Sustainable Landscape and Livelihoods Programme, Mount Kenya

Situation Analysis and baseline of the Impact Evaluation

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To support the implementation of the Mount Kenya Sustainable Landscape and Livelihoods Programme, Wageningen University & Research and ETC Consultants conducted a Situation Analysis (SA) and set the baseline for an Impact Evaluation (IE). The SA is based on detailed literature review, focus group discussions and key informant interviews in three counties in the Mt. Kenya Region (Embu, Kirinyaga and Nyeri). The IE is based on quantitative surveys amongst 977 coffee and tea farmers in Kirinyaga county. With a focus on improving the programme effectiveness, and possibly adapting the current proposed Theory of Change, three key recommendations emerge from both these studies: the need to more clearly define the scope of the intervention; strategies to ensure its effective management; and the need to design additional metrics to capture the full impact of the programme.

Key words: Impact evaluation, Situation analysis, Kenya, tea, coffee, small-scale farmers

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P.O. Box 29703, 2502 LS The Hague, The Netherlands, T +31 (0)70 335 83 30, E communications.ssg@wur.nl, http://www.wur.eu/economic-research. Wageningen Economic Research is part of Wageningen University & Research.

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Glossary

A2F	Access to Finance
ABSA	Kenyan Financial Institution
ADB	Agricultural Development Bank
AGRA	Alliance for the Green Revolution in Africa
ASALs	Arid and Semi Arid Lands
ASCA	Accumulating Savings and Credit Associations
ASK	Agricultural Society of Kenya
CBO	Community Based Organisation
CFA	Community Forest Users Associations
CFU	Continuous Fermenting Machine
Ci-Dev	Carbon Initiative for Development
CIDP	Community Integrated Development Program
CKDAP	Central Kenya Dry Area Smallholder and Community Services Development
CMS	Coffee Management Services
CSA	Climate smart agriculture
CSVC	Climate Smart Coffee and Cocoa Value Chain Project
CWES	Constituency Women Enterprise Scheme
EABL	East African Breweries Limited
EMCA	Environmental Management Coordination Act
ESG	Environmental and social governance
EU	European Union
EWS	Electronic green leaf Weighing Solutions
FCS	Farmer Cooperative Society
FGD	Focus Group Discussions
FMO	Dutch Development Bank
FSD	Financial Sector Deepening
GAPs	Good Agricultural Practices
GCF	Green Climate Fund
GFL	Greenland Fedha Limited (microfinance institution)
GIA	Green Innovation Awards
GIZ	German Society for International Development
GoK	Government of Kenya
HCVs	High Conservation Values
IE	Impact Evaluation
IF	Ikea Foundation
IFAD	International Fund for Agricultural Development
IPM	Integrated Pest Management
IWUAs	Irrigation Water Users Associations
KACCAL	Adaptation to climate change in Arid lands project
KALRO	Kenya Agricultural and Livestock Organisation
KBA	Kenya Bankers Association
KCB	Kenya Commercial Bank
KCSAP	Kenya Climate Smart Agriculture Project
KEFRI	Kenya Forestry Research Institute
KEPHIS	Kenya Plant Health Inspectorate Service
KES	Kenya Shilling
KFS	Kenya Forestry Service
KIDA	Kirinyaga Investment Development Authority
KII	Key Informant Interviews
KIRWASCO	Kirinyaga Water and Sanitation Company
KNBS	Kenya National Bureau of Statistics
KSS	Kenya Soil Survey
KTDA	Kenya Tea Development Agency
KWS	Kenya Wildlife Service
LDRI	Local Development Research Institute
LMB	Landscape Management Boards
MEKC	Mount Kenya Environmental Conservation project
NACOFA	National Alliance for Community Forest Association
NARIGP	National Agricultural and Rural Inclusive Growth Project
NEMA	National Environment Management Authority
NETFUND	National Environment Trust
NCPD	National Council For Population And Development
NGCC	National Geomatics Center of China

NGO	Non-Governmental Organisation
NSE	Nairobi Securities Exchange
NWS	National Wildlife Strategy
PES	Payment for Environmental Services
PEV	Post Election Violence
RA	Rainforest Alliance
ROSCAS	Rotating Credit and Savings Association
SA	Situation Analysis
SACCO	Savings and Credit Cooperative
SCMP	Sub-Catchment Management Plans
SLDMP	Sustainable Landscape Development and Management Plan
SME	Small and Medium Enterprises
TARDA	Tana and Athi River Development Authority
TIST	International Small Group & Tree Planting Programme
UKAM	Uk Aid Match
UNFCCC	United Nations Framework Convention on Climate Change
UTANRP	Upper Tana Natural Resource Management Project
WEF	Women Enterprise Fund
WRA	Water Resources Authority
WRUA	Water Resource User's Association
YEDF	Youth Development Fund

Executive summary

From research questions to implication for the different impact pathways.

- To support the implementation of the Mount Kenya Sustainable Landscape and Livelihoods Programme, Wageningen University & Research and ETC Consultants conducted a Situation Analysis (SA) and set the baseline for an Impact Evaluation (IE);
- The SA is based on detailed literature review, focus group discussions and key informant interviews in three counties in the Mt. Kenya Region (Embu, Kirinyaga and Nyeri). The IE is based on quantitative surveys amongst 977 coffee and tea farmers in Kirinyaga county.
- With a focus on improving the programme effectiveness, and possibly adapting the current proposed Theory of Change, three key recommendations emerge from both these studies: the need to more clearly define the scope of the intervention; strategies to ensure its effective management; and the need to design additional metrics to capture the full impact of the programme.

E.1 Defining the scope of the landscape approach

Boundaries of the landscape approach and planned intervention need to be more clearly defined, to determine where a landscape approach has added value over alternatives.

- It is essential that the precise scope of the landscape approach and associated interventions are set, not only in geographical terms, but also with respect to the actors or actor groups targeted. This requires a clearer specification of:
  - Key environmental pressures that the programme envisages to target;
  - Mapping the specific geographical regions and ecosystems (e.g. water catchments, farm lands, forested areas etc) in which the programme intends to address these pressures;
  - All actors that are impacted by, or influencing, changes in these pressures;
  - Key institutional or policy limitations that hinder addressing these pressures;
- Setting boundaries serves to identify where a landscape approach has added value over other interventions in the farming communities; Generally speaking, landscape approaches add most value for the supply of public environmental goods, like water or soil resources, where the incentives of individual actors do not lead to optimal social and environmental outcomes.
- Clarifying the added value of the landscape approach serves the development or alignment of joint activities, generates engagement and motivation for a long-term sustainable strategy.

For the scope of the programme to be effective, it is important to:

- Prioritise strategies with a large potential to raise farmer incomes and reduce poverty in order to raise incentives for participation;
- Target clean and stable water supply, in particular water pollution due to increased pesticide application and negative impact of climate change on water supply;
- Target soil and forest conservation, considering land use, soil nutrients and biodiversity conservation as well as the agricultural production potentially affected by climate change;
- Develop financial models that reward farmers and other land users for environmental conservation. Currently, financial rewards are limited and often only received as in-kind support;
- Develop financial models that incentivise stakeholders, either international buyers of agricultural commodities or downstream farmers, to fund water conservation practices by farmers upstream;
- Address the fragmented and sometimes ineffective land use policy environment.

A collective problem statement on current and future landscape use is needed for cost-effective programme implementation.

- It is essential that a considerable group of actors share the view that the programme activities have the potential to improve economic conditions at targeted households, without negatively impacting others;
- A shared problem statement is a prerequisite for a successful design of the programme in terms of scope but has not (yet) become apparent. Most of the conservation activities are being driven by large, donor funded, top-down projects;
- The programme effectiveness may be jeopardised when proposed activities are not viewed as enhancing (short term) economic benefits, but rather incurring short term costs, reflecting potential trade-offs between conservation and livelihood indicators.

E.2 Managing the landscape approach effectively

Identify the role of RA in the landscape approach more clearly.

- A review of landscape approaches reveals key prerequisites for effective management of landscape approaches, including the need to understand the incentives of all stakeholders and management of expectations;
- Defining the scope and boundaries of the landscape approach sheds light on the relevant actors to engage with for setting up the Landscape Management Boards (LMBs);
- A successful approach recognises and incorporates the challenges faced by specific groups of actors, including youth and women farmers, vulnerable and asset poor producers;
- Managing an LMB is a delicate task. It requires strong diplomatic skills in balancing the interests of various actors, including less powerful voices, with differing objectives;
- The role of RA (or another actor with a mediating and facilitating role) should be clarified, as well as mechanisms to identify and resolve conflicts and grievances, and balance trade-offs and conflicts of interest.

Manage expectations, ensure appropriate Landscape Management Board representation and organise the process across counties.

- Managing expectations about the realistic outcomes of a landscape approach is vital, especially when funding is constrained;
- Incentivise and motivate the LMB members to participate and be (truly) representative, based on LMB members' own ideas about doing so;
- Organise the landscape governance/management process such that it cuts across different counties, taking account of different ecosystems and commodities, while acknowledging and managing possible, and probable, conflicts and trade-offs.

E.2.1 Guiding a diverse set of actors with specific interests and incentives

The programme should offer real incentives for people in the short term to change their activities.

- Financial incentives, such as commodity price premiums or transfers by down-stream beneficiaries, are most effective to stimulate investments in more sustainable cropping practices;
- Reshaping current incentives requires a tailor-made approach accounting for personal and contextual factors, such as farm size, particularly so for the most vulnerable groups. For the latter, who need support the most, the incentives to invest in new coffee and tea practices or diversification are often considerably lower.

Persistent challenges in coffee and tea value chains limit a potential for major income gains from these crops.

- Low farm-gate prices, small farm sizes, high seasonality of labour demand and (resulting) youth migration to urban areas limit options for raising coffee and tea production and productivity;
- Selected opportunities for coffee and tea diversification into high-end markets, with associated income increases, may exist but require the creation of new market/supply chain linkages;
- Whether or not programme-induced coffee and tea productivity enhancements are sufficient for raising incomes and resilience for a considerable part of the farmer community remains to be determined;
- Small farm sizes imply that developing non-farm and off-farm employment offers the most promising option for raising incomes;
- The programme should explore options to create off-farm and non-farm employment opportunities around specific enterprises, facilitating linkages with financial institutions and, for instance, business development services.

- Options exist to profitably expand agricultural production into several alternative products, including avocado, macadamia, dairy and horticulture, on the premise that the associated cropping calendars does not conflict with tea and coffee production.

Proposed programme activities should assess the potential impact on labour allocation and productivity.

- Programme effectiveness requires a better understanding of how proposed activities impact household labour allocation, the time spent on different activities, and income for different household members;
- It needs to be assessed if proposed activities unequivocally raise labour productivity and, if not, whether gains in environmental benefits accruing to the household outweigh reduced labour productivity or whether financial incentives (price premiums) can be used to compensate.

Consider the needs of the young, including their preference for non-farm employment with greater returns.

- Many young people do not own land, or only small inherited farms, and lack collateral for loans. Opportunities for young farmers to engage in agriculture are limited;
- Those few young farmers often engage in high value horticultural value chains, or activities that require little land, such as livestock farming;
- Most young people prefer jobs where returns are greater than in agriculture, including sometimes more lucrative opportunities in agricultural processing and value chains.

Explore employment creation opportunities for women that support their differing roles and safety.

- Many female farmers have limited access to land resources and lack collateral for loans;
- Women lack time to spend on agricultural practices because of responsibility for domestic chores and often have limited financial autonomy;
- Programme activities should prevent a further imbalance of the gender situation and explore options for local employment creation, mitigating adverse effects on their current task and roles and their safety (e.g. when they have to travel).

Capitalise on the positive attitude towards green financing by linking financial products to sustainability management or conservation activities.

- The banks operating in the region commonly provide loans for raising production of key commodities, including coffee, tea, dairy, rice and horticulture;
- Farmers and financial institutions have identified several promising conservation activities, like rehabilitation of riparian areas, tree nurseries and tree planting, yet no financial products currently exist to invest in such activities;
- Some forms of green financing exist, at some financial institutions more so than others, including products targeting green energy or climate-smart agriculture;
- The programme should capitalise on the general positive attitude towards green financing.

E.2.2 Managing tensions and resolving trade-offs

Address and mitigate trade-offs between actors, or conflicts of interest, to secure long-term success of the landscape approach.

- Only rarely will the incentives of all actors be aligned. Rather, trade-offs are the norm, for instance between chemical input use of actors upstream and pollution experienced by actors downstream;
- One example includes wet mills and tea factories, which may not favour a shift in priorities to activities other than coffee and tea;
- Navigating such trade-offs is a central feature of using a landscape approach and identifying these at an early stage is essential for guaranteeing programme success.

Link options for income improvement more clearly to benefits of improving landscape values.

- For a considerable part of the target population options to raise incomes rest with off-farm and non-farm activities as an alternative to primary coffee and tea production;
- A wide range of diversification strategies is currently practiced by the target population, which could inform programme activities. However, whether such

activities contribute to broader landscape goals formulated in the project needs to be established in greater detail.

Develop business models and financial products for landscape conservation and identify trade-offs with other goals.

- Despite a positive attitude towards green financing, mobilising financial actors for designing actual products to support programme activities remains challenging;
- Doing so requires a clearly defined business case linking conservation to an actual income stream, a full understanding of activities' long-term economic benefits, and to whom these accrue and where;
- Most financial products on offer aim to raise agricultural productivity, often through facilitating chemical input use, potentially at odds with enhancing landscape values. This imbalance could be addressed by offering farmers a price premium for coffee and tea produced in sustainably managed landscapes.
- Such insights inform the best institutional set-up (smallholder groups, or newly set-up enterprises) through which to channel such loans for landscape conservation.

Learn from, and connect to, other conservation projects in the region for the design of the landscape approach.

- Even though experiences with conducting landscape approaches in the region have been limited, scope exists to learn from other conservation projects that operate or operated in the region.
- The Mount Kenya project run by Nature Kenya includes a Payment for Ecosystem Services (PES) scheme as well as a link to the Nairobi Water Fund, a mechanism for financing land conservation upstream that has led to significant increase in downstream water supply.

E.3 Assessing the potential success of the landscape approach

The review of data underlying this report reveals the need to establish additional indicators on landscape governance to assess programme impact.

- Indicators and metrics are needed that measure progress with respect to landscape governance: understanding the effectiveness, legitimacy, authority, power and interaction with existing structures of the LMBs as (new) institutions and whether the programme is effective in delivering the overall goals;
- Possible metrics include the use and identification of conflicts of interest, setting up and use of conflict resolution and grievance mechanisms, and monitoring of agreements;
- Preferably these metrics are developed with stakeholders jointly, for example in the LMBs.

More refined impact indicators are required to capture changes in the finance impact pathway.

- The current impact indicator capturing the percentage of farmers receiving credit presents a too narrow evaluation of the finance impact pathway;
- Additional metrics should be included that assess creditworthiness, i.e. the share of farmers seeking credit but unable to obtain it, as well as indicators that more clearly reflect programme ambitions on mobilising finance for landscape and conservation purposes;
- More detailed information about the portfolios of financial institutions could reveal suitable partners in achieving the programs ambitions.

Targets need to be added to clarify the level of ambition of the programme activities.

- Various indicators presented in the Terms of Reference need to have targets specified;
- A clear quantification of the level of ambition for the different output, outcome and impact indicators (i.e. a targeted x% rise in resilience) is required to understand the impact achieved, also as a function of the number of resources spent in order to compare it with other types of interventions;
- An ex-post reference to this quantified level of ambition allows for better evaluation of why the intervention proved to fare better or worse than expected.


1

1 Introduction

1.1 Background of the programme

Rainforest Alliance (RA) has joined forces with the Ikea Foundation (IF) to implement a project aimed at empowering rural communities and households in Kenya called the *Sustainable Landscape and Livelihoods Programme*. With increased pressure on land and water resources aggravated by external shocks due to climate change, the objective of the programme is to contribute to improved land and water management. The project aims to do so by bringing together local stakeholders to develop a joint plan of action with a specific focus on smallholder farmers involved in tea and coffee production and forest-dependent communities. The project commenced in 2020 for a period of five years and is implemented in two out three potential counties in Mt. Kenya region using an integrated landscape management approach.

Wageningen University & Research (WUR) and ETC Consulting were contracted to evaluate the *Sustainable Landscape and Livelihoods Programme*, whereby the full evaluation project is divided into 3 phases:

- Phase 1 Situational Analysis (SA) and the baseline assessment of the Impact Evaluation (IE);
- Phase 2 Midline assessment of the IE;
- Phase 3 End line evaluation of the IE.

This report documents the research activities carried out in phase 1.

1.2 Theory of Change

The Theory of Change (ToC) as proposed in the programme is presented in Figure 1.1 and captures three interconnected pathways: 1) landscape management, 2) landscape finance and 3) resilience. The ToC assumes improved landscape values, reduced supply chain risks for stakeholders and improved rural household resilience as a function of proposed interventions. RA has identified five interventions in line with the ToC including 1) regenerative and climate-smart agriculture, 2) integrated landscape management, 3) private & public-sector engagement, 4) livelihoods diversification and 5) connecting landscape management and finance.

The analysis underlying and presented in this report serves as a means to validate the proposed impact pathways in this ToC. Key findings and recommendations in this report serve to inform a process to further update and refine this ToC.

1.3 Contents of this report

To support the implementation of the *Sustainable Landscape and Livelihoods Programme* WUR and ETC carried out two studies under Phase 1:

- The first study is the Situation Analysis (SA). The aim of this analysis is to identify main factors affecting landscape sustainability, including risks and opportunities to contribute to programme design and its activities.
- The second study is the Impact Evaluation (IE), in particular the collection of baseline data to allow for assessing programme impact amongst participating farmers during the mid- or endline evaluations.

Since there is considerable overlap and synergy in data collection between the IE and SA, this report contains results from both. It provides an overview of the main internal and external factors affecting landscape sustainability. The outcome of the analysis will help to define major bottlenecks, barriers/threats and opportunities, and identify the scope and strategies for programme design.

The chapters of this report describe the relevant data collected under the SA and IE, in direct connection to the impact pathways as defined in the ToC. An overview of the focii of the respective chapters is found in Table 1.1, also listing the indicator numbers, as per the pre-established list agreed with IF and RA. A full overview of all indicators collected can be found in Annex 1 – Section 8.

