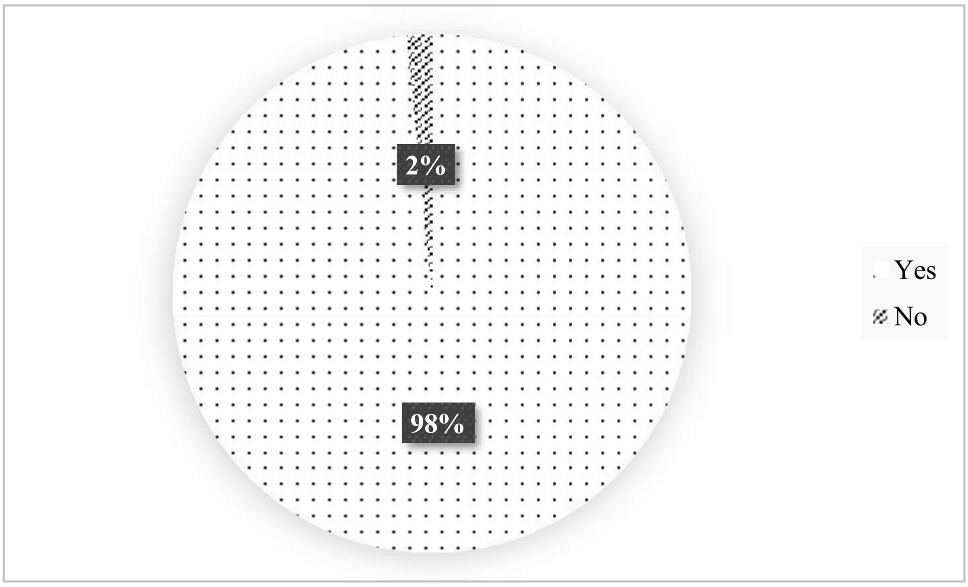


Fig. 14: Desire to adopt agroecology

3.5.8 What climate resilient agroecology- based food production practices have worked best for you?

When asked which practices are working best for the farmers, they listed several practices with planting drought-tolerant crops as the highest as shown in table 30 below.

Table 30: Best working practices

Frequency		
Practice	**N=190**	**%**
Drought-Tolerant Crop Varieties	122	64.2
Agroforestry Systems	89	46.8
Rainwater Harvesting	78	41.1
Permaculture	73	38.4
Integrated Pest Management (IPM)	41	21.6
Cover Cropping and Soil Mulching	37	19.5
Zero or Reduced Tillage	10	5.3

3.5.9 Give reasons for your answer above

Table 31 below lists the perceived reasons why the above practices work best.

Table 31: Reasons why listed best practices are working

Frequency		
Reason	**N=158**	**%**
Drought tolerant crops grow well during dry season	54	34.2
Yield production/increased food security	53	33.5
Rain water harvesting for irrigation in times of drought	15	9.5
Reduces soil erosion/ flooding	7	4.4
Integrated pest management	7	4.4

Increased soil nutrients through agroforestry	6	3.8
Dry area/desert/no rain/extreme temperature/climate change	5	3.2
Organic farming	3	1.9
Training farmers	2	1.3
Agroforestry	2	1.3
Cover cropping	2	1.3
Improve living standard of people	2	1.3
Permaculture is a good practice	2	1.3
Favorable climate	2	1.3

3.6.0 Why do you think they did not work as anticipated?

As presented in Table 32 below, respondents cited several reasons for the failure of agroecology practice implementation, with the most common being an unfavorable environment and lack of water.

Table 32: Reasons for failure

Frequency		
Reason	**N=95**	**%**
Infertile soils/ unfavourable soils	22	23.2
Inadequate rains/lack of water	21	22.1
Availability of food aid	16	16.8
Pests and diseases (like locusts)	14	14.7
Inadequate financial resources	13	13.7
Lack of tanks for storage of rain water	7	7.4

Did not attend any training/ lack of skills	7	7.4
Lack of tools/ material	7	7.4

Frequency		
Reason	N=95	%
Low levels of education	4	4.2
Tree branches fell on the plants thus breaking them/ tress hinder crop production	3	3.2
Extreme drought	2	2.1
Extreme temperatures	1	1.1
Destroyed by trees	1	1.1
Poor seeds	1	1.1

3.6.1 Are there specific adjustments you made to suit your local conditions?

As shown in Figure 15 below, when asked about adaptation practices related to agroecology, the majority of respondents (55%) indicated that they actively engage in such practices.

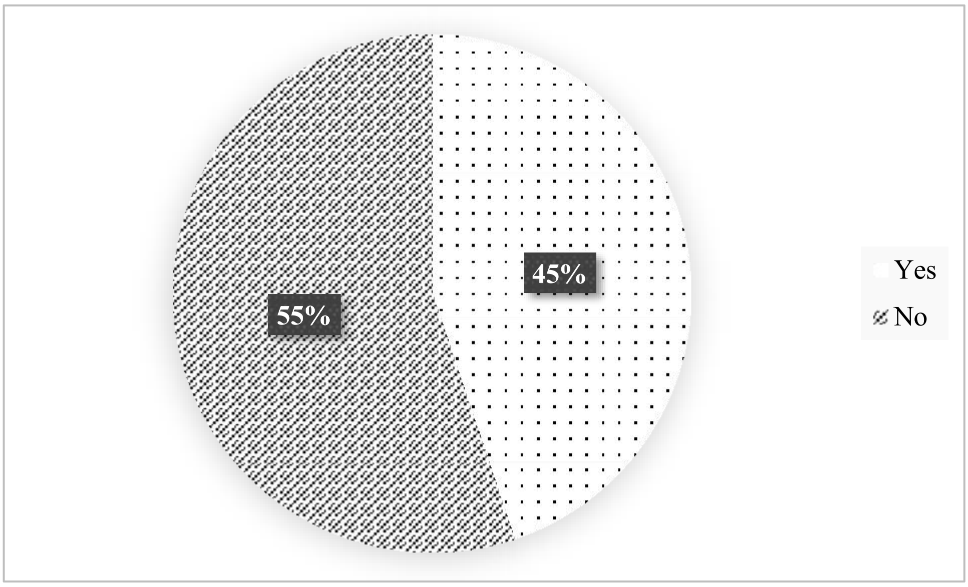


Fig 15: Farmers action

3.6.2 If yes, please list them

As shown in Table 33 below, the results highlight various mitigation measures farmers are employing to cope with the effects of climate change.