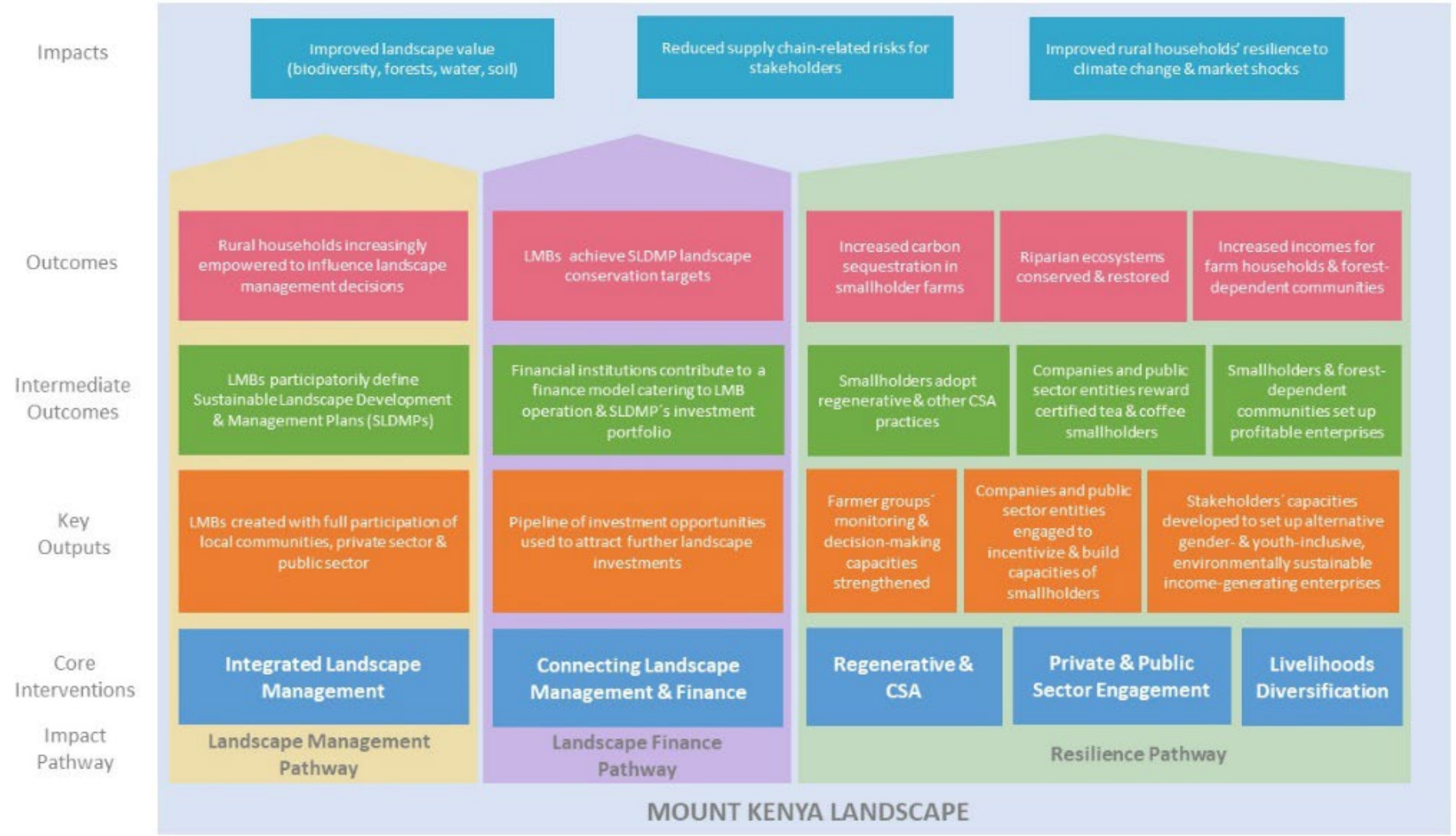

Figure 1.1 Project Theory of Change diagram

Source: landscape programme proposal. The numbers of the respective indicators relate to the list with indicators for the impact evaluation, see Annex 6.

Table 1.1 Chapter content and indicators presented

Chapter title	Indicator categories described
Chapter 3: General geographical information	Ecosystems (SA1-SA10; I.1.1-I.1.4; O.4.1); Climate Change (SA50- SA56)
Chapter 4: Stakeholder analysis and governance	Stakeholders (SA26-SA33); Governance (SA36-SA42)
Chapter 5: Impact pathway: landscape management	
Chapter 6: Impact pathway: landscape finance	Finance (I.2.2)
Chapter 7: Impact pathway: environmental and social resilience	Economy (SA11-SA13); Livelihoods (SA14-SA20; I.3.1; O.5.1; O.9.1; O.9.2); Human Rights (SA21-SA24); Sustainability issues and risks (SA25); Production (SA43-SA49); Ecosystems (O.3.1); Adoption (O.8.1; O.8.2;)
Chapter 8: Development context: knowledge capital	SA34-SA35

Chapters 3 describes the biophysical landscape in greater detail focusing on the characteristics of soils, land use, ecosystems and changes thereof, as well as major issues with respect to sustainability. Chapter 4 describes the landscape in terms of key stakeholders and existing governance arrangements, including insights on social inequality and conflict. The three chapters 5 to 7 focus explicitly on the three impact pathways defined in the ToC. On the one hand these chapters provide detailed information from the SA to understand how and when the assumptions underlying the impact pathways hold, and when not. On the other hand, these chapters present indicators from the IE that allow for assessing impact in phase 2 and 3 of the programme. Chapter 8, in turn, summarises information from similar ongoing projects in the region, as well as lessons learnt from Landscape Approaches in other regions of the developing world.

Finally, a key contribution of this first assessment report is to assess key challenges and risks for the programme effectiveness and reflect on areas where the current ToC needs revision. This is the chief focus of Chapter 9, not only summarising the key findings from the SA and IE but also listing specific topics that warrant closer attention in programme design. In addition, this chapter provides an overview of where additional indicators to measure the impact of the programme are desired. Chapter 9 thereby forms the basis for an iterative process, together with IF and RA, to refine the existing ToC, including an adaptation to indicators to be assessed.

The structure of the report is such that each chapter commences with an overview of the key challenges and risks for the foreseen programme implementation (Section *.1 in each chapter). These overviews can be read as stand-alone sections covering the key important findings of each chapter. They are based exclusively on the data presented in that chapter and presented without referencing.

1.4 Impact of COVID-19

National and international travel restrictions related to the COVID-19 pandemic seriously affected data collection and training activities. Both active collaboration of the local team of RA in the project area and consultation with the steering committee on workplan, stakeholders to consult, programmes of focus group discussions and the selection of farmers to be included in the household surveys was much appreciated and contributed to the fact that data collection started as soon as movement restricted were lifted. Safety measures to avoid infection with COVID-19 were taken during every step of the data collection.


2

2 Methodology

2.1 Research questions

As introduced in Chapter 1 this report combines data collected from both a Situational Analysis (SA) an a baseline Impact Evaluation (IE).

Generally speaking, the SA gives an overview of the main internal and external factors affecting landscape sustainability. The outcome of the analysis will help define major bottlenecks, barriers/threats and opportunities, and identify scope and strategies for programme design. At this stage, the IE data collected sets the baseline by which to assess impact of the intervention and covers information on landscape values (soil health, water quality, etc.); indicators to assess resilience of households; the use of sustainable and socially-inclusive cropping practices; and access to finance, amongst others.

As both research approaches differ in scope, the underlying research questions differ as well. The research questions for the SA include:

1. Who are the actual stakeholders and actual and potential beneficiaries given the issues to be addressed by the programme?
2. How are they engaged in the wider landscape and their level of involvement and influence, and in which ways (e.g. which governance arrangements)?
3. What are the main constraints (internal and external to the landscape) these stakeholders face?
4. What is the relation between the different stakeholders and the proposed target groups in the programme?
5. What types of activities for what group(s)/type(s) of target groups will be most relevant and effective and at what time of the programme?

In addition, the research questions for the IE baseline assessment are:

1. What is the baseline situation of the outcome and impact indicators identified for the impact evaluation?
2. How likely will it be that the intervention or interventions will contribute to the expected changes?
3. What could hinder interventions to contribute to change? And how to address such barriers?
4. What other factors are likely to contribute to change and in what way?

As agreed upon with RA and IF, the structure chosen in this report is to focus on the impact pathways defined in the ToC, rather then focusing on the separate research questions underlying both research approaches. Chapter 9 summarises the key findings in relation to the research questions above.

2.2 Elements of data collection

This assessment report presents the outcomes of Phase 1 of this evaluation project by combining the outcomes of the SA and IE in an integrated way (Table 2.1).

Table 2.1 Phase 1 activities of the evaluation of the Sustainable Landscapes and Livelihood Programme

Phase	Result
Workplan and methodology development	The methodology and workplan is developed based on information on the programme implementation and the results of the desk study.
Desk review (secondary data collection)	Secondary data are collected to answer the research questions and assess the contribution claims. For both the SA and the IE plans are developed for data to collect, for which indicator, through which tool and from which stakeholder.
Primary data collection and data analysis.	Where secondary data prove insufficient, primary data (both for the SA and the IE) is collected.
Review programme Theory of Change	The impact pathways of the programme Theory of Change are reviewed with IF and RA and adjusted where necessary.
Reporting	This report assesses all evidence against the research questions and provides recommendations for refining the existing ToC.

A detailed workplan outlining the methodology for this evaluation project supporting the *Sustainable Landscapes and Livelihood Programme* in the Mt. Kenya region, has been developed with and agreed upon by IF and RA. This chapter presents the key elements pertaining the SA, the baseline assessment for the programme IE, and the scope of this first assessment report as agreed upon in earlier communication. Full methodological details of the project, as presented in the workplan, are provided in Annex 1. A list with all indicators to be reported on is provided in Annex 1 – Section 8. The most important methodological elements are described below.

This report focuses on three counties in the region – Kirinyaga, Embu and Nyeri, of which two will be targeted by the programme interventions. In this report Kirinyaga will serve as the starting point/reference county of the analysis. To avoid needless repetition, the situation in Embu and Nyeri will be described in detail only in case the findings in this area deviate from the findings in Kirinyaga.

2.3 Desk-based literature research and review

Both the data collection activities under the SA and the IE follow the same structured approach to optimise learning from the available sources of information as well as to prevent collecting already available information twice. Primary data collection tools have only been implemented when truly necessary, in order to prevent overburdening of people's time and to allow for effective but also efficient research implementation. WUR and ETC have, after consultation with IF and RA, decided on the tools used, for what purpose and at what time in the evaluation.

Under this first step, the desk study scanned whether secondary data sources are sufficient in terms of scope, volume and quality to answer the research questions. The desk study informs the primary data collection activities. In other words, primary data collection focuses on those indicators and impact pathway assumptions, for which insufficient secondary data are available. This evidence gap analysis has informed a primary data collection plan including what information to collect and from whom.

2.4 Detailed geographic description and land use

Data on agro-ecological zone and soils were sourced from Kenya Soil Survey (KSS) with KENSOTER database at KSS used for describing soils (Sombroek, Braun et al. 1982; Jaetzold, Hornetz et al. 2006).

The land cover datasets at 30 metre spatial resolution (GlobeLand30) covering the region of Kenya were sourced from the National Geomatics Center of China (NGCC) through www.globeland30.org. The GlobeLand30 datasets comprise ten types of land cover, including forests, for the years 2000 and 2020. They were extracted from more than 20,000 Landsat (TM5, ETM+, OLI multispectral images) and Chinese HJ-1 satellite images.

The ARCGIS10.4 was used for spatial data processing. The land cover analysis involved combining the images to create a new image showing the land cover change trajectories for each county. Microsoft Excel was then used for the calculation of spatial extent of land cover types and change statistics.

Tree cover analysis (Natural Forests, plantation forests and non-forest) based on the Global Forest Watch database was used to measure tree cover change but also to compare trends from analysis based on GlobeLand30 database. Only trends between the two databases could be compared due to the following reasons:

- The use of different, classification scheme, algorithms and the training datasets between NGCC and Global Forest Watch;
- Apart from the Landsat images used by Global Forest Watch, NGCC also used China Environmental Disaster Mitigation Satellite (HJ-1) multispectral images in order to augment the LandSat imageries;
- The usage notes of the Global Forest Watch[1].

[1] https://storage.googleapis.com/earthenginepartners-hansen/GFC-2020-v1.8/download.html

2.5 Primary data collection and analyses

Informed by the desk-based research, primary data collection has been implemented as follows:

1. Qualitative primary data collection methods (interviews, focus group discussions) are used as a basis to get an in-depth understanding of the situation, and to understand how the output and outcomes could result in impacts;
2. Farmer survey(s) are developed informed by the qualitative data collection, primarily for the IE;

An overview of the primary data collection methods is provided in Table 2.2. The primary data collection leads to a judgement on whether the expected outcomes can be achieved by the programme as well as observed. It also identifies unique evidence required for assessing assumptions behind specific impact pathways.

Table 2.2 Primary data collection used in this study

Primary data source	Sample size	Main function
On-farm survey	990 (270 tea and 720 coffee)	IE
Key Informant Interviews (KII) of stakeholders, both internal and external	89	SA
Focus Group Discussions (FGD) using participatory methods	72	SA
Community assessment, done through stakeholder interviews and / or Focus group discussions.	22	SA and IE
Maps/satellite imagery	See Annex 1	SA and IE

The sample size of the farmer survey has been established such that the contribution of the programme to changes in outcome indicators (such as adoption of practices) can be assessed with statistical significance using difference-in-difference analyses. The rest of the data and information collected will be used in the analyses to conclude on the contribution of the programme to change in impact indicators, by creating 'impact stories' based on the ToC.

For the SA, qualitative studies (KII and FGD) have been used to collect data from the three counties in equal intensity. Full details are provided in Annex 1 – Sections 3 and 4. These data serve to inform the selection of the second county selected for programme intervention (Kirinyaga County being the first county targeted). This information will also be used in the midterm and endline evaluation as background information of the status at baseline for relevant indicators.

The on-farm survey has been conducted in Kirinyaga County only, since focusing on this county maximises the likelihood of revealing impact in 2025 against the 2021 baseline. This holds since the programme will commence in Kirinyaga County, maximising the period between start of the programme and the endline assessment and the likelihood of capturing changes in the impact assessment. Due to considerable socio-economic differences between the three counties a further choice has been made to select the comparison group of farmers from within the same county. The full dataset is provided in Annex 6a, while a selection of indicators (Key Process Indicators) has been shared in a separate table with RA and IF.

A two-stage sampling approach has been implemented to sample respondents in the on-farm survey. Full details are provided in Annex 1 – Section 2. In the first stage, three tea factories (Kangaita, Ndima and Thumaita) and four Farmers Cooperative Societies (FCS) were selected (Ngiriambu, Rwama, Mwirua and Mirichi) in Kirinyaga County based on four different selection criteria:

1. Presence of farmer communities with the following:
   - Communities or farmers organised into groups-WRUAs, CFAs etc.;
   - Smallholder farmers living and farming close to protected forests or community forests;
   - Communities or farmers living or farming close to protected natural ecosystems, i.e., wetlands, rivers etc.;
   - Communities or farmers living or farming in or close to a High Conservation Area (overlap with the 2 above): An area designated on the basis of High Conservation Values (HCVs) which are biological,

ecological, social or cultural values considered outstanding at the national, regional or global level;
   - Communities or farmers farming in degraded lands;
   - Communities or farmers with potential for diversification;
2. Organisation status and status of RA certification:
   - With similar organisational capacity, well-functioning and structured;
   - Similar certification status; RA certified versus non-RA certified;
3. Factories with the most spread on agro-ecological zones separately for tea and coffee;
4. Other criteria considered by programme (RA and KTDA) in selecting three tea factories:
   - Previous programmes run by KTDA in Kirinyaga;
   - Gender dynamics in Kirinyaga;
   - Internal KTDA dynamics and on-going activities/local dynamics;
   - Potential for diversification e.g. dairy.

In the second stage, individual famers have been sampled in the tea and coffee zones as follows:

- Tea zone: A list of eligible buying centres was prepared per tea factory, stratified into those participating at the beginning of the programme (intervention group) and those towards end of programme, year 4 (control group). From this list four buying centres were selected to participate in the intervention group with a probability proportional to size (number of farmers in the buying center). Similarly, four buying centres were selected for the control group. A list of eligible farmers in each of the selected buying centres was prepared from which 11-12 farmers were selected at random per buying centre. In total 45 farmers were selected as part of intervention group and an equal number in the control group (90 farmers per factory; a total of 270 farmers in the tea zone).
- Coffee zone: From each of the four selected Farmers Cooperative Society, two wet mills were selected with probability proportional to size. A list of eligible farmers in each of the selected wet mills was prepared. Ninety farmers were selected randomly in each wet mill and where the number could not be attained the sample was spread across the two wet mills in order to establish a sample of 180 farmers per Society.

An overview of the key average characteristics of farmers surveyed is presented in Table 2.3.

Table 2.3 Key characteristics of farmers surveyed

	Tea				Coffee			
	Intended programme participants	N	Comparison group	N	Intended programme participants	N	Comparison group	N
Average age (years)	51.3	122	53.5	154	53.1	361	55.6	360
Average household size (HH members)	4.2	122	4	154	3.3	362	3.4	361
Share of female respondents (%)	49%	122	48.7%	154	38.4%	362	43%	361
Share of female heads of household (%)	22%	122	25%	154	19.6%	362	26%	361
Share of households where HH head and spouse completed primary school or higher (%)	86%	122	81.2%	154	84.8%	362	82.3%	361
Average size of tea/coffee farm in hectares (ha)	0.3	117	0.27	154	0.31	361	0.24	361
Average yield/ha	11,570 kg/ha	112	11,125 kg/ha	144	3,261 kg/ha*	360	2,661 1kg/ha*	360

Based on the data from the on-farm survey, a baseline resilience index score has been computed based on five pillars constituting separate elements of resilience. Full details of the method used are provided in Annex 1 – Section 7. The five pillars include: Food access, Assets owned, Use of agricultural

practices, Adaptive capacity and Social networks. Jointly, these pillars capture separate elements of a broader notion of resilience. Focus Group Discussions (FGD) were used to identify the relative weights farmers place on these five elements in a computation of overall computation of resilience. Survey data for the baseline Impact Evaluation (IE) are used to compute normalised scores for each producer for each pillar. In the final step a weighed average across these five scores is computed, using the weights from the FGDs, yielding the composite baseline resilience index.

Finally, soil properties, notably organic matter content, are being assessed in order to assess programme-induced changes in landscape values. The method relies on the Munsell colour chart and the system of colour notation, together with rapid field measurements. A detailed protocol for these soil assessments has been established and is presented in Annex 1 – Section 6. Soil properties are assessed in this way at 30 farms during baseline and these same farms will be assessed at the midline and endline survey.

2.6 Data reporting

The primary and secondary data underlying these indicators have been compiled into a number of additional documents that have been provided to IF and RA. These include, for all three counties, the literature reviews; the Key Informant Interviews (KII); and the Focus Group Discussions (FGD). An additional report on the KII for the financial stakeholders has been provided, as well a report on the results of the soil properties assessment.

The additional annexes provided to this report include the following:

- Annex 1: Extended Methodology
- Annex 2: Complete indicator table Impact Evaluation (IE) Baseline data, and separate files listing household needs and aspirations and natural enemies applied in pest control;
- Annex 3a: Stakeholders consulted – summary
- Annex 3b: Stakeholders consulted -full details.
- Annex 4: A closer look at the finance indicators


3

3 General geographic information

This chapter generates insights to inform the design of the programme with regards to the current geographical situation, specifically discussing indicators characterising ecosystems in the three counties (SA1-SA10) and potential programme-induced changes thereof (I.1.1-I.1.4; O.4.1), as well as the impact of climate change (SA50-SA56).

3.1 Key trends and challenges from landscape and programme opportunities

This first section provides an overview of the key findings, as presented in more detail in the subsequent sections.

Over the last 25 years land use changed towards conversion of wetlands into agricultural land, conversion of agricultural land into urban settlements, loss in vegetation cover, encroachment into riparian areas and decrease in river water volumes. Several key insights with respect to land use in Kirinyaga, Embu and Nyeri use emerge:

- **Several drivers of land use change emerge**, including cultivation along river banks, unsound farming methods and increasing population; illegal logging, climate change; emerging market demands and favourable prices for horticultural crops and Khat; encroachment into forests; and inadequate legislation to prevent the encroachment of wetlands;
- **Forest tree cover reduced** by 2.6%, 7.2% and 3.4% in Kirinyaga, Embu and Nyeri respectively between 2000-2020.
- **Cultivated land increased across the three counties** with higher increases for cultivated land recorded in Embu (from 71.87% to 89.3% of land area) but increases in per capita cultivated land was insignificant.
- **Soils are in poor chemical health** with increasing acidity and low levels of soil nitrogen, phosphorus and potassium; soil **organic matter levels are in medium to high range**;
- **Water bodies reduced marginally** between year 2000 and 2020;
- **Protected areas**, like gazetted forests, forest reserves, National Parks and game reserves, **exist** which also double up as key biodiversity areas though opinions are divided on the level of conservation and protection with illegal activities still taking place;
- **Climate change is an emerging threat.** In the period 2011-2020 the three counties experienced extreme weather events (temperatures, rainfall, flooding) and temperatures that depart from historical averages;
- **Known climate-induced impacts include recession of the glaciers** on Mt. Kenya, increased incidences of dry spell affecting river water volumes, unprecedented extreme rain fall leading to displacement landslides and destruction of infrastructure (roads and buildings), rise in new pests (locusts, tomato leaf miner etc), delayed ripening of coffee attributed to income loss and pests and disease outbreaks;
- **Significant changes in precipitation and temperatures in drier parts** of Kirinyaga, Embu and Nyeri posing dramatic impacts on the phenology, distribution and composition of pasture grass species; and alteration of habitats through altering vegetation community composition and future suitability of plant species;
- **Reduction in tea and coffee yields are predicted**. Although no specific models of climate change have been developed for Kirinyaga, Embu and Nyeri. General models (*Projections of future meteorological drought events under representative concentration pathways (RCPs) of CMIP5 over Kenya, East Africa)* predict a reduction in tea and coffee yields;
- **Pests and diseases surge** leading to high costs of production, destruction of road infrastructure, food insecurity and increased unemployment.

To cope with these trends and challenges several opportunities emerge for the landscape programme to address:

- Opportunities exist in building business cases for linking upstream and downstream water users and or enhancing farm income through small-scale irrigation given the abundance of major rivers that provide water for multiple uses in the landscape.

- Opportunities exist to partner with Government agencies to conserve existing gazetted forest and non-gazetted forests and thereby conserve threatened flora and fauna and arrest declining tree cover in Kirinyaga, Embu and Nyeri part of the Mt. Kenya forest ecosystem.
- Opportunities exist for intensification and diversification to cope up with declining per capita land. The ideal agro-climatic conditions in the three counties supports other income generating crops such as avocado, macadamia and dairy, potentially offering opportunities for income diversification when supported with organised farmer marketing. Over the last 25 years there has been **planting of high value crops** (avocado, macadamia, vegetables etc.) and diversifying income sources away from tea and coffee;
- Mitigation measures aimed at reducing negative impacts of climate need to be put in place: Aquaculture, harnessing water resources for irrigation, domestic use and industrial use, arresting land degradation and biodiversity loss as well as revamping on-farm soil and water conservation structures e.g. in coffee zones; Promotion of drought-tolerant crops; enhancing tree cover in the agricultural areas, controlling flood water e.g. in Kirinyaga, aiding decision making by modelling climate scenarios for future impacts e.g. on tea and coffee.
- Opportunities exist to enhance sustainable use of natural resources. Farmers are willing to pay for ecosystem services derived from forested areas and water bodies (rivers and wetlands) as revealed in Focus Group Discussions. Farmers are willing to pay for forest ecosystem services with annual payments of KES 100-1500 for firewood; KES 20-116 for livestock grazing; KES 250-500 per acre for crop cultivation; KES 600-5000 for beekeeping; KES 500 per individual for fishing and KES 0-500 for getting herbal medicine from gazette forests. They are also willing to pay for river water and wetland ecosystem services at KES 1,000-24,000 and KES 200-1,500 annually respectively.
- Opportunities exist for income generation by the targeted communities through nature based activities targeting ecosystem services in the landscape (beekeeping, eco-tourism, turning bamboo to other products).

3.2 Detailed geographic description and land use

3.2.1 Location

Investment and development landscapes of Nyeri, Kirinyaga and Embu Counties in Central and Eastern Kenya are located between the equator and latitudes 0.916° South and longitude 36.6^0 and 37.936° East with Nyeri County having the largest landmass (3,337 km^2) and Kirinyaga the smallest land mass at 1,478 km^2).

Kirinyaga County is located between latitudes 0.145° and 0.785° South and longitudes 37.143° and 37.496° East and covers an area of about 1,478 km^2. Administratively, Kirinyaga County is divided into six sub-counties and 20 Wards (Figure 3.1).

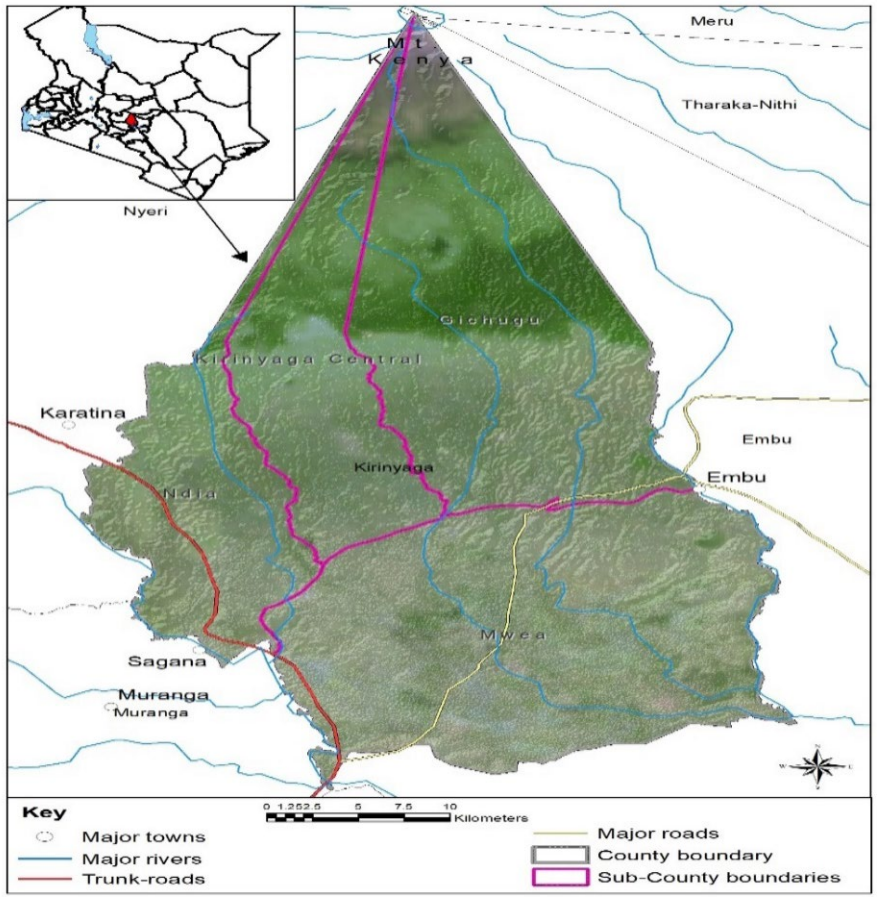

Figure 3.1 Kirinyaga County geographical range

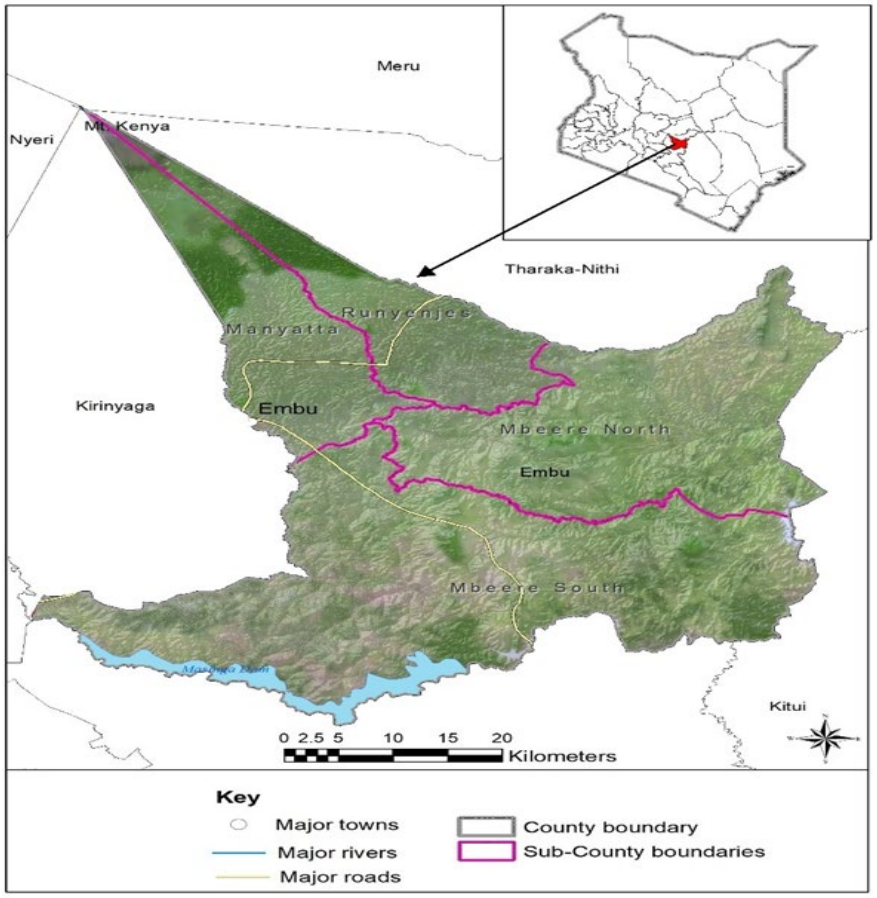

Figure 3.2 Location of Embu County in Kenya

Embu County is located between latitudes 0.145° and 0.916° South and longitude 37.267° and 37.936° East. The county comprises four sub-counties and 19 Wards covering a total area of 2,818 km^2 (Figure 3.2)

Nyeri County is located in the central region of the country and covers an area of about 3,337.2 km^2 (Kirinyaga County Government 2018). The County is situated between longitudes 36.60 and 37.3° East and between the equator and latitude 0.64° South. It has 8 sub-counties and 30 administrative Wards (Figure 3.3).

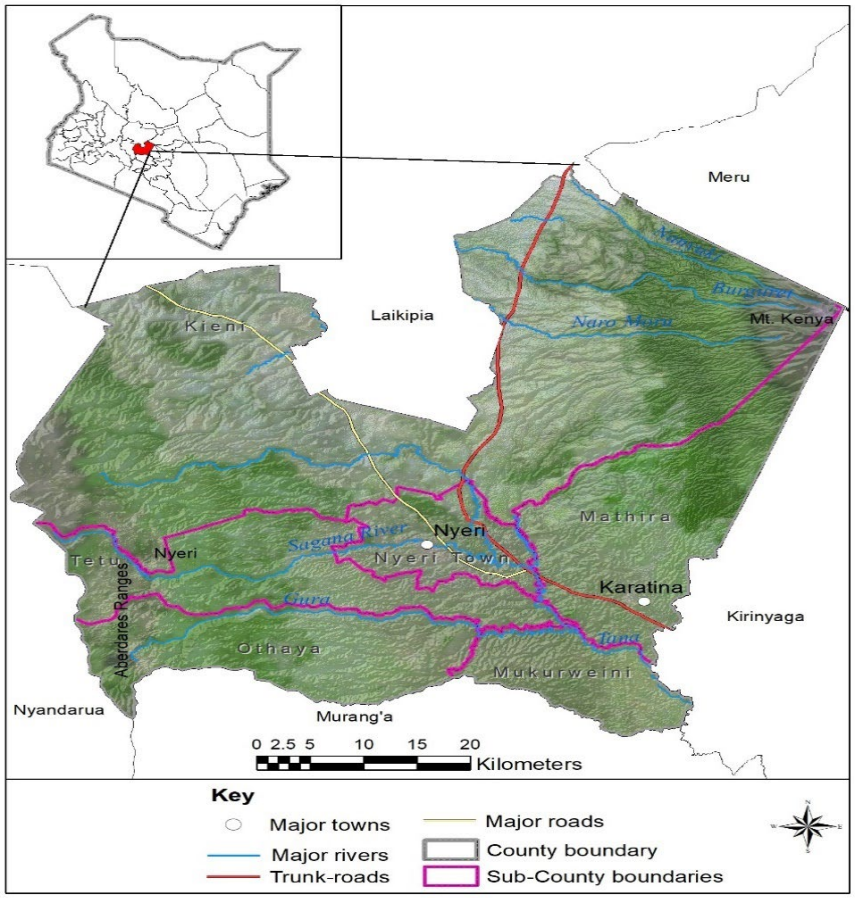

Figure 3.3 Location of Nyeri County in Kenya

3.2.2 Elevation and agro-climatic zones

Kirinya, Embu and Nyeri Counties have high natural potential and ideal agro-climatic conditions (rainfall, temperature) for crop and livestock production.

Kirinyaga County lies between 1,050 and 5,054 metres above sea level (m.a.s.l.) in the south and at the peak of Mt. Kenya, respectively. Mt. Kenya, which lies on the northern side, greatly influences the landscape of the county as well as other topographical features. The county has three major topographical zones i.e. lowland areas (1,158 to 2,000 m.a.s.l), the midland areas lie between 2,000 to 3,400 m.a.s.l.) and the highlands (3,400 to 5,054 m.a.s.l) (Figure 3.4).

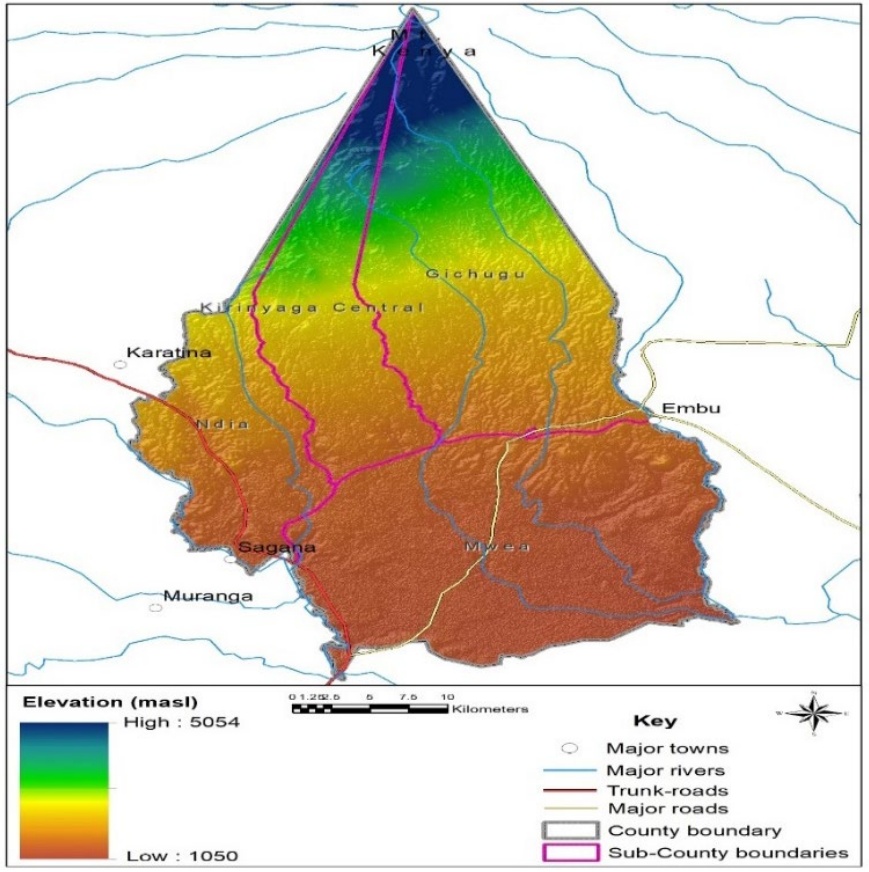

Figure 3.4 Digital Elevation Model of Kirinyaga County

The county has a tropical climate and an equatorial rainfall pattern. The climatic condition is influenced by the county position along the equator and its position on the windward side of Mt. Kenya. The county experiences a bimodal

rainfall pattern; long rainy season with an average of 2,146 mm occur between the months of March to May while the short rainy season with an average of 1,212 mm occurs between the months of October and November (Figure 3.5).

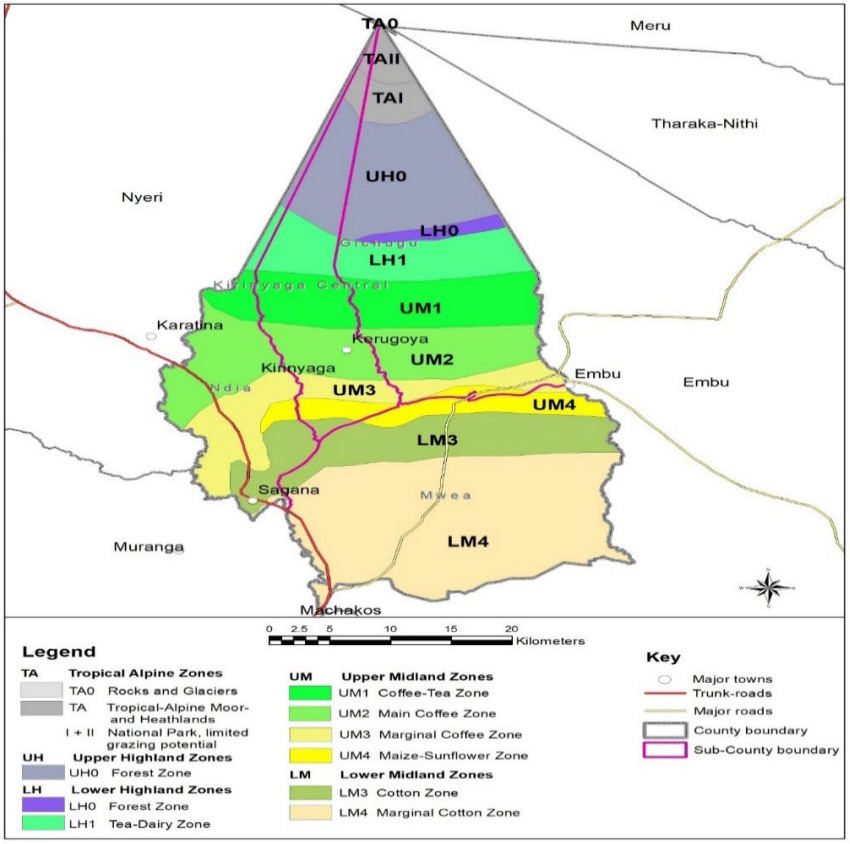

Figure 3.5 Agro-Ecological Zones of Kirinyaga County

Embu County is characterised by highlands and lowlands and slopes from north-west towards east and south-east with a few isolated hills such as Kiambere and Kiang'ombe. The elevation rises from about 514 m.a.s.l. at River Tana Basin in the east to 5,199 m.a.s.l. at the top of Mt. Kenya in the north-west (Figure 6). The southern part of the county is covered by Mwea plains which rise northwards, culminating in hills and valleys to the northern and eastern parts of the county. There are also steep slopes at the foot of Mt. Kenya.