Table 33. Coping mechanism

Frequency		
Adjustment	**N=87**	**%**
Timely planting	46	52.9
Watering of crops/irrigation	44	50.6
Planted short term crops/ drought tolerant crops	8	9.2
Crop rotation	7	8.0
Modification in crop variety	3	3.4

Food production	1	1.1
Nursery planting	1	1.1
Training	1	1.1
Mulching	1	1.1

3.6.3 What lessons have you learned that might benefit other communities transitioning to climate resilient agroecology- based food production practices?

As presented in Table 34 below, respondents identified several lessons that could be shared with other farmers. Training emerged as the most valuable transferable lesson, cited by 29.0% of respondents.

Table 34: learnt lessons

Frequency		
Lesson learnt	**N=176**	**%**
Skills in agriculture/ learn skills/ training the community	51	29.0
Agriculture enhances food security as wells as generating income	19	10.8
New farming techniques	17	9.7
Drought resistant crops e.g. sorghum	12	6.8
Vegetable growing in dry areas	9	5.1
Using organic matter in food production	9	5.1
Need for continuous trainings	8	4.5
Constant water supply is necessary for agriculture/ water harvesting	7	4.0
Agriculture through agroecology is easy to handle	7	4.0

Food production has increases with the availability of water	6	3.4
Pest management	6	3.4
Agroecology based activities are useful and not harmful since they do not contain chemically processed products	5	2.8
Farmers should do farming together as a group	4	2.3
Crop rotation enhances health products	3	1.7
Broadcasting is the best method of farming	3	1.7
Farming requires dedication and motivation	3	1.7
Drylands can be utilized for irrigation purposes	3	1.7
Poultry farming	3	1.7
The practice of polyculture is a variety of crops reduces risk in a farm produce	2	1.1
Community empowerment	2	1.1

3.6.4 What benefits of climate resilient agroecology- based food production practices have you observed on the surrounding community

As shown in Table 35 below, respondents outlined several benefits associated with adopting agroecology practices.

Table 35: Benefits of agroecology

Frequency		
Benefit	**N=175**	**%**
Reduced erosion	78	44.6
Increases water availability/borehole	71	40.6
Increases food supply/increased yield/reduced hunger	49	28.0

Increased income from farm produce	13	7.4
Improved living standards/ reduced poverty	13	7.4
Reduced dependence on relief food	6	3.4
Increased nutritional value	5	2.9
Reduce cost of farming	4	2.3
Reduced use of pesticides/ chemicals	4	2.3
New farming methods	3	1.7
Increased farming land	2	1.1
Increased soil health/soil fertility	2	1.1
Reduced chemical inputs	2	1.1

3.6.5 What is the community's long-term vision for sustainable food production and climate resilience?

Table 36 presents the community's vision regarding agroecology, with the desire for increased yields ranking as the highest priority.

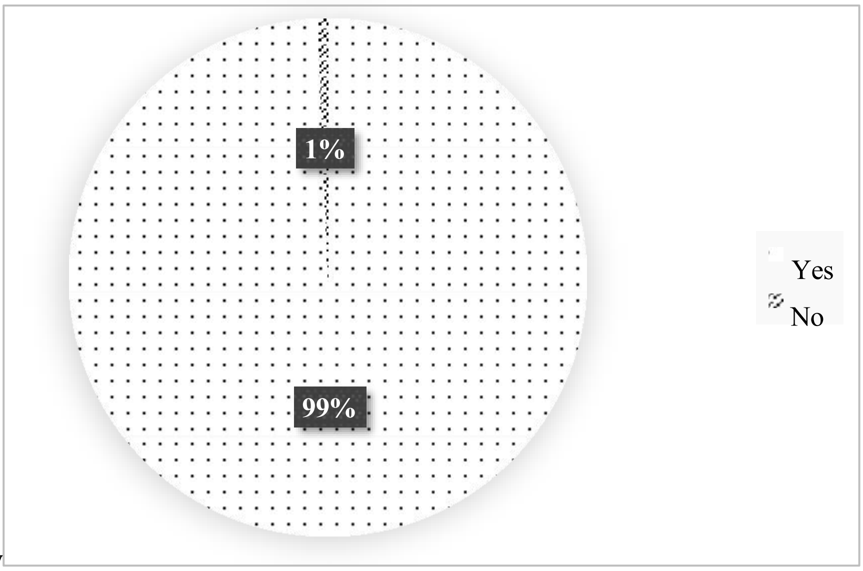
Table 36. Community vision

Frequency		
Long-term vision	**N=185**	**%**
Increased yields	41	22.2
To be the best producing community of different varieties of crops to enhance food production	40	21.6
Improved food security	28	15.1
Earn income through farming	17	9.2
Improved nutrition	16	8.6

To improve living standards through agriculture	15	8.1
Reduced dependence on food aid	11	5.9
Expand/extend my farm	11	5.9
Enhanced knowledge	6	3.2
Climate change	6	3.2
Improved water storage for irrigation	5	2.7
Construct a green house	5	2.7
Lack of water	5	2.7
Help in reducing the high rate of dependency	5	2.7
Training	4	2.2
Increased self-reliance	4	2.2
Market Linkages	3	1.6
Export our produce	3	1.6
Plan to get a borehole	3	1.6
hope to produce more food	3	1.6
Job creation/self-employment	3	1.6
Engage in fish farming	2	1.1
Reduced chemical inputs	2	1.1

3.6.6 Do you believe the current climate resilient agroecology- based food production practices are sustainable and viable in the long term?

The results showed that almost all the respondents (99%) believe agroecology is sustainable as



showed in fig 16 below

Fig.16: Is agroecology sustainable

3.6.7 Kakuma Rapid Market assessment.

The results of the rapid market assessment conducted in Kakuma through a transect walk, as shown in Table 37 below, revealed a variety of produce and their sources. Findings indicate that most of the produce is sourced from outside the Kakuma area.