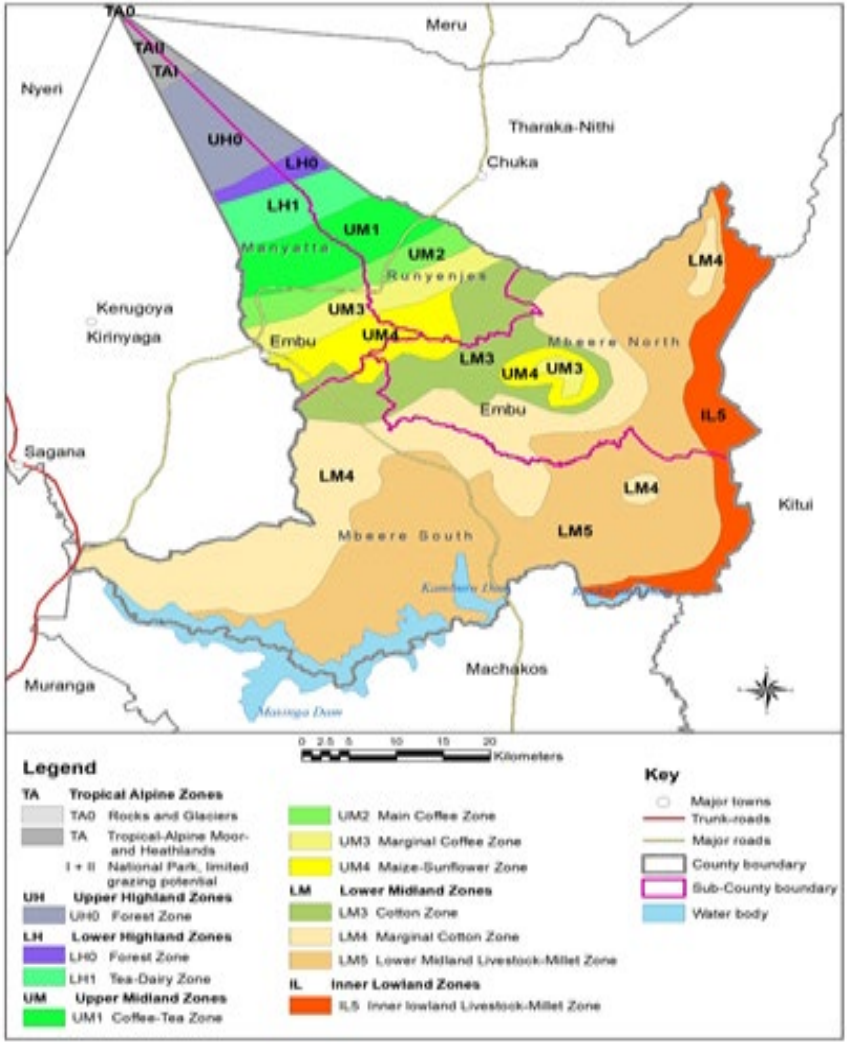

Figure 3.6 Digital Elevation Model of Embu County

Embu-Climate and Agro-Ecological Zones: The County has two typical climatic zones comprising of cold and wet upper zones (next to Mt. Kenya) to hot and dry lower zones in the Tana River Basin. The average annual rainfall ranges from more than 2,200 mm at 2,500 m.a.s.l. to less than 600 mm near the Tana River at 700 m.a.s.l. (Jaetzold, Hornetz et al. 2006). According to Jaetzold et al. (2006) the county is categorised into eight agro ecological zones (AEZs) (Figure 3.7).

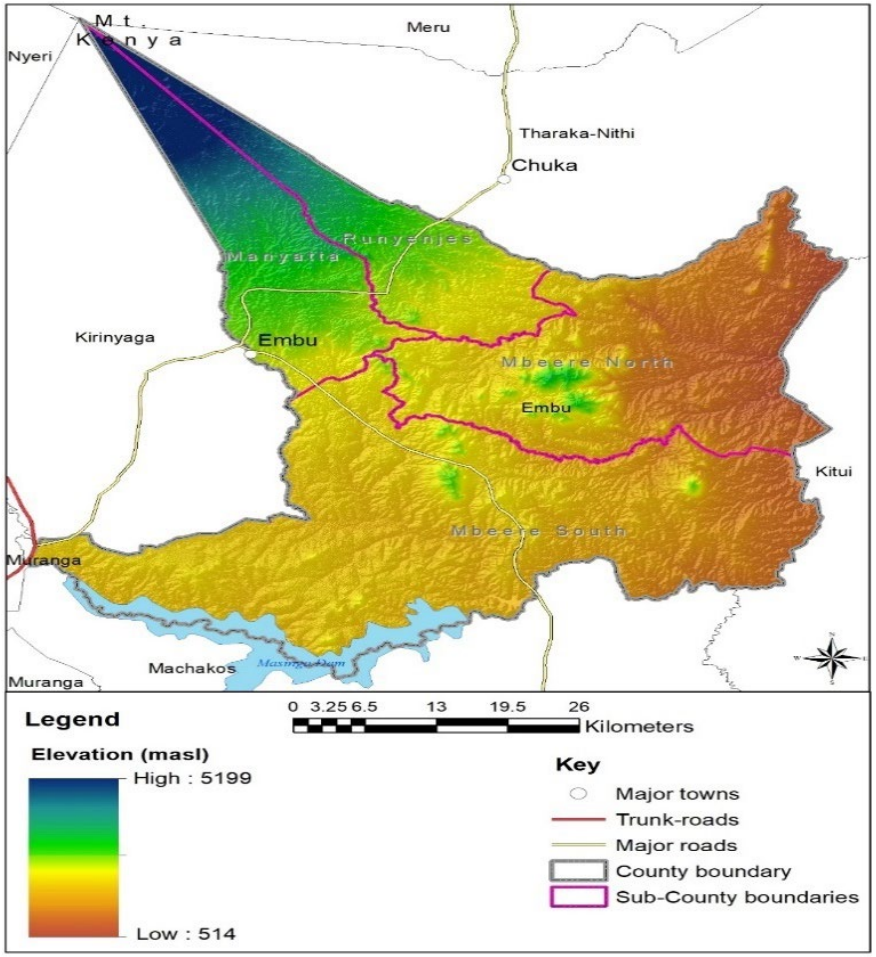

Figure 3.7 Agro-Ecological Zones of Embu County

Nyeri: The main topographic features of the county include Mt. Kenya (5,199 m.a.s.l.) to the east and the Aberdare Ranges (3,999 m.a.s.l.) to the west as shown in Figure 3.8. The western region of the county is flat, whereas further southwards, the topography is characterised by steep ridges and valleys, with a few hills such as Karima, Nyeri and Tumutumu. These hills affect the rainfall patterns and thus influence the mode of agricultural production in some localised areas (Figure 3.8).

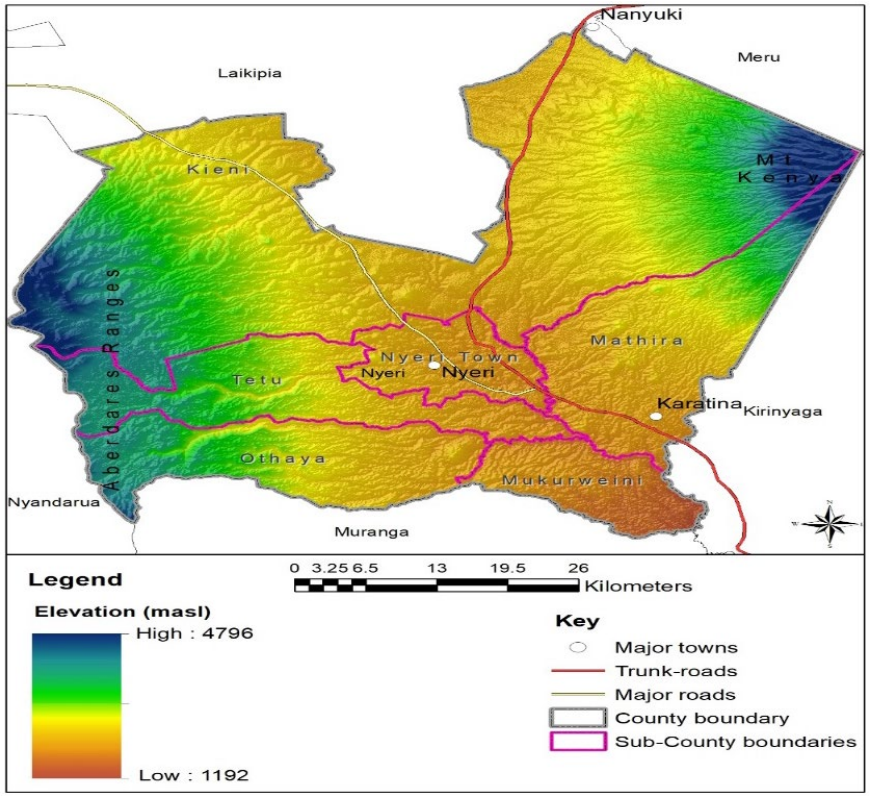

Figure 3.8 Digital Elevation Model of Nyeri County

The county experiences equatorial rainfall due to its location within the highland zones of central Kenya region. This is influenced mainly by the existence of two major mountainous ecosystems of the Aberdare Ranges and

Mt. Kenya. The county experiences a bimodal type of rainfall with the long rainy season occurring from March to May while the short rainy season occurs from October to December (Ministry of Agriculture 2016). The agro-ecological zones of Nyeri county are presented in Figure 3.9.

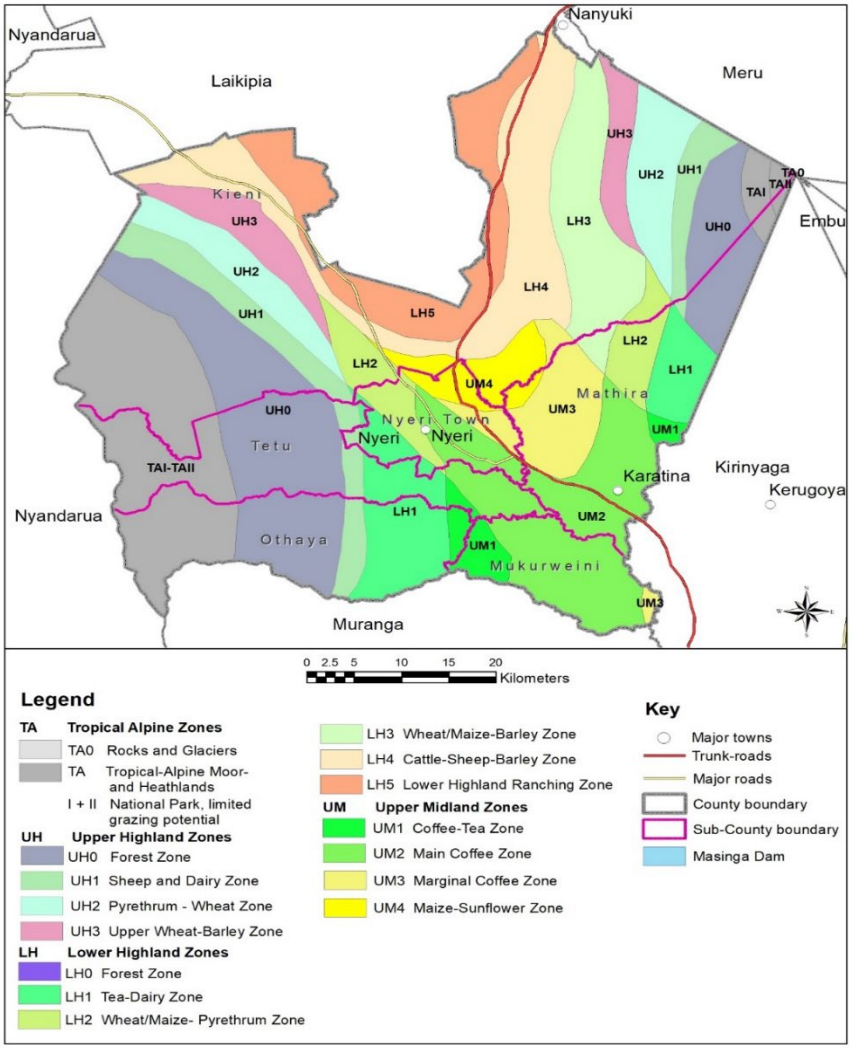

Figure 3.9 Agro-Ecological Zones of Nyeri County

3.2.3 Geology

The geology of the area consists of volcanic rocks and recent superficial deposits with various parts of the counties, especially lower parts, having soils developed from varying different soil parent materials.

Kirinyaga: The geology of the county consists of volcanic rocks. The county also comprises volcanic bedrock, with some small areas southwest of Kerugoya, consisting of rocks of varying Basement Rocks System (Figure 3.10).

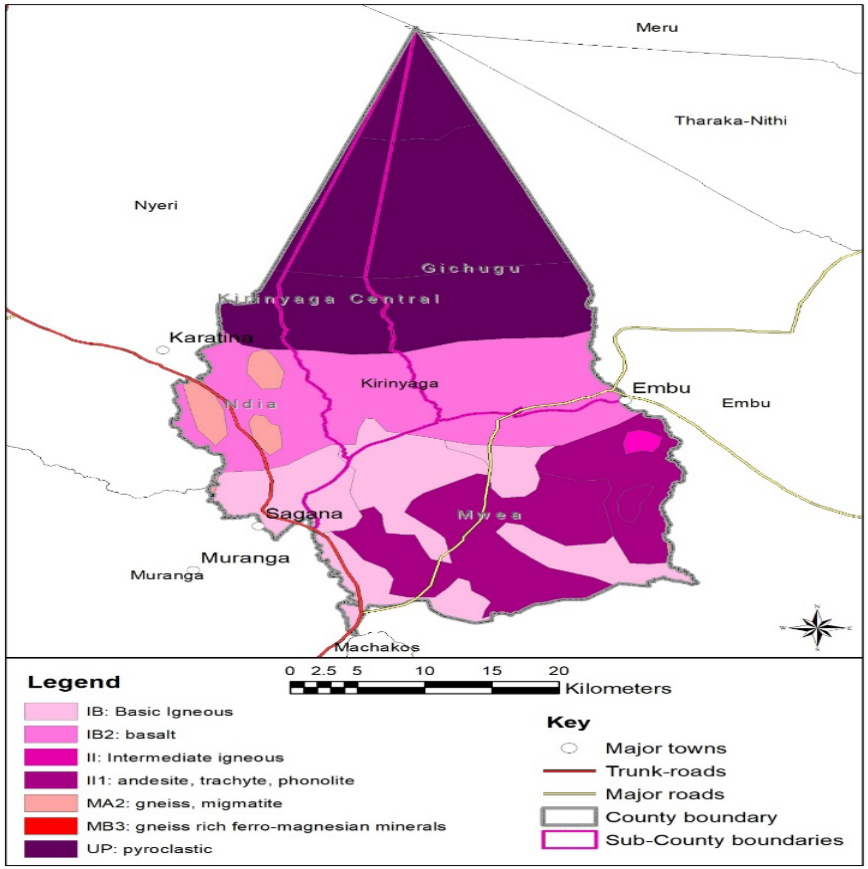

Figure 3.10 Geological map of Kirinyaga County
Source: Batjes and Gicheru (2004).

Embu: The geology of the county is presented in Figure 3.11.

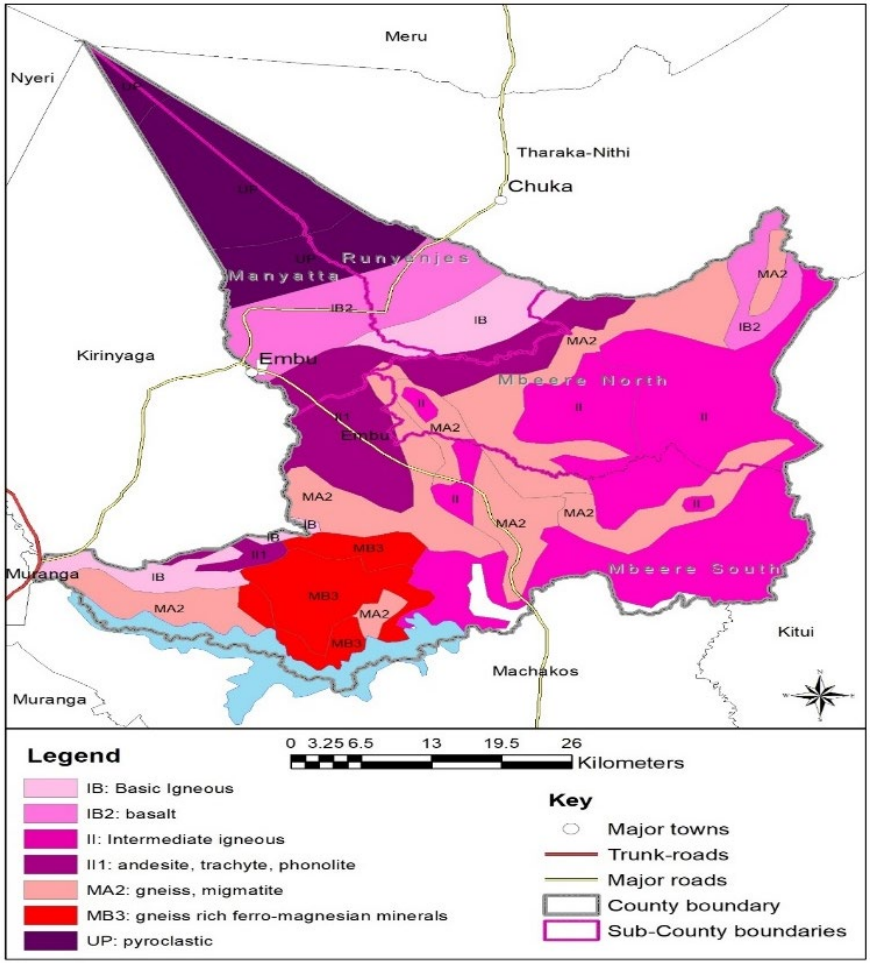

Figure 3.11 Geological map of Embu County
Source: Batjes and Gicheru (2004).

Nyeri: The geology of the county is presented in Figure 3.12. Soils at Nyeri are composed of tropical residual red clay soil developed over slightly to moderately weathered volcanic tuff. Major soils are Nitisols with associated Andosols that support tea and coffee growing in a humid-cool temperate climate (Shackleton 1945).

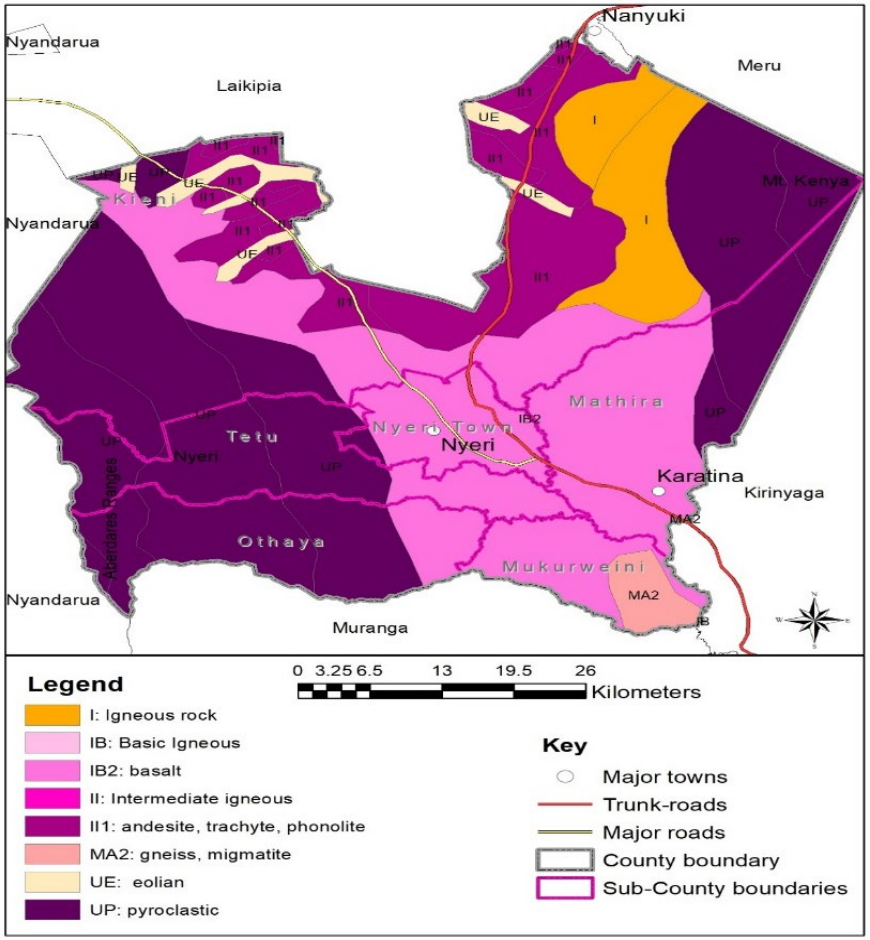

Figure 3.12 Geological map of Nyeri County
Source: Batjes and Gicheru (2004).