Table 37: Rapid Kakuma Market assessment

Product	Town of Origin
Green maize	Kitale
Mangoes	Ortum
Oranges	Kitale
Onions	Ortum
Fish	Turkana
Tobacco	Meru
Cabbage	Kitale
Tomatoes	Kitale
Cowpeas –kunde	Around Kakuma

Bananas	Kitale
Spinach	Kakuma/Kitale
Charcoal-	Kakuma
Murere-local	Local
Terere	Local
Omena	Eldoret
Apples	Nairobi
Oranges	Nairobi
Passion fruit	Nairobi
Thorn melon	Nairobi
Tamarind	Kitale
Dates	Kitale
Water melon	Lodwar
Eggs	Nairobi
Pawpaw	Kitui
Sweet potatoes	Kitale
Nduma	Kitale
Butternut	Kitale
Mangoes	Kitui

3.6.8 Model Development

Household survey data were entered into STATA version 15 and coded for both descriptive and inferential statistical analysis. A Multivariate Probit (MVP) model was applied to assess the adoption of sustainable, climate-resilient agroecology-based food production practices, including permaculture, agroforestry, agroecology, climate-smart agriculture, organic farming, mixed farming, and polyculture.

Table 38 Summary statistics and definition of variables used in MVP model

Variable	Description of the variable	Mean	S. D	C.V
Dependent variable				
Permaculture	Adopted permaculture (1=Yes; 0= Otherwise)	0.36	0.48	1.33
Agroforestry	Adopted agroforestry (1=Yes; 0= Otherwise)	0.45	0.50	1.11
Agroecology	Adopted agroecology (1=Yes; 0= Otherwise)	0.32	0.47	1.47
Climate smart	Adopted climate smart (1=Yes; 0= Otherwise)	0.26	0.44	1.69
Organic Farming	Adopted organic farming (1=Yes; 0= Otherwise)	0.61	0.49	0.80
Mixed farming	Adopted mixed farming (1=Yes; 0= Otherwise)	0.73	0.45	0.62
Polyculture	Adopted polyculture (1=Yes; 0= Otherwise)	0.15	0.36	2.40
Independent variable				
Age	Age of Household head (1= < 20; 2= 20-30; 3= 30-40; 4= 40-50; 5= above 50)	3.67	1.04	0.28
Gender	Gender of Household head (1= Male;	1.26	0.44	0.35

	2= Female)			
Marital status	Marital status of Household head (1= Single; 2= Married; 3= Widowed; 4= Divorced)	2.21	0.63	0.29
Family size	Total number of people in the household	7.88	3.87	0.49
Level of Education	Level of Education of Household head (1= Non-formal; 2= Primary; 3 = Primary dropout; 4= Secondary; 5= Secondary dropout; 6= Tertiary; 7= Adult Education; 8= University)	1.99	1.80	0.90
Occupation	Household head's occupation (1= Casual worker; 2= Farmer; 3= Firewood seller; 4= Charcoal Seller; 5= Formal employment; 6= Business person)	2.06	0.78	0.38
Farm size	Size of farmland (acres)	5.41	1.87	0.35
Land ownership	Ownership of the land (1= Individual owner; 2= Communal land; 3= Leased)	1.14	0.35	0.31
Information Access	Access to climate resilient agroecology- based food production practices information or training (1=Yes; 0= Otherwise)	1.41	0.49	0.35

Financial support	Receipt of any financial support or incentives for climate resilient agroecology- based food production practices (1=Yes; 0= Otherwise)	1.60	0.49	0.31

Polyculture recorded a coefficient of variation (CV) of 2.40, indicating extremely high variability in its adoption. This suggests a wide dispersion of data points around the mean, pointing to potential inconsistencies in its implementation or effectiveness across different areas. Climate-smart agriculture also showed high variability, with a CV of 1.69, though slightly lower than that of polyculture. Permaculture, agroforestry, and agroecology exhibited CVs ranging from 1.1 to 1.5, reflecting moderate to high variability. These high levels of variation imply significant differences in the adoption of these practices across farms or regions, likely influenced by varying access to resources, knowledge, or environmental conditions.

Advice on Policy

3.6.8.1 *Targeted Policy Interventions*: Given the high variability, a one-size-fits-all approach may not work. Policies should be localized and tailored to different regions or farmer groups based on their specific constraints.

3.6.8.2 *Capacity Building & Standardization*: The high variation in climate-smart agriculture and agroecology practices suggests uneven adoption and knowledge gaps. More training, incentives, and guidance could help reduce variability and ensure better implementation.

Table 39. Multicollinearity test

Multicollinearity	VIF
Age	1.36
Gender	1.94

Marital status	2.00
Family size	1.35
Level of Education	1.24
Occupation	1.14
Farm size	1.20
Land ownership	1.19
Information access	1.21
Financial support	1.26
Mean VIF	**1.39**

3.7.0 Econometric Model Results

3.7.1 Test for Multicollinearity

Multicollinearity occurs when two more independent variables in a regression model are highly correlated, making it challenging to assess the effect of each predictor on the dependent variable independently. This can lead to inflated standard errors, make coefficient estimates unstable and difficult to interpret as well as reduce statistical significance. In the presence of multicollinearity, the model results in wrong signs of coefficients, high standard errors of coefficients, and high R^2 value even when the parameter estimates are not significant (Wossen et al., 2017). The variance inflation factor (VIF) for each variable was evaluated to check for multicollinearity. If the VIF exceeds 10, that variable is said to be highly collinear and can be excluded from the model. The results of the multicollinearity test are presented in Table 39 above. The results show that the mean VIF value is 1.44 and that none of the variables included in the models have VIF greater than 10. This indicates that there is no multicollinearity problem in the dataset and hence all the explanatory variables are included in the models.

3.7.2 Model Fitness, Probabilities, and Correlation Matrix from MVP Model

A multivariate probit model was determined for sustainable climate resilient agroecology-based food production practices that entailed permaculture, agroforestry, agroecology, climate smart, organic farming, mixed farming, and polyculture. The correlation coefficient among the organic agriculture practices (ρij) was determined to assess if these practices are complementary and/or substitutable. The results show that the correlation coefficients of eight combined practices, namely ρ21 (agroforestry and permaculture), and ρ31 (agroecology and permaculture), ρ51(organic farming and permaculture), ρ52 (organic farming and agroforestry), ρ53 (organic farming and agroecology), ρ61(mixed farming and permaculture), ρ62(mixed farming and agroforestry), ρ65 (mixed farming and organic farming) were positive and statistically significant at less than 1% probability levels.

Two combined practices, namely ρ42 (climate smart and agroforestry) and ρ63 (mixed farming and agroecology) were positive and statistically significant at less than 5% probability levels.

Two combined practices, namely ρ74 (polyculture and climate smart) and ρ75 (polyculture and organic farming) were negative and statistically significant at less than 5% probability levels. The rest of the combinations proved to be neither complementarity nor substitutability in their adoption.

Table 40 Model fitness, probabilities, and correlation matrix of sustainable climate resilient agroecology- based food production practices

Variables	Estimated correlation of sustainable climate resilient agroecology-based food production practices (Pair-wise correlation coefficients)
ρ21	0.436**
ρ31	0.241**
ρ41	-0.046
ρ51	0.201**
ρ61	0.251*

ρ71	0.091
ρ32	0.048
ρ42	0.176*
ρ52	0.188**
ρ62	0.371**

Variables	**Estimated correlation of sustainable climate resilient agroecology-based food production practices (Pair-wise correlation coefficients)**
ρ72	-0.042
ρ43	-0.069
ρ53	0.248**
ρ63	0.156*
ρ73	-0.021
ρ54	0.082
ρ64	0.108
ρ74	-0.156*
ρ65	0.249**
ρ75	-0.149*
ρ76	0.037

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed)

Likelihood ratio test of $\rho21 = \rho31 = \rho41 = \rho51 = \rho61 = \rho71 = \rho32 = \rho42 = \rho52 = \rho62 = \rho72 = \rho43 = \rho53 = \rho63 = \rho73 = \rho54 = \rho64 = \rho74 = \rho65 = \rho75 = \rho76 = 0$

chi2 (21) = 126.14 Prob > chi2 = 0.0000

Number of draws = 5

Number of observations = 198

Log likelihood = -714.31526

Wald chi2 (68) = 121.31

Prob > chi2=0.0001

3.7.3 Parameter Estimates of the MVP Model on the Determinants of adoption of soil conservation practices

The results of the multivariate probit model revealed that seven explanatory variables had a statistically significant effect on the adoption of sustainable, climate-resilient agroecology-based food production practices. These variables include the age, gender, and marital status of the household head; household size; farm size; access to information or training on climate-resilient agroecological practices; and receipt of financial support or incentives. Specifically, the age of the household head positively influenced the adoption of both permaculture and polyculture, suggesting that older farmers may be more receptive or experienced in implementing these practices. The gender of the household head also had a positive and significant effect on the adoption of polyculture, indicating potential gendered dimensions in agroecological decision-making. Marital status showed a similar positive effect on polyculture adoption, possibly reflecting the role of household stability or shared labor in sustaining such practices. Larger household sizes were significantly associated with increased adoption of polyculture, likely due to greater labor availability. Farm size was positively linked to the adoption of agroforestry and climate-smart agriculture, underscoring how land availability can facilitate more diversified or resource-intensive practices. Access to training and information emerged as a key driver of adoption for mixed farming and polyculture, highlighting the importance of knowledge dissemination. Lastly, households that received financial support or incentives were significantly more likely to adopt organic farming and polyculture, reinforcing the value of targeted support mechanisms in accelerating agroecological transitions.

3.7.4 Predicted probability

Results presented in Table 41 assessed the chance of households adopting these sustainable climate resilient agroecology-based food production practices. The likelihood of implementing permaculture, agroforestry, agroecology, climate smart, organic farming, mixed farming, and polyculture are 36.3%, 45.0%, 32.4%, 26.2%, 60.5%, 72.7%, and 15.3% respectively, indicating the importance of all these practices.

Table 41 Predicted probabilities

Variable	Predicted probability
Permaculture	0.363
Agroforestry	0.450
Agroecology	0.324
Climate smart	0.262
Organic Farming	0.605
Mixed farming	0.727
Polyculture	0.153

Note

Likelihood Ratio Test ($\chi^2 = 126.14$, $p < 0.000$)

The Likelihood Ratio Test (LRT) checks whether the model with independent variables explains the data significantly better than a model without independent variables (i.e., a null model with no predictors). Since the chi-square value is large (126.14) and p-value is below 0.000, this means that at least one of the independent variables significantly improves the model. This means that the predictors, when taken together, have a statistically significant impact on explaining adoption of agroecology-based food production practices.

Wald Chi-square Test ($\chi^2 = 121.31, p < 0.0001$)

The Wald test evaluates whether all independent variables collectively have a significant impact on the dependent variable. Since the p-value is extremely low (<0.0001), this confirms that the independent variables as a group significantly influence adoption of agroecology-based food production practices. The variables included in the model are not random and contribute meaningfully to explaining adoption.

The **log-likelihood value** measures how well the model fits the data. A higher (less negative) log-likelihood value suggests a better model fit. While the value **(-714.32)** alone does not indicate whether the model is good or bad, the statistically significant chi-square tests confirm that the model is useful. The model is a good fit for the data, meaning it provides valuable insights into what drives adoption.

Test of Hypothesis

Null and Alternative Hypotheses

- **Null Hypothesis (H_0)**: The independent variables **do not** significantly influence the adoption of agroecology-based food production practices. (i.e., the model **does not** provide a better fit than a model without predictors).
- **Alternative Hypothesis (H_1)**: At least one of the independent variables **significantly** influences the adoption of agroecology-based food production practices. (i.e., the model **performs better** than a

model with no predictors).

Hypothesis Testing Using the Likelihood Ratio Test

- **Test Statistic:** Chi-square (χ^2) = **126.14**
- **p-value: < 0.000**

Result: Since **p < 0.000**, we reject the null hypothesis and conclude that the model significantly explains adoption.

Hypothesis Testing Using the Wald Chi-Square Test

- **Test Statistic:** Wald χ^2 = **121.31**
- **p-value: < 0.0001**

Since $p < 0.0001$, we reject the null hypothesis, confirming that the independent variables jointly influence adoption.

SECTION 4: DISCUSSION

Socio-Demographic Characteristics

The assessment revealed that most farmers in Turkana West are women over the age of 40, a reflection of the region's pastoralist culture where men often engage in market activities or migrate with livestock in search of pasture. Most households are polygamous with 5–10 members sharing meals. The primary livelihoods include small-scale farming, charcoal/firewood selling, and petty trade. While most land is communally owned, individuals typically cultivate 1–3 acres each. Education levels are low, with a significant proportion of respondents having no formal schooling, consistent with Turkana's nationally high illiteracy rates.