3.2.4 Soils

Diverse soil types are found in the landscape soils with well-developed soil profiles and horizons (Nitisols, Acrisols, Andosols); soils of shallow depth, weakly developed and/or excessively drained (Cambisols, Regosols, Arenosols, Leptosols), soils strongly weathered (Ferralsols) and; soils under impeded drainage (Vertisols).

Kirinyaga: The eight major soil types in Kirinyaga County are shown in Figure 3.13 and are classified according to Muchena et al. (1982); Sombroek et al. (1982); Jaetzold et al. (2006) and FAO (2006). Soils in the county include: soils with well-developed soil profiles and soil horizons (Nitisols, Acrisols, Andosols); soils of shallow depth, weakly developed and/or excessively drained (Cambisols, Regosols, Leptosols), soils strongly weathered (Ferralsols) and; soils under impeded drainage and/or salt-affected (Vertisols).

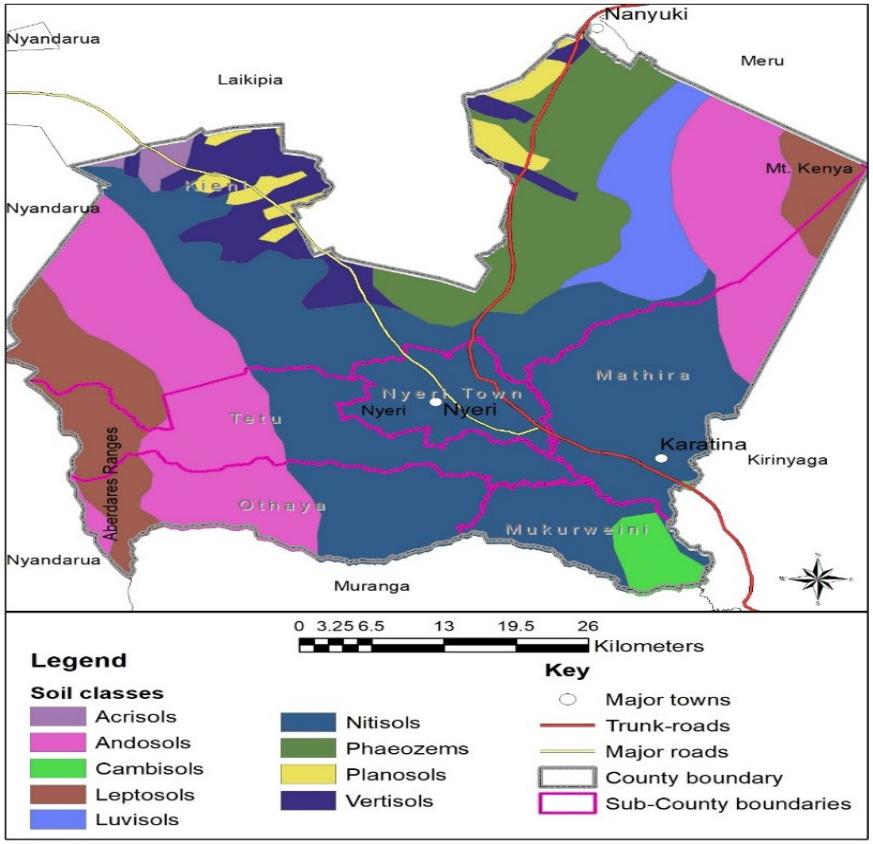

Figure 3.13 Major soil types of Kirinyaga County

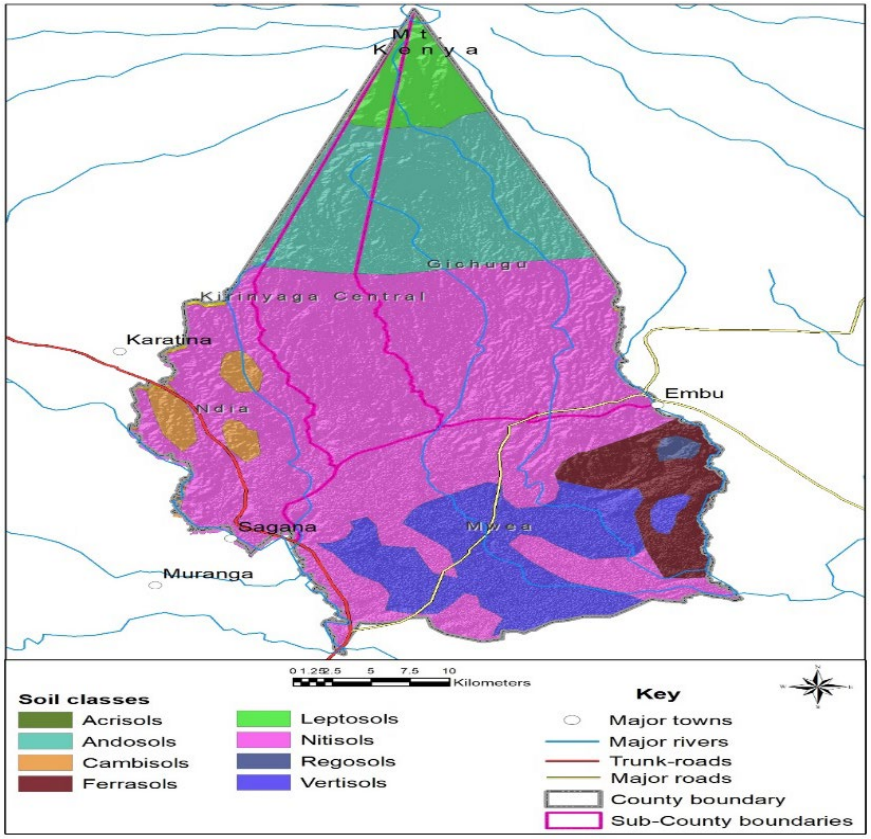

Figure 3.14 Major soil types of Embu
Source: Sombroek et al. (1982).

Embu: The nine major soil types in Embu County are shown in Figure 3.14. The soils in the County include soils with well-developed soil profiles and soil horizons (Nitisols, Acrisols, Andosols); soils of shallow depth, weakly developed and/or excessively drained (Cambisols, Regosols, Arenosols, Leptosols), soils strongly weathered (Ferralsols) and; soils under impeded drainage and/or salt-affected (Vertisols).

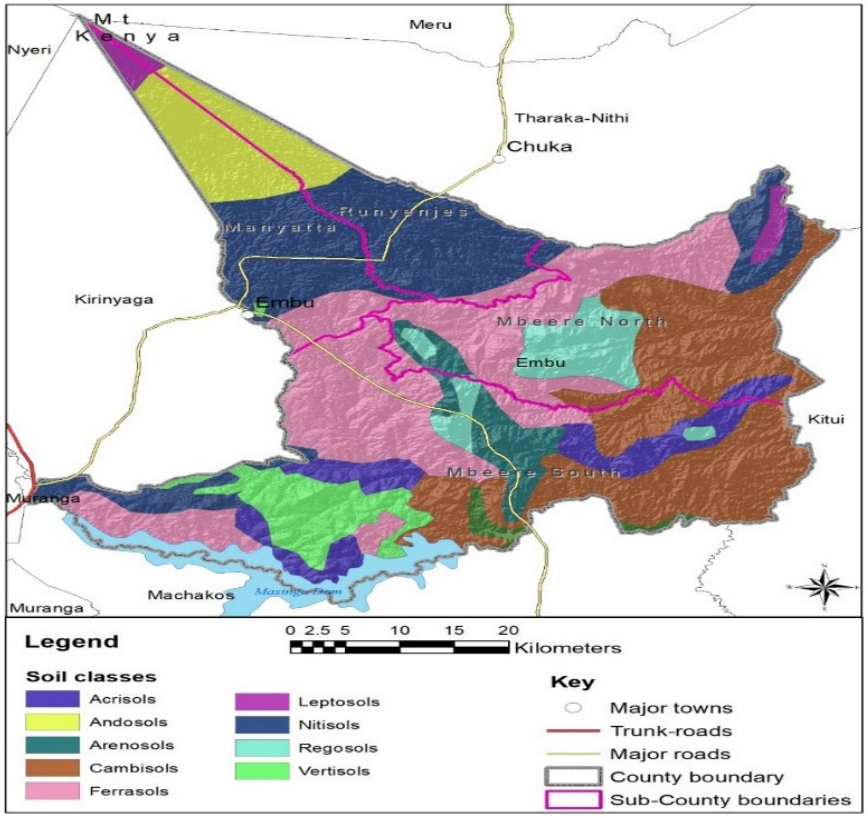

Figure 3.15 Major soil types of Nyeri (Sombroek, Braun et al. 1982)

Nyeri: The nine major soil types in Nyeri County are shown in Figure 3.15.The soils are variously distributed in different physiographic positions and on different soil parent materials. These include soils with well-developed soil profiles and soil horizons (Nitisols, Luvisols, Acrisols, Andosols, Phaezoms); soils of shallow depth, weakly developed and/or excessively drained (Cambisols, Leptosols), soils strongly weathered (Ferralsols) and soils under impeded drainage and/or salt-affected (Planosols, Vertisols).

Varying results emerge for soil organic matter but in general, soils in the target areas of Kirinyaga tea and coffee zones are in poor chemical health. The soils are increasingly becoming acidic in tea zones with all farms sampled in Ndima Tea Factory catchment and 60% of farms studied in Kangaita and Thumaita in Kirinyaga having pH values below 4.5 required for tea production. Though mixed results regarding pH unfolds in coffee zone, all farms studied in Rwama FCS and Ngiriambu FCS were characterised by pH below critical limits for coffee production (less than pH 5.3).

Organic Carbon was rated low, medium and high based on local agronomic threshold values. Overall 45% and 52% of 31 farms studied have soil organic carbon in the medium and high categories respectively with 3% having farms in the low category.

Although colour of top soil as measured using 'Value' from Munsell Colour Chart corroborated well with soil organic carbon, the study concludes that the use of Munsell Colour Chart alone and or in combination with soil texture is inadequate in estimating soil organic carbon in situations where soils are uniform in terms textural, structural, and morphological landscape processes and formations.

Soils conditions across the three counties vary but there is a general decline in soil fertility in smallholder farms. Other than the tea and coffee zones, soil fertility decline in many parts of the landscape is attributed to the increased soil structural deformation due to excessive organic matter depletion. Soil Nitrogen, Phosphorus and Potassium are increasingly becoming a concern in the study sites. The natural nitrogen supply is low to moderate. Phosphorous availability is reduced by increased fixation, caused by the increasing rate of acidification (Muya et al. 2009).

The fertility status of the dominantly clay soils of the project areas is low due to adverse nutrient and C:N ratios, increased acidity and impeded

decomposition processes and limited nutrient cycling especially in the lower and drier parts of Kirinyaga, Embu and Nyeri.

Major soils in the landscape are well drained. However, some parts of the landscape have Vertisols e.g. in lower Kirinyaga with management challenges such as poor drainage and water logging, runoff and soil erosion, difficult tillage and unsuitability for land preparation implements and low organic carbon and nitrogen (Wamari et al. 2016).

The declining trends in soil quality and health take place along a land use intensity gradient, from the natural forest, through undisturbed grassland, tea and coffee to intensively cultivated cropland (Gachimbi 2002).

In the three counties of Kirinyaga, Embu and Nyeri, soil types tend to have a relationship with elevation. The higher slopes of Mt. Kenya are dominated by volcanic ash soils (Andosols). The middle foot slopes have mainly deep well-structured nutrient rich clay soils (Nitisols). The lower foot slopes are dominated by very deep strongly leached poor clay soils (Ferralsols and Acrisols) and by less leached soils (Cambisols, Regosols, Lixisols and Luvisols). Other soils encountered are poorly drained clay soils (Vertisols, Gleysols and Planosols), shallow soils (Leptosols) and alluvial soils-Fluvisols (Sombroek et al. 1982).

3.2.5 Hydrology

The Mt. Kenya Landscape is endowed with major rivers that provide water year round for multiple uses: small-scale irrigation, domestic and livestock use and hydropower generation.

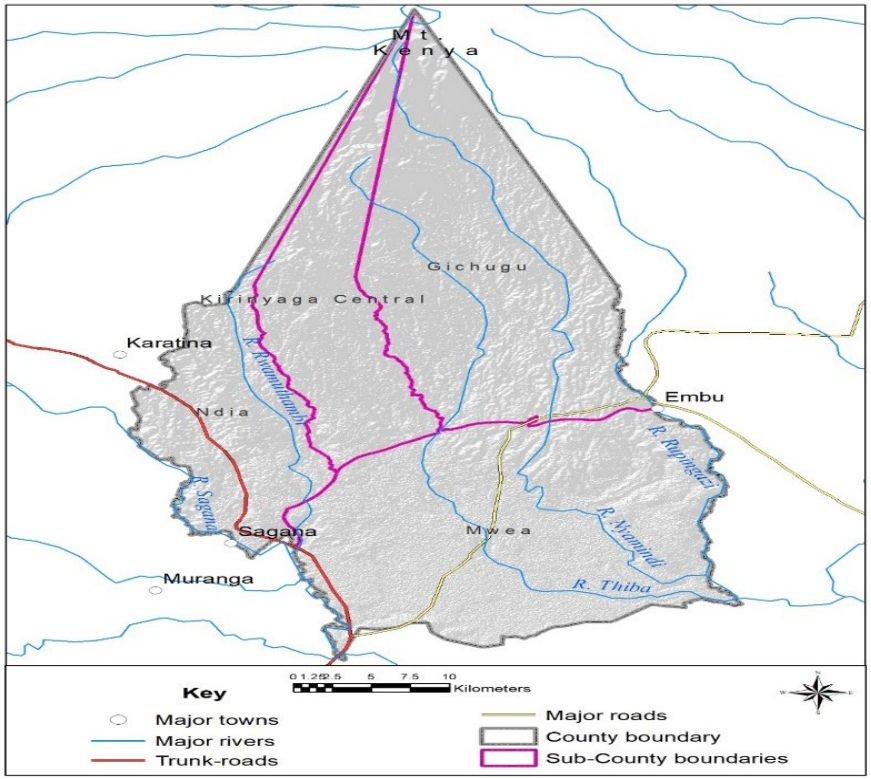

Figure 3.16 Major rivers of Kirinyaga County

Kirinyaga County has six major rivers, namely: Sagana, Nyamindi, Rupingazi, Thiba, Rwamuthambi and Ragati, all of which drain into Tana River and they are the principal source of water in the county (Figure 3.16). The water from these rivers has been harnessed through canals to support irrigation at the lower zones of the county especially in Mwea Sub-County. The

rivers are also important sources of domestic water through various water supply schemes**.**

Embu County is served by six major rivers which are Thuci, Tana, Kii, Rupingazi, Thiba and Ena (Figure 3.17). The above rivers are served by the following tributaries Thambana, Nyanjara, Gichangai, Itimbogo, Kapingazi, Kirurumwe. These rivers originate from Mt. Kenya forest in Manyatta and Runyenjes Sub-Counties. Some major dams which generate hydroelectric power for the national grid are located in the county and include Masinga, Kiambere, Kindaruma and Gitaru dams which are situated along Tana River.

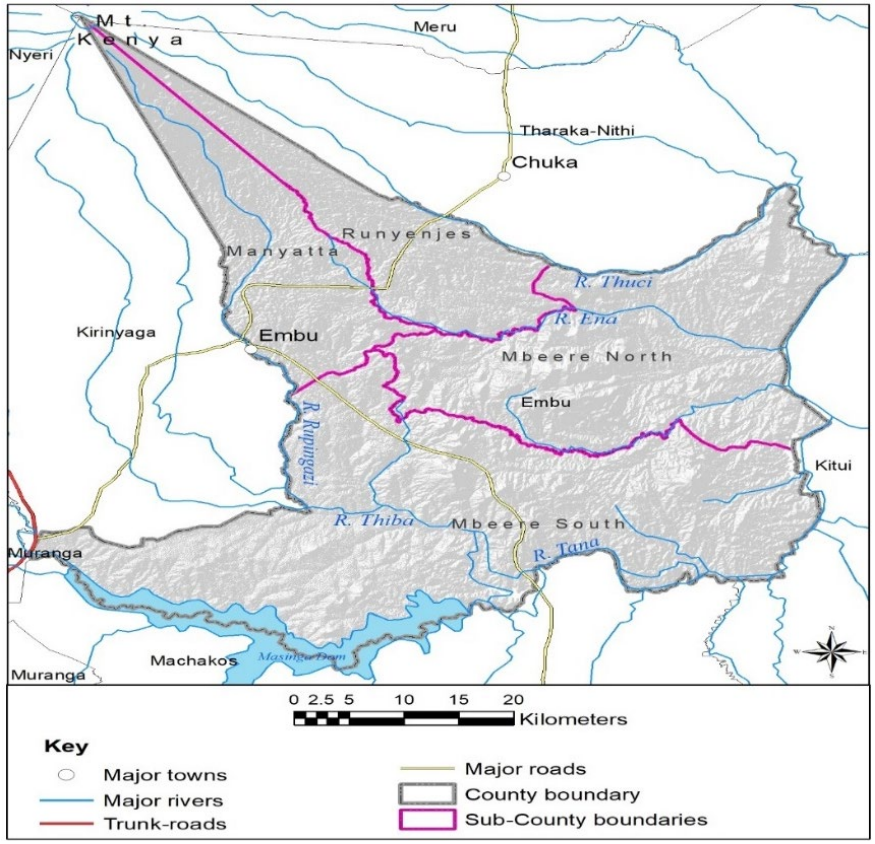

Figure 3.17 Major rivers of Embu County

Nyeri County's water resource comprises of both ground and surface water. Surface water consists of permanent rivers such as Nanyuki, Burguret, Naromoru, Thegu, Uwaso Ngiro, Karemeno, Rwarai, Gikira, Thuti, Kururu, Muthira, Sagana, Nairobi, Chania, Gura, Honi and Ragati among others (Figure 3.17). The main catchment areas for these rivers are the two water towers i.e. Aberdare Ranges and Mount Kenya. There are 49 permanent rivers in the County and the major rivers are Sagana, Ragati, Chania, Gura and Nairobi.

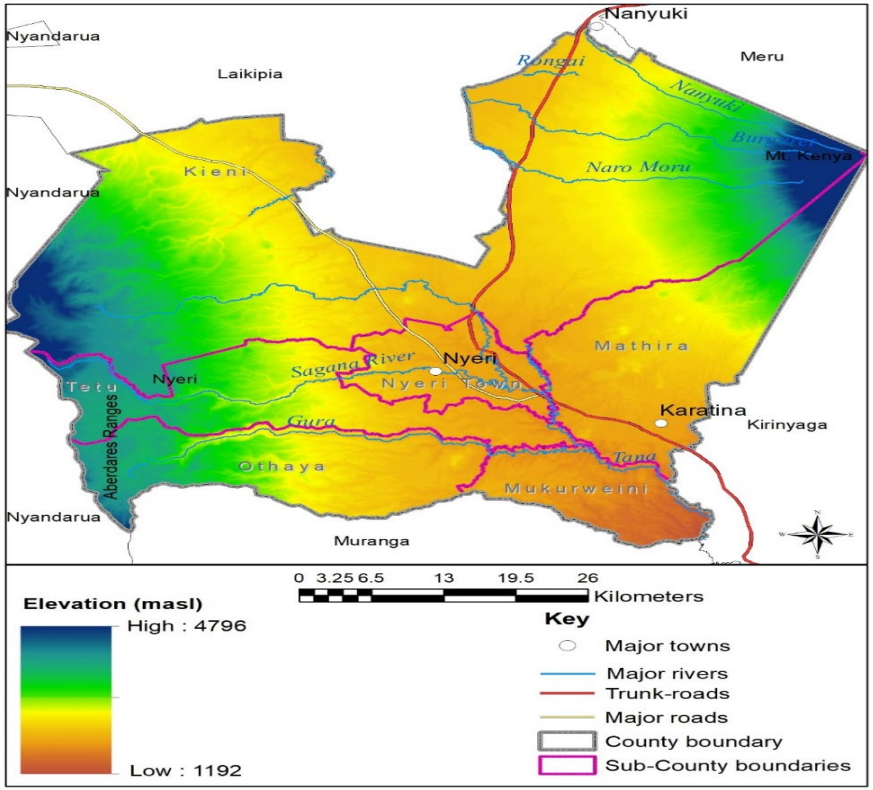

Figure 3.18 Nyeri Digital elevation and major rivers

3.2.6 Land use (SA4)

Current land uses include rainfed crop production, irrigated agriculture, livestock production, fish production, tourism and wildlife, agroforestry, forestry, mining and natural resources.

Kirinyaga County: Major land uses include land for crop production, irrigated agroculture, livestock production, fish production, tourism and wildlife, agroforestry and mining of natural resources (Kirinyaga County Government 2018). The total arable land in the county stands at 116,980 ha which represent 79% of total area. The total land under food crop production is currently 50,864 ha and 31,244 ha under cash crop production. The major crops grown include tea, coffee, bananas, macadamia, Hass avocado, cabbages, French beans, tomatoes, maize, beans, sweet potatoes, bananas, macadamia, avocado, tissue culture banana, arrow roots, cassava.

Embu County is characterised by a predominantly rural settlement pattern where there is concentration of people along the major permanent water sources such as rivers and dams where irrigation, farming and fishing are carried out. The average farm size for small scale farming is in range 0.8-0.9 ha[2]. The major land uses in the county are rainfed crop production, Irrigated agriculture, Livestock production, fish production, Tourism and Wildlife, Agro-forestry and Mining of natural resources.

Nyeri County: Arable land in the county is estimated at 987.5 km^2 (Nyeri County Government 2018). In terms of land ownership, most of the land is owned by individuals as freehold where mainly subsistence farming is practiced with the mean holding size being one hectare for majority of the smallholders. Except for area size, land uses in Nyeri are similar to ones in Kirinyaga. Land uses include rainfed crop production, irrigated agriculture, livestock production, fish production, tourism and wildlife, agroforestry, forestry, mining and natural resources (Nyeri County Government 2018).

[2] Cultivated land: In 2019, 130,990 farming households in Embu County operated 122,114 ha of farming land, translating into 0.93 ha per household (Kenya 2019 Census, Vol IV).

3.2.7 Land cover (SA1 and SA2)

Cultivated land and built-up areas increased across the three counties with higher increases for cultivated land recorded in Embu (while higher increases in built up areas in Nyeri). Water bodies reduced marginally from between year 2000 and 2020. In the same period forest tree cover reduced by 2.6%, 7.2% and 3.4% in Kirinyaga, Embu and Nyeri based on global forest statistics.

Kirinyaga County land cover can be classified into seven broad classification types, namely: Cultivated land, Forest, Grassland, Shrubland, Waterbody, Built-up areas, Bare land and Permanent Snow and Ice. Land cover changes in terms of area and percentage between year 2000 and 2020 is presented in (Figure 3.18).

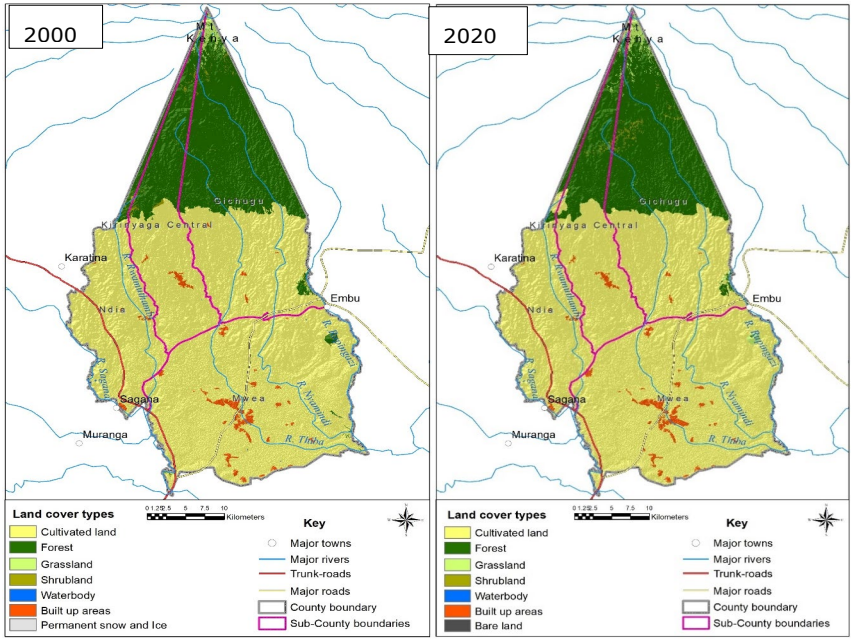

Figure 3.19 Kirinyaga land cover maps year 2000 and 2020
Source: National Geomatics Center of China (2014).

Table 3.1 data show that between 2000 and 2020 there were increments in percentage land cover of cultivated land (though insignificant), built-up areas and grassland cover when changes are expressed as percentage change in area surface. The percent land cover changes of forests, shrublands and water bodies decreased. The decrease in forest cover by 2.5% (% area change) is corroborated by Global Forest Watch citing a 2.6% decrease in tree cover from 2001 to 2020.

The general decrease in forest cover, due to increases in farming, population pressure and urbanisation as well as climate change was triangulated in the FGDs.

Table 3.1 Land cover change analysis between year 2000 and 2020, Kirinyaga County

Land Cover	Area 2000 (Ha)	Area 2020 (Ha)	2000 (% cover)	2020 (% cover)	Change in area (Ha)	Percent change in area (%)
Cultivated land	110,027	110,436	74.12	74.39	409	0.4
Forest	34,596	33,729	23.31	22.72	-866	-2.5
Grassland	1,052	1,541	0.71	1.04	489	46.5
Shrubland	6,98	524	0.47	0.35	-173	-24.9
Waterbody	62	28	0.04	0.02	-33	-54.8
Built up areas	2,000	2,172	1.35	1.46	171	8.6
Bare land	8	13	0.01	0.01	5	62.5
total	14,8446	14,8446	100.00	100.00		

Source: National Geomatics Center of China (2014).

The FGD indicated that cultivated land has increased marginally, but on a per capita basis cultivated land has been declining due to increasing population and land sub-division.

Embu County: falls into nine broad classifications namely; Cultivated land, Forest, Grassland, Shrubland, Wetland, Waterbody, Built-up areas, Bare land and Permanent Snow and Ice (Figure 3.19).

Table 3.2 further shows the land cover changes in terms of area and percentage between year 2000 and 2020. The data show that between year 2000 and 2020 there were increments in percentage land cover of cultivated land, built up areas and water bodies while forests, shrublands and grasslands decreased. Cultivated land, water body and bult up areas increased between 2000 to year 2020. The decrease in forest land, due to a.o. illegal logging and charcoal production was corroborated by the FGD.

Trends in decrease in forest cover has been triangulated by Global Watch that uses a different methodology and reported a 1.2% loss between 2002 and 2020, a shorter time period than the observations made in this study (Table 3.5).

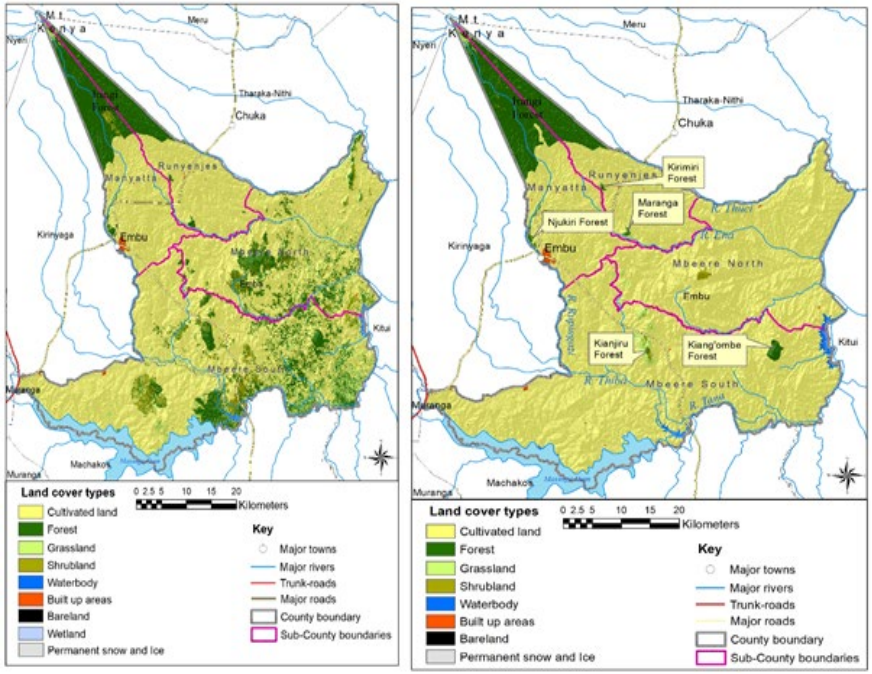

Figure 3.20 Embu land cover maps year 2000 and 2020
Source: National Geomatics Center of China (2014).

Table 3.2 Land cover change analysis between year 2000 and 2020, Embu

Land Cover	Area 2000 (Ha)	Area 2020 (Ha)	2000 (% cover)	2020 (% cover)	Change in area (Ha)	% change per area of land
Cultivated land	203,627	253,023	71.87	89.30	49,396	24.6
Forest	50,677	21,840	17.89	7.71	-28,836	-56.9
Grassland	12,857	2.682	4.54	0.95	-10,175	-99.9
Shrubland	12,334	830	4.35	0.29	-11,504	-93.3
Wetland	5	0	0.00	0.00	-5	-100
Waterbody	3,034	4,169	1.07	1.47	1,135	37.4
Built up areas	678	760	0.24	0.27	82	12.0
Total	283.332	283,332	100.00	100.00		

Source: National Geomatics Center of China (2014).

The county has two gazetted forests (Irangi and Maranga) and six non-gazetted forests (Kiang'ombe, Kirimiri, Kianjiru, Njukiri, Ndune and Kiambere) (Table 3.3)).

Table 3.3 Embu County forest cover analysis

Name	Location	State	Area (Ha)	Category	Remarks
Irangi	Embu East and Embu North Sub-Counties	Gazetted	Indigenous (15,308 ha) Industrial (198 ha)	Indigenous closed canopy and plantation. forest	Forest part of Mt. Kenya Water Towers and source of Kapingazi, Rupingazi, Ena rivers
Maranga Hill	Embu East Sub-County	Gazetted	Natural Forest (173.5 ha) Plantation (46 ha).	Indigenous and plantation forest	Forest important for Runyenjes Town climate amelioration and potential ecotourism site.
Njukiiri East	Embu North and Embu West Sub-Counties	Proclaimed forest area	Indigenous (165.6 ha) Industrial (278.1 ha)	Indigenous closed canopy and plantation forest	Forest source of perennial streams which drains to Rupingazi River. Forest important for Embu Town climate amelioration and is a potential ecotourism site.
Maranga Hill	Embu East Sub-County	Gazetted	Natural Forest (173.5 ha) Plantation (46 ha).	Indigenous and industrial forest	Forest is important for Runyenjes town climate amelioration and a potential ecotourism site.
Kirimiri Hill	Embu East Sub-County	Trust land managed by KFS	Natural Forest (94 ha) Plantation (7 ha).	Indigenous and industrial forest	Forest is important for Runyenjes town climate amelioration and is a potential ecotourism site
Kianjiru Hill	Mbeere South Sub-County	Trust land managed by KFS	1004.2 ha	Natural Forest	Potential for wind power, sky viewing site and potential ecotourism site.
Kiang'ombe Hill	Mbeere North Sub-County	Trust land managed by KFS	2,104.0 ha	Natural Forest Closed canopy at the top and bush land in the lower Zone	Major water catchment site which is a source of perennial stream which drains to Tana River and also a major water abstraction points for the community. Potential ecotourism site and climate amelioration.
Kiambeere Hill	Mbeere South Sub-County	Trust land managed by KFS	643.0 ha.	Natural Forest	Potential for wind power, sky viewing site and potential ecotourism site. Forest has been partially encroached.
Ndune Hill	Mbeere South Sub-County	Trust land managed by KFS	1004.2 ha.	Natural Forest	Potential for wind power, sky viewing site and potential ecotourism site.

Source: Embu County Government (2018).

Nyeri County: a land cover map is presented in Figure 3.19. Land cover analysis between 2000 and year 2020 for Nyeri shows that there was an increase in cultivated land (though insignificant), grassland and built up areas (Table 3.4). However, it is noted that per capita cultivated land decreased over the same period. This was corroborated by participants of FGD. Forest cover decreased by 6.7% between 2000 and year 2020 while the Global Forest Watch using a different methodology estimated figures of 3.4 % decrease from 2001 to 2020 (Table 3.5).

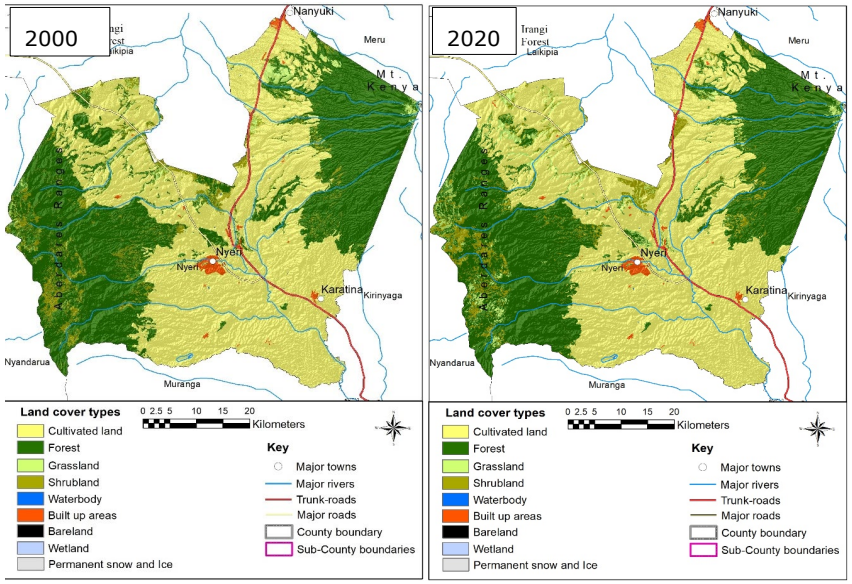

Figure 3.21 Nyeri land cover maps year 2000 and 2020
National Geomatics Center of China (2014).

Table 3.4 Land cover change analysis between year 2000 and 2020-Nyeri County

Land Cover	Area 2000 (ha)	Area 2020 (ha)	2000 (% cover)	2020 (% cover)	Change in area (ha)	% change in area
Cultivated land	173,410	174,718	51.98	52.37	1393.20	0.8
Forest	134,503	125,483	40.32	37.61	-9,020.61	-6.7
Grassland	5,554	13,338	1.66	4.00	7,783.65	140.2
Shrubland	17,431	17,256	5.22	5.17	-175.05	-1.0
Waterbody	116	61	0.03	0.02	-56.07	-47.
Built up areas	2,598	2,759	0.78	0.83	160.74	6.20
Permanent snow and Ice	11	11.43	0.00	0.00	-0.09	3.9
Total	333,627	33,3627	100	100	91	

Source: National Geomatics Center of China (2014).

Table 3.5 Tree cover changes in Kirinyaga, Embu and Nyeri Counties

County	Tree cover[1] in 2000 (ha)	% lost by 2020	Approximate cover retained in 2021 (ha)
Kirinyaga	148,434.6	2.6	144,575.3
Embu	283,361.3	7.2	262,959.3
Nyeri	333,451.5	3.4	322,114.1
All	765,247.4	4.7	729,648.8

Source: Global Forest Watch 2021.

[1]Comprises natural forests, plantations and non-forests.

3.2.8 Historical land use change (SA5)

Land use changed towards planting high value crops, conversion of wetlands into agricultural land, conversion of agricultural land into urban settlements, loss in vegetation cover, encroachment into riparian areas and decrease in river water volumes.

Kirinyaga County: Over the last 25 years there has been a change in land uses: Increased diversification to other crops (rice, Hass avocado, grafted macadamia, bananas, cabbages, tomatoes and French beans) and dairy

farming; encroachment into wetlands and river banks for cultivation; degradation of both gazetted and non-gazetted forests and reduction in tree cover; increased intercropping of coffee with other crops (potatoes, passion fruit etc.); Increased encroachment and conversion of wetlands into agricultural land (Kimoriri, Itetema, Gathuki, Kiambatha, Gatumbi and Mubur and Kimorori swamps), encroachment into rive riparian areas (Kiine, Nyamindi, Kii, Kiwe, Rodo, Kavinda, Sagana and Egendabura rivers); expansion of urban areas and decrease in water volumes (Thiba and Nyamidi Rivers) during dry periods.

The major drivers to land use change are environmental degradation such as a decline in soil fertility, deforestation, cultivation along river banks, industrial pollution and unsound farming methods and increasing population. Illegal logging has contributed to decimation of forested areas. In recent years, climate change and variability has also emerged as a key driver to land use change and threat to sustainable development in the county. This is because the rise in temperatures and erratic rainfall has resulted in the drying up of some rivers and recession of glaciers on Mt. Kenya with agriculture and health (increase of malaria) being the most affected.

Of the drivers of change include need to diversify away from tea and coffee; emerging market demands and favourable prices for crops such as rice, arrow roots, horticultural crops and miraa; encroachment into forests for agriculture especially along boundaries and illegal livestock grazing in forested areas; Lack of enforcement of legislation to prevent the encroachment of wetlands and county governance where some wetlands have been allocated for farming.

Embu County: Coffee was introduced in Embu in 1933 but it was not until the 1960s that large numbers of farmers adopted the cash crop to the detriment of other crops in upper Embu. However, the plummeting of coffee prices in the 1990s slowed the expansion of the crop. The decline of soil fertility due to continuous cropping with little addition of manure and climate change effects have contributed to yield decline of maize and other crops. Other major drivers to land use change include environmental degradation through acts such as sand harvesting, erosion, deforestation in farming areas, forest illegal logging and charcoal production in Arid and Semi Arid Lands (ASALs) and wetland encroachment (Maitima et al. 2004.). The apiculture industry has also been constrained by destruction of natural habitats. The extraction of building materials such as rocks and mud to make bricks also continues to degrade the environment.

Key informants and farmers triangulated that there has been land use change over the last 25 years: Diversification into other agricultural enterprises such as banana, avocado, macadamia, milk and honey production; Uprooting of coffee and tea by some farmers to plant khat, macadamia nuts and vegetables; Shift to production of short cycle crops that generate more income faster than that of coffee and tea; Uprooting tradition varieties of coffee trees for newer varieties resilient to changing climatic conditions and infestation by pests and diseases; converting agricultural land adjacent to town into urban settlements e.g. for rental houses, universities, conducting ASK shows; conversion of wetlands into agricultural land and increased incidences of mining (brick making, sand mining etc).

Nyeri: Over the years, there has been a general decline in land productivity resulting in a decline of the natural resources ability to support the population e.g. reduced farm productivity due to decline in soil fertility, soil erosion, over cultivation of the land, increased scarcity of resources such as water, grazing lands and arable area.

Key Informants and Focus Group Participants made further observations on land use and land use change over the last 25 years: Agricultural land per household has decreased; area under wetlands and riparian areas has decreased; pyrethrum production collapsed; increase in planting high value crops (avocadoes, macadamia, bananas etc); encroachment into the forest and road construction through forest; Conversion of agricultural land to urban centres; encroachment into game parks and game reserves for grazing, settlement and logging.