Crops and Farming Practices

Farmers primarily grow vegetables such as kale, spinach, okra, watermelon, cowpeas, amaranth (dodo), maize, and sorghum, mainly for the market. Despite high water demands, these crops are preferred due to their marketability, especially in Kakuma. Sorghum was noted as a traditional crop with multipurpose uses including food and local brewing. Traditionally, farming was not widely practiced among the Turkana, except by a few women who traded surplus with others.

Tree Growing

Tree species grown include lemon, moringa, papaya, and neem, while *Prosopis juliflora* (Mathenge), though invasive, plays a significant role in environmental greening and water catchment. Efforts to manage its spread include government-supported charcoal producer groups and biochar projects.

However, tree survival rates are low—about 30% within institutional settings and even less on communal lands due to lack of caretaking.

Livestock Keeping

Goats are the most reared animals, followed by poultry, sheep, and cattle. Historically, the Turkana kept large herds of cattle and camels, but the 1980–82 drought, cattle rustling, and disease outbreaks significantly reduced livestock populations. The rise in diseases like PPR and trypanosomiasis is linked to reduced forest quarantine practices and insecurity that prevents herders from isolating sick animals.

Key Stakeholders and Program Gaps

Respondents identified over 100 active organizations in Turkana West, offering services such as relief food, seeds, training, borehole drilling, cash transfers, kitchen gardens, and poultry support. However, many stakeholders operate in silos with little coordination, resulting in duplication and missed opportunities for synergy. Communities expressed dissatisfaction with top-down approaches, noting that their voices are often not included in project design. With sparse populations and logistical challenges, NGOs tend to focus on refugee camps, leaving surrounding communities underserved. Participants emphasized the need for long-term, integrated interventions rather than fragmented, short-term relief.

Current Agroecological Practices

Current practices include mixed farming, organic farming with manure use, agroforestry, permaculture, flood irrigation, rain-fed cultivation, and limited use of conventional techniques. Mixed farming was the most preferred approach, as it integrates crops, livestock, and trees, offering diversification and resilience.

Predictive analysis showed a 72.7% likelihood of adoption for mixed farming, followed by organic practices.

Barriers and Risks to Agroecological Transition

Major challenges include extreme weather events, water scarcity, pest and disease outbreaks, high poverty levels, and lack of agroecological knowledge. Refugees face unique constraints such as limited farming space and high poultry mortality due to heat stress. Social tensions between host and refugee communities were reported, largely driven by perceptions of unequal aid distribution and resource conflicts—particularly related to livestock damage of refugee crops. Additional concerns include limited access to tools and inputs, distance to farms, and lack of youth involvement in project design.

Market Dynamics

A rapid market assessment in Kakuma revealed a high demand for fresh produce, but local supply is limited. Most products are sourced from distant towns such as Kitale and Eldoret, driving up prices. Host farmers face marketing challenges due to poor mobility, unfair competition with better-equipped refugee sellers, and low awareness of external markets. Traditional barter systems are still prevalent, and knowledge gaps in pricing, marketing, and post-harvest handling persist.

Proposed Solutions and Pathways to Transition

To de-risk the transition to agroecology, the assessment recommends a phased approach combining short- and mid-term interventions. Short-term actions include the establishment of kitchen gardens, poultry support, composting, and food assistance during transition periods. Medium-term measures involve tree planting, skills training, group formation for financial access, youth engagement, improved access to drought-tolerant crops, and livestock integration. Strengthening social cohesion, fostering co-creation, and ensuring inclusive planning, particularly for refugees and youth are critical.

Financial support remains a key enabler, particularly through cash-for-work schemes and microloans. Market access should be strengthened through training, improved mobility, and aggregation centers. Water access must be prioritized through borehole development and water-efficient farming methods such as mulching, agroforestry, and swales. Respondents cited water availability (78.2%), income (70.5%), and soil quality (50.8%) as the top determinants of adoption.

Benefits of Embracing Agroecology

Participants strongly believed that agroecology could improve food and nutrition security, reduce dependency on aid, restore degraded ecosystems, and build community resilience to climate change. Improved livelihoods, empowered farmers, enriched soils, and social harmony were among the cited benefits. Refugees particularly emphasized the dignity that comes with self-reliance, stating, *"Agroecology will bring us a decent livelihood."* Many highlighted that with the right environment and support, agroecology could transform Turkana from a food-insecure region into a model of sustainable dryland agriculture.

SECTION 5: BEST MODEL RECOMMENDATION

Based on the findings derived from descriptive statistics and multivariate probit model analysis, several factors were identified as critical to the adoption of sustainable, climate-resilient, agroecology-based food production systems. The following recommendations are proposed for consideration in developing the most suitable and context-responsive agroecology model:

1. Socioeconomic Factors

Key household characteristics significantly influence the adoption of agroecological practices. Variables such as the age, gender, and marital status of the household head; family size; farm size; access to training or information; and receipt of financial support were all found to positively impact adoption. An effective model must therefore integrate these socioeconomic dimensions to ensure sustainability and scalability.

2. Integrated Farming Systems

Both household-level probability models and qualitative inputs from FGDs and KIIs highlight a preference for integrated or mixed farming systems. Households favored models that combine crop cultivation, livestock keeping, and agroforestry, recognizing the synergistic benefits. The proposed model should include holistic livestock management within a diversified system.

3. Financial Support Mechanisms

To facilitate the transition to agroecological practices, short-term financial support such as cash-for-work should be embedded in the model. This will offer households a cushion until farms become productive and self reliant, providing income and other livelihood sources.

4. Co-Creation with Communities

Sustainable models must be co-designed with the target communities from inception. Engaging beneficiaries ensures the interventions are aligned with community priorities and increases ownership and long-term viability.

5. Training of Trainers (ToTs) Approach

To address logistical challenges and foster local ownership, the model should train local champions as Trainers of Trainers. This not only enhances continuity but also reduces implementation costs and improves community-level knowledge transfer.

6. Long-Term and Flexible Funding

Agroecological transitions require time due to the gradual nature of system changes and the need for behavior shifts. A successful model must be supported by long-term, flexible funding that accommodates feedback loops and iterative adaptations.