The major drivers of land use change include cultivation on fragile areas such as steep slopes, wetlands, riparian reserves and quarrying activities. This has led to landslides and soil erosion hence reduced productivity. The county is prone to landslides in the hilly areas of Mukurwe-ini, Othaya and Tetu Sub-Counties due to poor farming methods where riparian areas have been destroyed and rivers banks left bare. Other drivers of land use change include Population increase, farming in riparia areas and conversion of agricultural to urban areas due to lucrative land prices for land bordering agricultural lands.

3.2.9 Protected Areas (SA6)

The Counties of Kirinyaga, Embu and Nyeri have five protected areas each comprising various sizes of gazetted forests, forest reserves, National Parks and game reserves.

Kirinyaga: There are a total of 6 protected areas in Kirinyaga County: Five forests and Mwea National Reserve. The major protected areas in the County are part of the Mt. Kenya Ecosystem which consists of parts of Mt. Kenya National Park (71, 510 Ha) and Mt. Kenya Forest/National Reserve (198 249.69 ha) (KFS 2010).

There are seven forests in Kirinyaga County, out of which 5 are gazetted (protected), (Table 3.6). The two non-gazetted forested are Karimandu forest covering an area of 12 ha and Kerugoya urban forest covering an area of 10 ha (Kirinyaga County Government 2018).

Table 3.6 Protected areas present in Kirinyaga County

Name	Size in Ha
Mt. Kenya Forest	35,043
Njukiini West Forest Reserve	570
Murinduku Forest Reserve	194
Kariani Forest Reserve	24
Kamuruana Forest Reserve	23

Source: Kirinyaga County Government (2018).

Embu: There are a total of 5 protected areas in Embu County. The major protected areas in the counties are Mwea National Reserve (4,200 ha), Maranga Forest Hill Reserve (219.5 ha), Irangi Forest Reserve, The Mt. Kenya National Park and Mt. Kenya Forest/ National Reserve covering a total of 18,258.60 ha in Embu, (KFS 2010). Non-gazetted forests include Kimiriri, Kiambere, Kiang'ombe, Kianjiru, Ndune and Njukiri.

Nyeri: The major protected areas are the Aberdares Ecosystem (Aberdares National Park; Aberdares Ranges Forest Reserve) and Mt. Kenya Ecosystem (Mt. Kenya National Park; Mt. Kenya Forest/National Reserve).

3.2.10 Key biodiversity habitats (SA8) and natural ecosystems (SA2)

Kirinyaga, Embu and Nyeri Counties have key biodiversity areas and natural ecosystems

Kirinyaga County is part of Mt. Kenya Forest Ecosystem, a Key Biodiversity Area (KBAs) (Gacheru, Mutunga et al. 2020) in Kirinyaga in addition to Mwea National Reserve and wetlands. Other wetlands include: Kiwe- Kimorori; Upper Nyamindi- Itetema, Kiang'ondu, Gitararo, Kathethe, Kangoi, Mototo, Munyu, Mueru, Njoga, Kainamoi; and Rwamuthambi- Gikumbo (72 acres).

Others include Gikumbo, Kariagagachomo, Mairuinya, Kirumiando, Gathimo (Kangaita CFA); Kiria Kinene (Njuki-ine CFA); Igethambura (Kathandeni CFA); Keria, Riabatha, Karindi and Gatondo (Castle CFA) (Table 3.7).

Table 3.7 Protected areas and endangered species in Kirinyaga County

Forested areas	Wetlands	Endangered species in forests/game parks and wetlands
Kangaita forest- Part of Mt. Kenya forest	Kiangwaci Thumaita Kiandangai Kariagagacomo (inside the forest)	**Trees** Podo, *mukaragathi*, *muiru*(Meru oak),*muthaiti* (red cedar), *mutundu*, *muhu*, *muhuru*, *mukoigo*, *mukurwe*(used in ripening bananas, *mukuyu, mugumo, moringa* **Animals** Elephant, gazelles/antelope, wild pig, hare, fox, buffalo, *gitore*, owl, crown birds, *thegere*, hornbill **Plants in wetlands** *Muthanje*, papyrus reed, *Ndothua* (used to treat measles in children), *Mwinduri*, *mararia*(vegetable rich in protein)

Source: this study.

Embu County: Key biodiversity areas for Mt. Kenya Ecosystem, which Embu County is part of has been consigned in the section for Kirinyaga County (*in bid*). Natural forests and ecosystems are presented in Table 3.3 (gazetted

forests). Other natural ecosystems include wetlands. None of the wetlands known in the Project area falls under Ramsar Convention as they are mainly small in size, less than 10 km^2 or above. Wetlands in the area are however under heavy threat, mainly through conversion to agricultural use.

Nyeri County: Key biodiversity areas include the Aberdares Ecosystem (Aberdares National Park; Aberdares Ranges Forest Reserve) and Mt. Kenya Ecosystem (Mt. Kenya National Park; Mt. Kenya Forest/National Reserve) and various wetlands

Natural forests and reserves have been presented under Section 3.2.8. None of the wetlands known in the project area falls under Ramsar Convention as they are mainly small in size, less than 10 km^2 or above. Wetlands in the area, (Table 3.8) are however under heavy threat, mainly through conversion to agricultural use.

Wetlands (swamps) in Nyeri do not receive required attention compared to rivers. They are continually encroached for farming. Other times they are drained and converted to settlements. Most of these wetlands are located within private properties and it thus becomes almost impossible for the administrators to access them and enforce wetland related regulations.

Table 3.8 Wetlands in Nyeri County

	Name of wetland	Area/Location
1	Thuti Swamps	Othaya
2	Kandune Swamps in Kabaru	Kabaru
3	Rongai Swamps	Kambura-ini Location
4	Njengu Swamps	Kimathi
5	Kianjogu Swamps	Mathira
6	Mumwe	Mahiga,Othaya
7	Karia-ka-Ngware	Wanjerere
8	Karia ka Ngware	Wanyerere
9	Kianjuri	Kararumo forest
10	Kinungu,	Kararumo forest
11	Itoga,	Ichaga Location, Mathira East
12	Ragati Area	Mathira East near Karatina
13	Chele	Chele Forest
14	Chinga dam	Othaya
15	Mahuhi River	Upper Iriaini Location, Ragato
16	Makurata	Ndathi
17	Ngutui Swamp	Kimahuri in Kabaru Forest
18	Kahuhi Swamps	Kahuhi River
19	Thingini Swamps	
20	Gakanga (Itandara)	Tetu
21	Miagayuini (Tetu)	Tetu, Shopping centre
22	Kanjora	Kangora Sub Location, Tetu
23	Kiunyu Dama	Giakanja, Tetu
24	Kagioini	Chegenge, Tetu
25	Hombe dama	Hombe Forest
26	Nguniu dam	Hombe Forest
27	Kangati Kainit dam	Kiamariga, Nyeri

Source: Government of Kenya and IFAD (2014).

3.2.11 Threatened species and their habitats (SA7, SA8)

Kirinyaga, Embu and Nyeri which are part of the Mt. Kenya ecosystem. There are diverse flora and fauna threatened. At least 11 endemic species of plants and more than 150 species of animals that are near endemic.

Kirinyaga: Fauna species of special concern in the Mt. Kenya Ecosystem are (KWS 2010; Nature Kenya 2019):

- African elephant (*Loxodonta africana*)
- Black Rhinocerous (*Diceros bicornis*)
- Grevy's zebra is an endangered zebra species
- Mountain Bongo (*Tragelaphus eurycerus isaaci*)
- Black-fronted Duiker (*Cephalophus nigrifrons*)
- Leopard (*Panthera pardus)*
- Giant forest hog (*Hylochoerus meinertzhageni*),
- King African mole rat (*Tachyoryctes rex*)

About 53 out of Kenya's 67 African highland biome bird species, 35 forest specialist species and six of the 8 species from Kenyan Mountains Endemic Bird Area occur in Mt. Kenya (KWS 2010; Nature Kenya 2019). There are at least 11 endemic species of flora and more than 150 species that are near endemic in Mt. Kenya Forest (KWS 2010; Nature Kenya 2019). Indigenous forest species found in this ecosystem include Podocarpus latifolia mixed with *Nuxia congesta* at the upper altitudes, *Ocotea usambarensis* and croton sp. among others.

In farmlands a mix of indigenous and exotic tree species are found. Examples include *Croton macrostachus*, *Croton megalocarpus*, *Bridelia micrantha*, *Erythrina abyssinica*, *Cussonia holstii*, *Markhamia lutea* and *Ekebergia capensis*. Introduced species include *Grevillea robusta*, *Cuppressus lusitanica*, *Eucalyptus saligna*, *Eucalyptus camaldulensis*, *Cassia siamea* and *Leucaena leucocephala* among others.

Embu County: Threatened fauna species and habitats have been described in the section for Kirinyanga County (*in bid*).

Mwea National Reserve boosts of wealth of wildlife species. Species present in the reserve include (KWS 2021): African Elephant (vulnerable species), giant gazelle, slender mongoose, dwarf mongoose, stripped ground squirrel, spotted hyena, rock hyrax, warthog, impala, bush pig, Hartebeest, Tree hyrax, Lesser kudu, Nile crocodile, Leopard, Burchell's zebra, Buffalo, Hippo, Sykes monkey, vervet monkey, Rothschild zebra, common zebra, black-backed Jackal, giraffe, grey duiker, bushbuck, water buck, serval cat, Impala, olive baboon, cape hare, dikdik and tortoise. Rare species found in the reserve are: black backed jackal, yellow baboons, stripped ground squirrel and genet cat.

Over 200 Bird species are found in the reserve including (Birdlife International 2021; KWS 2021):

- Globally threatened endemic bird species present is the Hindes Babbler (Turtoides hindei) which is also a restricted range species.
- Two rare bird species recorded in the reserve are: the Pel's fishing owl (Scotopelia peli) (regionally threatened) and white -backed night heron (Gorsachius leuconotus,).

Regionally threatened species include African Darter (Anhinga rufa) and Martial Eagle (Polemaetus bellicosus), the status of which is unknown

Nyeri: The threatened fauna species and habitats have been described in the section for Kirinyanga County (in bid).

3.2.12 Ecosystem sustainability and risks (SA9)

Human activities and climate change threaten biodiversity and ecosystem sustainability in forested areas as well as farming areas. This includes unsound farming practices, solid and industrial waste disposal, water pollution and excessive water abstraction from rivers in the three counties.

Kirinyaga: The main causes of biodiversity degradation in these areas are wildlife poaching, wildfires and habitat loss due to deforestation resulting from illegal logging, charcoal burning, invasive alien species, pests and diseases, encroachment and excisions (GEF 2012; Nature Kenya 2019). Others are climate change that is altering habitats through altering vegetation community composition and overgrazing in adjacent forest boundaries.

The main threats to arable land include improper solid and industrial waste disposal, cultivation along riverbanks, increased dumping especially in urban centers and nearby forested areas, and poor farming practices such as unsound farming practices in steep slopes and excessive use of agrochemicals especially in lower parts (Mwea Constituency) of the county and over utilisation of private quarry sites making the area prone to soil erosion (Kirinyaga County Government 2018).

The major threats to water resources include a lack of sewerage system in the entire county resulting in water pollution; car wash activities on near riverbanks or water sources; excessive water abstraction from rivers; Climate change related extreme weather events such as droughts and flooding have resulted to decreased water quantity and quality; the drying up of Mt. Kenya's glaciers resulting in the reduction in the quantity of water of rivers emanating from it; increase in population exerting pressure to existing water supply schemes; Contamination of rivers with agrochemicals (fertilisers and pesticides) used in irrigation schemes hence poor quality of water mainly in the Thiba and Nyamindi rivers erosion (Kirinyaga County Government 2018).

The Focus Group Discussion triangulated that there was increased threat to biodiversity, including climate change (floods, drought, extreme temperatures); deforestation; hunting/poaching; floods; cultivation near water bodies; encroachment on wetlands and land inhabited by wildlife; destruction of animal habitats such as natural vegetation for porcupines; forest fires; planting of eucalyptus in the wetlands.

Mentioned threats to water resources include: encroachment into riparian land, flooding, excessive use of agrochemicals and water pollution; planting of eucalyptus trees, excessive extraction of water upstream (for irrigation and domestic use), over-siltation due to cultivating along riparian areas; reduction in water quality due to people swimming and washing near water bodies; directing untreated waste water to rivers and removal of natural vegetation.

FGDs indicated that such increasing threats would result in negative impacts in the future.

Embu: Threats to biodiversity and to forest ecosystems and associated impacts for the Mt. Kenya ecosystem have been described in the section for Kirinyanga County (*in bid*). Similar threats to land and water ecosystems are found also for Embu County.

Nyeri: Threats to biodiversity and to forest ecosystems and associated impacts for the Mt. Kenya ecosystem have been described in the section for Kirinyanga County (*in bid*). Similar threats to land and water ecosystems are found also for Nyeri County.

3.2.13 Ecosystem services provided (SA10)

Environmental services found are: water resources (fresh water); carbon sinks; buffer zone against human encroachment into forest reserves; food from farming practices; cultural services and spiritual/religious values, historical values (hide-outs for Mau Mau); aesthetic values; national heritage values (UNESCO World Heritage site) and research and education values

Kirinyaga County: The county is part of the Mt. Kenya ecosystem that provides diverse environmental services for multiple uses:

Water resources (fresh water): the Mt. Kenya ecosystem is the source of many rivers whose water is used for domestic purposes, irrigation and hydro-electric power generation (downstream water users).

Carbon sinks: Thick indigenous forests in Mt. Kenya and their associated plantations act as carbon sinks to emissions of CO_2 (KWS 2010; KFS 2010). For example, the total carbon stocks in the Mt. Kenya ecosystem in 2018 were estimated at about 73 million tonnes (Nature Kenya 2019).

Buffer zones: In Mt. Kenya Forest Reserve, Nyayo Tea Zones serve as buffer zones to check against human encroachment into forest reserves (KFS 2010).

Food: The area around the Mt. Kenya forest reserve has very high agricultural potential due to the fertile volcanic soils and reliable rainfall. Farming (crop and livestock) is thus the main stay of the economy of the forest adjacent communities around the ecosystem (KFS 2010). Crop production is also practiced in forest areas through the Plantation Establishment Livelihoods Improvement Scheme (PELIS).

Cultural services and spiritual/religious values: The Mt. Kenya ecosystem is regarded as a shrine by communities that live adjacent to it (KWS 2010). The sacred areas include hills (Kirima Kiamatu, Kirima Ntue, Kirima Kiamwioko and Kirima Kiamagimbi), the peaks of the mountain, lakes (Nkunga and Thae), caves and rivers (KFS 2010).

Historical values: The Mt. Kenya forest ecosystem has various historical values. The Burgeret forest, for example, was a hideout for Mau-Mau freedom fighters

who were fighting against the British colonial government in the 1950s (KFS 2010). Further, it was also a camping site for escaped Italian prisoners of war during the 2nd World War.

Aesthetic values: Scenic views in Mt. Kenya ecosystem (KWS 2010) include Snow-capped peaks, wilderness attraction and lakes, tarns and glaciers, diverse wild life and caves for tourist attraction (KFS 2010).

National heritage values: The ecosystem is recognised as a UNESCO World Heritage site (KWS 2010).

Research and education values: The Mt. Kenya ecosystem also offers Research and Education values- e.g. The Kenya Forestry Research Institute (KEFRI), students from Universities etc. (KWS 2010).

Focus Group Discussions held in Kirinyaga further provided insight on specific environmental services emanating from natural resources within the county and include: firewood and charcoal; timber; wind breakers; source of clean water; habitat for wildlife; pasture; fodder; favourable climate; beekeeping; medicinal plants; value for tourism; protection of soils; fishing from water sources in the forest; spiritual value-shrines; sustainable cultivation ('Shamba system'); and clean air.

In the FGDs, participants mentioned a number services being obtained from major rivers in the county, including: water for domestic and industrial use, irrigation, water-used in coffee and tea factories, fishing, tourist attraction and hydro-power generation (e.g. Kathandeni-Hydro-electric power for Thumaita Coffee factory as well as value for tourism. In addition, swamps and other related wetlands are reported to provide opportunities for cultivating specific crops such as arrow roots and vegetables; the provision of grass for livestock during dry seasons; a source of irrigation water; fishing; and opportunities for tourism.

In addition, Kangaita and Kathandeni CFAa obtained minerals (known as *munyu*), with healing properties. Njuki-ini CFA had a tree (*mugico*) that was used to purify water and also for weaving baskets and chairs.

Embu: Just like Kirinyaga, Embu County is part of the Mt. Kenya Ecosystem with similar ecosystem services as described in the section for Kirinyaga County.

Among the economic, financial and socio-cultural values adjacent communities derive from River Ena, Kapingazi and Itimbogo include: water for domestic use; water for irrigation; water for construction; water used by factories and institutions adjacent to these rivers; sand harvesting; fishing; for recreation activities such as swimming; they are also used for religious activities such as baptism.

Across three WRUAs FGDs, reported benefits of the forests include the following: a source of firewood, timber and logs; habitats for wildlife; pastures for both wildlife and livestock; as water sources of tributaries of river Tana that generate hydroelectric power; fresh air provision; wild fruits and food provision; medicinal and herbal products; beekeeping in these forests; fishing and hunting; tourism.

Wetlands such as Kiambai, Ngirimari and Njue were reported to offer the following benefits: they are the source of River Itabua, Kimangaru and other small streams. They provide water for domestic use, irrigation and institutional use. They are habitats for diverse plant, animal and insect life. Cultivation of arrowroots and other similar crops happen at the perimeters of these wetlands. They provide raw materials such as sand, clay, water and reeds for construction. Others harvest grass for their livestock from these ecosystems while others fish both native and farmed fish species from these wetlands. They also said they contribute towards controlling floods and soil erosion. Others use them for recreational purposes.

Nyeri: The county is also part of the Mt. Kenya ecosystem. Mentioned ecosystem services of forests and wetlands are similar to those described under Kirinyaga County

3.2.14 Values of ecosystem services provided (SA10)

Farmers are willing to pay for forest ecosystem services with annual payments for firewood; for livestock grazing; crop cultivation; beekeeping; fishing and getting herbal medicine from gazette forests. Farmers are willing to pay for river water and wetland ecosystem services.

Societal values (economic, financial and social) placed on landscape function and costs of maintaining and or enhancing landscape functions were indirectly solicited in FGD using a 'willingness to pay' environmental valuation assessment methodology for major river waters, forests and wetlands found in the landscape. This methodology was used to assess the values farmers place on ecosystem services from these natural resources, while actual schemes to pay for a number of ecosystem services exist in the counties as outlined below.

Kirinyaga: Actual user fees for accessing forest ecosystem services were quite diverse depending on the benefits and the forest in question:

- Firewood collection was charged KES 100-150 per month: KES 100/person/month for firewood collection from the forest (Rwamuthambi WRUA); KES 146/month for firewood (Kathandeni CFA); KES 150 per month for firewood (Njuki-ini CFA); KES 116/month for firewood (Castle CFA);
- Grazing charges KES 20-116 per animal: KES 30/month/sheep for grazing (Rwamuthambi WRUA); KES 100/head of cattle/month for grazing (Kathandeni CFA); KES 20/head of cattle/month for grazing (Njuki-ini CFA); KES 116/head of cattle/year for grazing (castle CFA);
- Cultivation of crops in the forest (the Plantation Establishment Livelihoods Improvement Scheme, PELIS): Levies ranged from KES 250-500 per year. KES 500/year for half an acre cultivation of crops in the forest while caring for young planted tree seedlings (Rwamuthambi WRUA); cultivation was KES 250/year (Njuki-ini CFA);
- Beekeeping in the forest charged KES 600-5000 per year depending on whether it is an individual or group activity: 1000/group/year for beekeeping (Kathandeni CFA); KES 5000/individual/year for beekeeping (Kathandeni CFA); KES 1,500/group/year (Kangaita CFA); KES 1,500/person or group/year for beekeeping (Njuki-ini forest); KES 600 per individual per year for beekeeping (Castle CFA); KES 1,500/ group/year for beekeeping (Castle CFA);
- Fishing: KES 500/individual/year for fishing (Castle CFA);
- Accessing herbal medicine: Charges ranged from KES 0-500 per entry into the forest; KES 500 per entry for herbal medicine (Kangaita CFA); KES 0 (Kathandeni CFA);
- Water ecosystem services: Current annual charges for using River Kiwe water were KES 1,000 per individual, KES 3,000 per household using water project and KES 5,000 per those abstracting water for commercial use (industry). Upper Nyamindi gave a figure of KES 2,000 annually. The charges mentioned by Rwamuthambi WRUA were KES 250 for a project, while charges for domestic use were made according to the amount used, but the minimum was KES 250 per month. The KIRIWASCO company was providing water to the households;
- Wetlands (swamps) ecosystem services: There were no prevailing charges leveied on the use of wetland resources (swamps).