7. Demonstration and Scaling Strategy

Demonstration plots are essential for initial uptake. The model should begin on a small scale, utilizing pilot sites to showcase success. Peer learning through exposure visits and exchange programs should be integral, reinforcing the principle that "seeing is believing."

8. Integration of Indigenous Knowledge

Agroecology harmonizes traditional wisdom with scientific innovation. The model must incorporate local indigenous knowledge—especially coping strategies historically used in Turkana—while enhancing them through modern research and technologies.

9. Water Resource Management

Given the scarcity of water in the region, water access must be a cornerstone of the model. This includes promoting drought-tolerant species, water-saving techniques (e.g., mulching, zai pits, storey gardens), and sustainable irrigation. Working with nature and enhancing water use efficiency is crucial.

10. Context-Specific Adaptability

High variability across farms and wards indicates differing levels of readiness and resource access. The model must be context-sensitive, allowing for flexible design tailored to specific environmental, economic, and social conditions.

11. Inclusive Stakeholder Engagement

A multi-stakeholder approach is essential. The model should engage all relevant actors—community members, NGOs, county departments, research institutions, and private sector players—from the beginning, with clearly defined roles to ensure coordination and synergies.

12. Selection of Suitable Tree Species

Agroforestry is a recommended component. Tree species to be included may comprise fruit trees and indigenous varieties such as *papaya, citrus, guava, Melia volkensii, Terminalia brownii, Senna siamea,* *Jerusalem thorn, Acacia tortilis, Acacia senegal, Vangueria madagascariensis, Leucaena leucocephala, Croton megalocarpus,* and *Thespesia garckeana*, among others.

13. Soil and Water Conservation

With most farms situated along rivers, riparian protection is vital. The model should integrate soil and water conservation techniques, including the planting of Napier grass, bamboo, and trees along riverbanks to reduce erosion and improve land health.

14. Technology Integration

The modern agroecology model must leverage digital tools and platforms. Technologies such as plant identification apps (e.g., PlantNet), digital farm design, precision agriculture tools, and social media for marketing should be employed. Artistic tools like agroecology-themed music and storytelling can also enhance outreach and advocacy.

15. Alignment with County and National Policies

With the launch of Kenya's National Agroecology Strategy (2024–2037), it is imperative that county-level policies align with national frameworks. Findings from this study can inform the development of localized strategies to support implementation and policy coherence.

16. Gender and Youth Inclusion

Women are central to agroecological systems, contributing significantly across the food production chain and holding valuable indigenous knowledge. The model must actively support women's participation and leadership. Simultaneously, youth engagement is critical, given their potential to sustain and innovate agroecological practices for future generations.

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APPENDICES

Appendix I: Data Collection Tools

HOUSEHOLD SURVEY QUESTIONNAIRE

COVER LETTER

Hello, my name is Nicholas M. Syano from Drylands Natural Resource Centre (DNRC). I am conducting a research study on the assessment and agroecology model development in Turkana County, specifically in Kakuma. This is part of a consultancy for Dan Church Aid (DCA).Before we begin, I want to assure you that your participation is voluntary, and all the information you provide will be kept strictly confidential. The data you share will not be shown to or discussed with any other individuals or organizations. The information collected will only be used for this research and will help inform DCA's efforts to implement better agroecology projects in your community, ultimately benefiting the residents of Turkana.Additionally, please note that participation in this survey is not compensated, and you will not be penalized in any way if you choose not to participate or decide to withdraw at any time. We take your privacy seriously. All personal data collected during this survey will be processed in compliance with the General Data Protection Regulation (GDPR). Only the necessary data will be collected and securely stored, with measures in place to prevent unauthorized access. You have the right to access your data at any time, request its deletion unless required by law to retain it, and your data will be kept only as long as needed for the research, after which it will be securely deleted. Danish Church Aid (DCA) adheres to strict data privacy policies to protect your personal information. If you have any concerns about how your data will be used, please contact Geoffrey from DCA at 070609252 for more details. At this time, would you like to ask any questions about the study? May I proceed with the interview now?

PART 1: GENERAL INFORMATION

1. Name of Interviewer……………………………………Date…………………………….
2. Sub-County…..........Ward……………………Village….........
3. Name of respondent……………………………..Phone number…………………………
4. Gender of Respondent Male [ ] Female [ ]
5. Do you have any form of disability? Yes[ ] No [ ]
6. Age of Respondent (tick) < 20 [ ] 20-30 [ ] 30-40 [ ] 40-50 [ ] above 50 [ ]
7. Relation of respondent to the household head man [ ] wife [ ] other [ ]

If the household head is the respondent, skip to number 12

8. Name of Household head ……………………………………………………………
9. Age of Household head (tick) < 20 [ ] 20-30 [ ] 30-40 [ ] 40-50 [ ] above 50 [ ]
10. Gender of Household head Male [ ] Female [ ]
11. Disability [Yes] [No]
12. Marital status of Household head: Single [ ] married [ ] Widowed [ ] divorced [ ] polygamous [ ]
13. If polygamous, how many wives………………………………………………………
14. Total number of persons in the household (family size)……………………………….
15. Level of Education of Household head:

Non-formal [ ] Primary [ ] Primary dropout [ ] Secondary [ ] Secondary dropout [ ]

Tertiary [ ] Adult Education [ ]

University [ ]

16. Occupation: tick where appropriate casual worker [ ]

Farmer [ ]

Firewood seller [ ] Charcoal Seller [ ] formal employment [ ] Businessperson [ ]

Other [ ] (specify)……………………………………………………

17. What is the size of your farm (in acres)? ………………………………………………

18. Ownership of the land ………………………………………………………………….

Individual Owner [ ] Communal Land [ ] Leased [ ]

Other [ ] (specify)………………………………………………..

19. What types of crops do you primarily manage?

Watermelon [ ] Beans [ ] Maize [ ] Dodo [] Okra [ ]

Spinach [ ] Kales [ ] others [ ] specify……………………

20. What types of livestock do you primarily manage?

………………………………………………………………………………..

21. How much income did you earn from the sales of agricultural produce in the past year?

- less than Kshs 50,000 [ ]
- Kshs 51,000 –Ksh100,000 [ ]
- Ksh 101,000 – Ksh150,000 [ ]

- Ksh 151,000 – Ksh200,000 [ ]
- Above Ksh 200,000 a year [ ]

PART-TWO: EVIDENCE, GOOD PRACTICES, LEARNT LESSONS

22. Are there key stakeholders you know who are promoting sustainable, climate resilient agroecology- based food production in the project site? Yes [ ] No [ ]
23. If yes, please fill the table below providing the stakeholder's name and their specific roles

Stakeholder's name	**Role in** promoting sustainable, climate resilient agroecology- based food production

24. How do the organizations working in Turkana Country Address challenges and constraints they face during the implementation of Agroecology- based food production systems.

Challenge/constraint faced	**How addressed**

25. Do you feel that adopting climate resilient agroecology- based food production practices poses any financial risk to your farm? Yes [ ] No [ ]

26. If yes, what type of financial risks concern you the most? (e.g., cost of inputs, potential crop failure, unpredictable market prices)

…………………………………………………………………………………………………..

…………………………………………………………………………………………………

27. What non-financial risks do you associate with adopting climate resilient agroecology- based food production practices? (e.g., labor demands, need for new skills, changes in yield)

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

28. Which farming practices/technologies do you currently use?

Conventional practices (local and traditional	**stainable Climate resilient agroecology- based food production practices**

food production practices)	
Fertilizer application [ ]	Permaculture [ ]
Broadcasting during planting [ ]	Agroforestry [ ]
Use of Farm yard Manure [ ]	Agroecology [ ]
Drying food for preservation [ ]	Climate smart [ ]
Flooding Irrigation [ ]	Organic Farming [ ]
Mechanization [ ]	Mixed farming [ ]
Mono cropping [ ]	Polyculture [ ]
Other [ ] (specify……………………..	Others [ ] (specify …………….

29. Which of the listed local and traditional food production practices in Q29 above enabled Turkana people to cope with climate change impacts over time?

Fertilizer application [ ]	Permaculture [ ]
Broadcasting during planting [ ]	Agroforestry [ ]
Use of Farm yard Manure [ ]	Agroecology [ ]
Drying food for preservation [ ]	Climate smart [ ]

Flooding Irrigation [ ]	Organic Farming [ ]
Other [ ] (specify……………………..	Others [ ] (specify ………………..

30. How can the practices selected in -Q29 above be incorporated to modern agro-ecological approaches for synergy?

………………………………………………...……….

....……

………………………………………………...

31. What motivated you to adopt the Climate resilient agroecology-based food production practices?

Increasing Productivity [ ] Adapting to Climate Change [ ]

Reducing dependency on chemical inputs [ ] Access to training and support [ ]

Other [ ] Specify ……. …………………………………….

32. What environmental factors support successful implementation of sustainable, climate resilient agroecology-based food production?

Favorable climate [ ] Soil Health [ ] Water Availability [ ]

Moderate pest and diseases pressure [ ]

Other [ ] Specify………………………………..

33. How can these factors be enhanced?

………………………………………………...

....

………………………………………………...

34. What challenges/constraints affect the adoption of sustainable, climate resilient Agroecology-

based food production practices in Turkana County

Water constraints [ ]

Pest and disease constraints [ ]

Soil erosion [ ]

Conflict [ ]

Market access [ ]

Other [ ]

(specify)……………………………………………………………………………

35. How can these challenges/constraints be mitigated?

…………………………………………………………..

....

…………………………………………………………..

36. What are the envisioned short-term, mid-term and long term impacts (social, economic and environmental) of sustainable climate resilient, agroecology-based food production interventions in Turkana County

----

37. According to your own views/experiences which practices do you think are the best agroecology-based food production interventions.

Agroforestry Systems [ ]

Crop Rotation and Polyculture [ ] Integrated Pest Management (IPM) [ ] Drip Irrigation and Water Harvesting [ ] No-Till or Reduced-Till Farming [ ] Cover Cropping and Green Manures [ ] Composting and Organic Fertilizers [ ] Permaculture [ ]

Soil and Water Conservation Techniques (e.g., contour plowing, terracing) [ ] Kitchen Gardens [ ]

Other [ ] explain…………………………………………..

38. State best way to replicate these best practices

----

39. What do you think are the main factors affecting the adoption and successful implementation of agroecology-based food production technologies practices in Turkana

Water [ ]

Soil [ ] Culture [ ] Income [ ]

Education Level [ ] Family size [ ] Land size [ ]

Age [ ]

Marital Status [ ]

Other [ ] Specify…………………………………………………………..

40. How do agroecology-based food production methods enhance food security and self-reliance by individual farmer and the communities in the project site

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----

41. What are the socio-economic, cultural, environmental and institutional factors that enhance/support agroecology-based models and how can they be harnessed for successful and out scaling of the same (agroecology-based food production)

----

42. At the market point, what level of interest is there for agroecologically produced produce

43. What are the main constraints (problems) you experience in your farm

44. According to your opinion, which of the following agroecology approaches is currently working well in Turkana County?

Agroforestry [ ] Organic farming [ ] Regenerative agriculture [ ] Permaculture [ ]

Other [ ] …………………………………………..

45. What are the environmental factors support successful implementation of sustainable, climate resilient agroecology-based food production

Soil Fertility and Health [ ] Water Availability and Quality [ ]

Biodiversity and Ecosystem Balance [ ] Moderate Climate and Weather Patterns [ ]

Other [ ] specify ……………………………………………….

46. What are the environmental factors that hinder successful implementation of sustainable, climate resilient agroecology-based food production

Soil Erosion and Degradation [ ]

Water Scarcity and Inefficient Distribution [ ] Extreme Weather Events (e.g., droughts, floods) [ ] Limited Biodiversity and Pest Pressure [ ]

Other [ ] ……………………………………………

47. How can the factors in (Q49) above mitigated

----

48. On a scale of 1 – 5, to what extent do you feel that climate change is affecting your farm operations?

1 – No extent [ ] 2 – Little extent [ ] 3 – Some extent [ ]

4 – Large extent [ ] 5 – Very large extent [ ]

49. Have you experienced any climate-related events in the past five years? (e.g., drought, floods, temperature extremes) Yes [ ] No [ ]

50. If yes, what-climate related events did you experience?

……………………………………………………..

....

51. Do you believe climate resilient agroecology- based food production practices can help mitigate climate-related risks on your farm? Yes [ ] No [ ] Maybe [ ]

52. Do you have access to climate resilient agroecology- based food production practices information or training? Yes [ ] No [ ]

53. What sources of information do you rely on for climate resilient agroecology- based food production practices? (e.g., extension services, online resources, peer farmers, NGOs)

……………………………………………………..

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……………………………………………………..

54. Have you received any financial support or incentives for climate resilient agroecology- based food production practices? Yes [ ] No [ ]

55. What types of additional support would help you transition to Agroecology? (e.g., financial aid, training, improved access to markets)

……………………………………………………..

....

……………………………………………………..

56. How would you describe the current state of food security in this community? 1 - Very insecure [ ]

2- Insecure [ ] 3 – Secure [ ] 4 – Very secure [ ]

57. How satisfied are you with the impact of climate resilient agroecology- based food production practices on your farm? (Scale: 1–3)

1 – Not Satisfied [ ] 2 – Neutral [ ] 3 – Satisfied [ ]

58. Do you plan to continue or expand climate resilient agroecology- based food production practices on your farm? Yes [ ] No [ ]

59. What climate resilient agroecology- based food production practices have worked best for you?

Agroforestry Systems [ ] Rainwater Harvesting [ ] Permaculture [ ]

Drought-Tolerant Crop Varieties [ ] Cover Cropping and Soil Mulching [ ] Integrated Pest Management (IPM) [ ] Zero or Reduced Tillage [ ]

Other [ ] explain……………………………………

60. Give reasons for your answer above

……………………………………………………………...

....

………………………………………………………..

61. What practices did not meet your expectations?

………………………………………………………..

....

………………………………………………………..

62. Why do you think they did not work as anticipated?

………………………………………………………..

....

………………………………………………………..

63. Are there specific adjustments you made to suit your local conditions? (e.g., modifications in crop variety, timing, irrigation methods) Yes [ ] No [ ]

64. If yes, please list them

………………………………………………………..

....

………………………………………………………..

65. What lessons have you learned that might benefit other communities transitioning to climate resilient agroecology- based food production practices?

………………………………………………………..

....

………………………………………………………..

66. Do you have specific examples of successful practices that could be scaled or replicated in similar

settings? Yes [ ] No [ ]

67. If yes, please list them

……………………………………………………...

....

……………………………………………………...

68. What benefits of climate resilient agroecology- based food production practices have you observed on the surrounding community (e.g., increased water availability, reduced erosion)?

……………………………………………………...

....

69. What is the community's long-term vision for sustainable food production and climate resilience?

……………………………………………………...

....

70. Do you believe the current climate resilient agroecology- based food production practices are sustainable and viable in the long term? Yes [ ] No [ ] Not Sure [ ]

Thank you for your time

APPENDIX II: INTERVIEW SCHEDULE

Hello, my name is Nicholas M. Syano from Drylands Natural Resource Centre (DNRC). I am conducting a research study on the assessment and agroecology model development in Turkana County, specifically in Kakuma. This is part of a consultancy for Dan Church Aid (DCA).Before we begin, I want to assure you that your participation is voluntary, and all the information you provide will be kept strictly confidential. The data you share will not be shown to or discussed with any other individuals or organizations. The information collected will only be used for this research and will help inform DCA's efforts to implement better agroecology projects in your community, ultimately benefiting the residents of Turkana. Additionally, please note that participation in this survey is not compensated, and you will not be penalized in any way if you choose not to participate or decide to withdraw at any time. We take your privacy seriously. All personal data collected during this survey will be processed in compliance with the General Data Protection Regulation (GDPR). Only the necessary data will be collected and securely stored, with measures in place to prevent unauthorized access. You have the right to access your data at any time, request its deletion unless required by law to retain it, and your data will be kept only as long as needed for the research, after which it will be securely deleted. Danish Church Aid (DCA) adheres to strict data privacy policies to protect your personal information. If you have any concerns about how your data will be used, please contact Geoffrey from DCA at 070609252 for more details. At this time, would you like to ask any questions about the study? May I proceed with the interview now?

- Who are the relevant stakeholders promoting sustainable, climate resilient agroecology- based food production in the project site and their specific roles on the same
- What are the main challenges and constraints that affect the adoption of sustainable, climate resilient Agroecology-based food production practices in Turkana County
- How do local communities and organizations working in Turkana Country Address challenges and

constraints they face during the implementation of Agroecology- based food production systems.

- What are the short-term, mid-term and long term impacts (social, economic and environmental) of sustainable climate resilient, agroecology-based food production interventions in Turkana County
- Which and how the is the best agroecology-based food production interventions would be replicated to similar areas
- What are the main factors affecting the adoption and successful implementation of agroecology-based food production technologies practices in Turkana
- How do agroecology-based food production methods enhance food security and self-reliance by individual farmer and the communities in the project site
- What are the socio-economic, cultural, environmental and institutional factors that enhance/support

Agroecology-based models and how can they be harnessed for successful and out scaling of the same (agroecology-based food production)

- What are some of the local and traditional food production practices that have enables Turkana pastoralists to cope with climate change hazards over time and how can they be incorporated to modern agroecological approaches for synergy
- At the market point, what level of interest is there for agroecologically produced produce
- What are climate change related challenges for marketing local foods and how best to address them
- What risks are there in transitioning from conventional food production to sustainable, climate resilient agroecology-based food production
- What is the best bet Agroecology-based food production models/approaches for the farming communities in Turkana County
- What are some of the envisioned social, economic, and environmental outcomes if we best agroecology is implemented
- -What are the environmental factors that hinder successful implementation of sustainable, climate resilient agroecology-based food production and how can they be enhanced and or mitigated
- What is the best combination of agroecological approaches and practices that can generate better results in Turkana County?
- What are the synergies and tradeoffs between agroecology-based food production and other humanitarian interventions, such as Cash transfers, food aid distribution and livelihood support programs among others
- How can these interventions be integrated to maximize benefits and minimize unintended consequences in Turkana County?
- What is the best combination of agroecological approaches and practices that can generate better

results in Turkana County?

- What are the key environmental factors influencing the adoption of agroecology-based food production in Turkana County

Some probing questions: how is that, anything else, can you elaborate more how did this happen among others

By Nicholas

ANNEX

focus group discussion

Communal farm

Communal land newly planted with sorghum

Okra growing in communal farm

Zai pits

Different vegetables at Kakuma market

Focus group discussion

Focus group discussions

Surveys

Conducting KII interview