When asked to value the services ecosystems provide to end users, using a willingness to pay methodology the following valuations emerged:

- When considering forests close to respondents, taking into account totality of ecosystem services, varying annual financial values were placed on ecosystem services by various FGD participants: Kiwe WRUA KES 100-500; Castle, Kangaita, Kathandeini and Njuki-ini CFAs KES 100-5,000;
- Water ecosystem services were valued in the range of KES 1,000-3,000 annually by participants of FGD based on willingness to pay; Kiwe WRUA KES 1,000-1,500 annually; Upper Nyamidi WRUA KES 3,600 annually; Rwamuthambi WRUA KES 1,800-3,000 annually.
- Wetlands (swamps) ecosystem services: Values of willingness to pay varied from one FGD to another-KES 100/boat ride/head to KES 1,500 per year. However, Rwamuthambi WRUA had a willingness to pay of KES 500 per household per year to continue enjoying benefits from the wetlands. Others mentioned KES 300-1,500 per year (Kangaita CFA); KES 100/boat ride (Njuki-ini CFA); KES 250/visit/head (Kathandeni CFA); KES 500/year for crop cultivation in land surrounding the wetlands (Castle CFA).The others were of the opinion that wetlands were 'freely available' and some were actually on farmers designated land areas.

Embu: Actual user fees for ecosystem services were diverse but followed similar patterns as in Embu:

- Beekeeping: 1,500 per individual annually (Upper ENA WRUA, ITABUA WRUA, ITIMBOGO WRUA);

- Collecting firewood from forest: 1,500 per individual annually (Upper ENA WRUA, ITABUA WRUA, ITIMBOGO WRUA);
- Attending Embu County Agricultural Society of Kenya (ASK) show in Njuki-ini Forest: KES 200 per entry;
- Water ecosystem services (river water): Only those using piped water currently pay while those neighbouring rivers do not pay since water 'passes through their farm'. Current payments made to use piped water from water Projects was about KES 3,000 annually and KES 8,400 annually for water supplied by Embu Water and Sewerage Company paid roughly 8,400 (Upper ENA WRUA, ITABUA WRUA, ITIMBOGO WRUA);
- Wetlands ecosystem services (swamps): Currently there are no payments levied on use of wetland ecosystem services, leading to 'the tragedy of the commons' with regards to wetlands utilisation and subsequent degradation.

When asked to value the services ecosystems provide to end users, using a willingness to pay methodology the following valuations emerged:

- Participants were willing to pay KES 1,200-6,000 per person annually to continue enjoing ecosystem services from the forests in Embu.
- Participants were willing to pay KES 1,200-24,000 per person annually to continue enjoing ecosystem services from rivers in Embu depending on what they will use the water for.
- The WRUA members would be willing to pay between 1,200 and 6,000 Kenyan shillings annually per person for the restoration of the degraded wetlands (Upper ENA WRUA; ITABUA WRUA). The main reason they would pay even though most were not deriving any direct benefits from wetlands was that they were direct sources of rivers and streams that were greatly depended upon by the local communities for domestic and agricultural purposes.

Nyeri: Values placed on forest, water and wetlands (swamps) ecosystem services:

- Currently farmers pay to access services from protected forests in the county-grazing of animals, firewood collection etc. On annual basis these payments are in the range KES 4,320-KES 8,800;
- Water ecosystem services (river water): Participants of FGDs indicated that their water bills ranged from KES 1000-KES 14,440 annually depending on the Water Project they subscribe to and what the water is used for (WRUA, Kagumo WRUA and Gura WRUA);
- Wetlands ecosystems services (swamps): Most of the wetlands are unprotected and others somewhat protected because they are located on private lands and there is no public access. Currently farmers do not pay to access wetlands but a few who lease the wetlands for farming activities are the ones paying for the wetlands. Level of payments are on mutual agreement and in the range of KES 200-15000 annually (Gura WRUA, Ragati WRUA, Kagumo WRUA).

3.3 Climate change and extreme weather events

3.3.1 Historical occurrence of extreme weather events (SA50)

Climate variability and extremes is emerging as a major threat to livelihoods with extreme weather events (temperatures, rainfall, flooding) being experienced (2011-2020) in Kirinyaga, Embu and Nyeri.

An extreme weather event is typically considered as being an extreme event is a time and place in which weather, climate, or environmental conditions—such as temperature, precipitation, drought, or flooding—rank above a threshold value near the upper or lower ends of the range of historical measurements. The choice of the threshold is subjective, often set at the highest or lowest 5% or 10% of historical measurements.

Kirinyaga: According to the Kirinyaga County Integrated Development Plan (2018-2022, page 46), climate variability and extremes is emerging as a major threat to sustainable development of the county (Kirinyaga County Government 2018). Droughts, floods, heavy rainfall, landslides and low temperatures had affected the community over the years and worsened from 2010. The years marked X exhibited extreme climatic factors in the county just like those marked N and M (Table 3.9).

Table 3.9 Years that had extreme weather events (FGD Results)

Climatic factor	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Drought						X; M				
Floods								X		
Heavy rainfall	N	N	N	N	N	N	N	X; N	NM	N
Landslides	N	N	N	N	N		N	N	X	N
Low Temperature									X, M	

Key: N-New Ngariama; M-Mutira Coperative Society FGDs (coffee zone); X= Men FGD Thumaita-Tea zone.

Source: this study.

Historically, the worst floods across Kenya, were the El Nino rains of 1997-98, which displaced 1.5 million people. Drought, on the other hand, hit hardest in 2011, leaving 3.5 million people affected by famine. In the following years: 2010/2011: Kenya experienced its worst drought in 60 years, with 13.3 million people being affected by the drought.

In 2005, another 'national catastrophe' was declared in reference to the famine that affected 2.5 million persons in Kenya (Northern Kenya). Furthermore, in 2004, due to the failure of the long rains (March-June), massive crop failure left more than 2.3 million people in need of assistance. Finally, in 2000, 4 million people were in need of food aid after Kenya was hit by its worst drought in 37 years. Essentially, the droughts and floods that have been experienced in Kenya's are a sign that natural resilience is breaking down.

Embu: In the past, Embu County has witnessed floods which were largely caused by overflow in main river banks, thereby causing enormous damage and loss of life and property including crops and infrastructure. Climate change has worsened the effects of flooding in Embu County as desertification and deforestation have led to the erosion of top soil for crops and trees to grow (Ministry of Agriculture 2016).

Historical occurrence of extreme weather events have been observed at field level and triangulated in FGDs and KIIs. Over the last 5-10 years rainfall patterns in the area have become irregular and unpredictable. Temperature patterns have also transformed over the last 5-10 years. Tea and coffee farmers reported that some years were relatively cold while others hot. In the last 10 years, extreme heavy rainfall was experienced in the area in 2015. Extreme hot temperatures were experienced in 2017 and 2018. Extreme low temperatures were experienced in 2015 about the same time the heavy rains were received.

Nyeri: the county is prone to both drought and floods since some areas are semi-arid (those lying on the leeward side of Mt. Kenya) and others very wet. Rain patterns in Nyeri County have changed, with amounts decreasing after every 3-4 years. Drought is common in the semi-arid Kieni West, East Mukurweini, Mathira West and Tetu where the consequences include crop failures (if crops are still in the field), or no planting at all (if the drought comes before farmers plant) and reduction in milk production following a decrease in quantity and quality of pastures.

When asked about the most important climate risks (extreme weather events) affecting the community, the farmers identified droughts, heavy rains, landslides and floods. According to the farmers, they experienced drought in 1984 and 1992. Heavy rains and floods were experienced in 1998 and 2020, while landslides were experienced in 2018,2020 and 2021 in some areas in the county. They further stated that in the last 5-10 years, there has been no major change in the amount of rainfall. However, the rainfall seasons have greatly changed with unpredictable rainfall patterns, unpredictable onset and cessation of rainfall seasons with fewer periods of drought.

3.3.2 Temperature extremes different from historical averages (SA51)

Increasing temperature with departures from historic average is causing recession of Mt. Kenya glaciers, decreased river water volumes and incidences of malaria.

Kirinyaga: In Kirinyaga County, there has been rise in temperatures which has partly resulted in increase of malaria, erratic rainfall resulting to drying up of some rivers and also flooding especially on the lower parts of Mwea. The county is also already experiencing the effects of the recession of the glaciers on Mt. Kenya which is a water tower in the county (Kirinyaga County Government 2018). The most affected sectors are agriculture and health. Climatic analysis of extreme temperatures covering the East African region

including Mt. Kenya ecosystems has indicated that minimum temperatures have been on the rise since 1905 (Tan et al. 2020).

Embu: Farmers in Embu County testify to the intensive changes in climate and weather patterns in the County over time. These include increased temperatures (heat stress) in the months of January - March and August - October mostly in the hot and dry semi-arid lowland areas (Agro-ecological zones AEZs LM3, LM4 and LM5 - Mbeere North and South). In the cold season, the temperatures are extremely low especially in the cold and wet AEZ LH1.

Nyeri: A number of climatic hazards are evident in Nyeri County, the most remarkable being drought and extremely low temperatures. The most problematic with regard to agricultural value chains were identified as drought and variations in extreme temperature/frost (Ministry of Agriculture 2016).

In the past, the cold season spanned July to August, but now the cold season begins in May through August. Temperatures have become higher now especially during dry spells unlike in the past. Rain distribution is becoming unreliable and unpredictable. For example, the long rains of 2013 were delayed by 2 weeks in Kieni, and about 70% was received in April alone (Ministry of Agriculture 2016). Similar scenarios as are described for Kirinyaga and Embu Counties.

3.3.3 Known climate induced impacts (SA52)

Climate-induced impacts include recession of the glaciers on Mt. Kenya, increased incidences of dry spell affecting river water volumes, unprecedented extreme rain fall leading to displacement landslides and destruction of infrastructure (roads and buildings), rise in new pests (locusts, tomato leaf miner etc), delayed ripening of coffee resulting in adverse effects to women, youth and men attributed to income loss and pests and disease outbreaks.

Kirinyaga County has been experiencing the effects of the climate change related recession of the glaciers on Mt. Kenya (which is one of the most important water towers in Kenya). The most affected sectors are agriculture and health (Kirinyaga County Government 2018).

There has been a prolonged dry spell in Kirinyaga County in the last 10 years. This has affected water volumes in major rivers such as Nyamindi, Thiba, Rutui, Kiringa and Mukengeria, which are major suppliers of water to the Mwea Irrigation scheme.

In contrast to this, unprecedented extreme rain fall in Kirinyaga in 2020 led to displacement of households and deaths due to drowning and huge losses in lower parts of Kirinyaga, Mwea while land slides in May 2020 in Ndia constituency led to the submerging of coffee farms, destruction of buildings and displacement of people.

Due to climate change, new pests have been observed. From the year 2020, desert locusts ravaged most parts of the country, Kirinyaga included. This is a very new phenomenon. Similarly, there have been outbreaks of the pest Tuta absoluta (tomato leaf miner), destroying some tomato farms.

From FGDs and KIIs, climate change had contributed to soil erosion and decreased soil fertility, resulting in decreased yields (especially in tea and coffee); increase in pests and diseases e.g. False Army Worm in maize, higher expenditures on agrochemical due to disease and pest attack during cold seasons; Delayed rains affecting ripening of coffee.

Women were affected by climate change through: Reduced income due to lower yield from horticultural crops which are mostly done by women and the youth; Arthritis and pneumonia attacks arising from staying out in the cold when plucking tea; Pneumonia attacks, which also affected children and the elderly; Frequent coughs for women picking tea; Walking long distances looking for water during prolonged drought.

The men developed skin diseases from frequent spraying of crops against pests and diseases and also developed arthritis; men were affected negatively by cold weather when spraying coffee.

Climate change affected the youth through: Reduced income due to lower yield from horticultural crops; Increased unemployment because of adverse weather affecting agricultural production (especially during floods), therefore reducing casual jobs for the youth.

Embu County is particularly susceptible to sustained and extreme droughts, historically causing major damage and even total crop failure to staple crops like maize and illness and even death to livestock (Ministry of Agriculture 2016). Prolonged droughts in the county have reduced crop yields and caused drying up of seasonal rivers in Embu County like River Thura. Floods are also experienced in the lowlands within Embu County leading to soil erosion and siltation of River Tana.

Erratic rainfall patterns experienced in the county has impacted negatively on crop producton cycles of many crops both cash and food crops grown in the region.

During the seasons the area experiences extreme temperature drops, making women vulnerable to respiratory illnesses because of constant exposure to extreme low temperatures. The other way women uniquely face the brunt of climate change is when they have no any other alternative but to fetch water for domestic use from rivers and distant sources because of the frequent water rationing experienced during prolonged dry seasons.

Prolonged dry periods lead to low agricultural productivity and low household incomes. Low incomes mean men are not be able to fully provide for their family which more often than not ends in conflicts between husbands and wives.

The FGD participants stated that low agricultural productivity means few employment opportunities for young men and women who rely on casual labour to fend for their families. Few employment opportunities push some youth into a life of drug abuse and crime. Others relocate to other towns within and outside the county to look for better economic opportunities for themselves. Still others decide to get married really early so that they can support each other with the little they get.

Nyeri: Climate risks and changes have contributed to reduction in crop yields, increase in the incidences of pest and diseases, increase in wild fires, migration of animals and humans, and altered changes in ecosystem services, insufficient supply of timber and forest products, inadequate water supply and lack of clean air.

The FGDs and KIIs identified the specific impact of climate risks and climate change on women as that women suffer disproportionate job loss following climate risks, traveling long distances to collect water and firewood exposes women to risks of physical abuse and harm; poor mental health due to stress caused by the shocks; women have to work on the farms to earn a living when it is cold and drizzling-this exposes them to respiratory and cardiovascular diseases and increased domestic violence due to socioeconomic stress.

The specific climate risks and changes on men were identified as decreased ability to earn income and grow food, increased stress levels in men due inability to provide for their families; family disintegration – as men are forced to separate from their families to look for alternative sources of livelihoods; loss of self-esteem due to the inability to meet families' basic needs; money shortage increases tension in the families leading to gender-based violence; and more stress as they have to look for pasture and fodder for livestock.

The specific impacts that climate risks and changes have on the youth were identified by the participants as lack of employment and food and nutrition insecurity due to poor food availability. Female youth drop out of schools due to early marriages and increased family conflicts. Each of these factors could, in turn, serve as independent risks for the development of youth depression among the youth as well as alcohol and drug abuse.

3.3.4 Climate-related threats to agricultural production (SA53)

Historical maps of various threats to agricultural production are presented in Table 3.9 and Section 3.3.1 and 3.3.2.

3.3.5 Anticipated future changes in climate, climate impact and plant suitability (SA54, SA55 and SA56)

Climate change likely results in reduction in tea and coffee yields, pests and diseases surge, leading to high costs of production, destruction of road infrastructure, food insecurity and increased unemployment. Changes in precipitation and temperatures in drier parts of the three counties pose dramatic impacts on the phenology, distribution and composition of pasture grass species and alteration of habitats through altering vegetation community composition and future suitability of plant species.

Kirinyaga: No specific models of climate change have been developed for Kirinyaga County but general models such as *Projections of future meteorological drought events under representative concentration pathways (RCPs) of CMIP5 over Kenya, East Africa* has given the indication that drought events will intensify in Kenya over the next two decades while flooding is also expected to surge over the same period and beyond. It is anticipated that extreme weather events will have far-reaching consequences for agriculture, infrastructure, health and the energy sector if mitigation plans are not quickly put into action (Tan et al. 2020).

In the tea and coffee zone, it is anticipated that climate change will induce reduction in yields, trigger a surge in pests and diseases leading to high costs of production, rains will destroy road infrastructure, and there will be food insecurity and increased unemployment.

Based on the above stated climate change scenarios, it is estimated that the arid zones of Kirinyaga County will experience significant changes in precipitation and temperatures, with some places becoming wetter and others drier. These changes may pose dramatic impacts on the phenology, distribution and composition of grass species that form pastures for livestock, and upon which many people depend for their livelihoods.

Climate change is also transforming habitats through altering vegetation community composition and future suitability of plant species. For example, Nature Kenya (2019) reports that the impacts of climate change (such as frequent and prolonged droughts) are already being experienced in the Mt. Kenya forest ecosystem and has impacted biodiversity negatively. It's expected that some vegetation such as the unique alpine vegetation communities will reduce in area.

Embu: According to the Embu Integrated Development Plan (2018-2022 page 53), over the coming decades, global climate change will have significant, but yet uncertain impacts on food production and security, water availability, land use, health and energy supply in Embu County. Embu County will face substantial consequences due to the vulnerability, risks and impacts of climate change. With the potential risks from climate change on economic growth and poverty reduction in Embu adaptation to climate change is now a key issue in development planning for Embu County.

At field level, climate change is anticipated to result in declining productivity, low incomes, food insecurity and to make agriculture-dependent households sink deeper into poverty. It is also anticipated that warmer temperatures will result in increased prevalence of crop pests and diseases. This will obligate farmers to use a lot more agrochemicals and weeding to manage these pests and diseases than they did before.

Increased temperatures leads to infestation by sucking insects such as mites and aphids. Farmers without processing equipment, especially those in the hotter lowlands, are susceptible to these climate risks. With respect to future suitability of plant species similar effects are expected as presented for Kirinyaga County.

Nyeri: the anticipated changes are similar to Kirinyaga and Embu Counties.

3.4 Presentation of indicator values connected to landscape values and ecosystems services

Five indicators for evaluating the impact pathway on landscape management, particularly with respect to landscape values and ecosystem services, are measured during the baseline. Baseline values for these indicators are presented in this section.

(I.1.1) Forest cover in government controlled forests, community forests, and tea and coffee farmers' individually-owned forests.

Forest tree cover reduced by 2.6%, 7.2% and 3.4% in Kirinyaga, Embu and Nyeri based on Global Forest Watch statistics (see SA5 (land cover)).

(I.1.2) Abundance of native tree species that provide habitat integrity for biodiversity in government controlled forests, community forests, and tea and coffee farms and farmers' individually-owned forests.

Abundance of native tree species was not captured during this study. A previous study using 265 quadrants of 50 *100 m^2 in different agro-ecological zones on individual land in five counties that surround Mt. Kenya has estimated the number of native tree species at 286 in farmlands. The primary forest

cover loss (native/indigenous trees) and area occupied by primary forests as estimated by Global Forest Watch is presented in Table 3.10. The relative area covered by native trees was highest in Nyeri (21.4%) and lowest in Embu at 4.4%. There are at least 11 endemic species of higher plants and more than 150 species that are near endemic in Mt. Kenya Forest Ecosystem (KWS 2010).

Table 3.10 Primary forest (natural forest) cover loss in Kirinyaga, Embu and Nyeri

County	Primary tree cover year 2000-2001	Year 2002-2020 Primary tree cover loss (ha)	Primary tree cover (ha) 2020 Contribution to total Primary tree cover loss (%)	Total tree cover (Primary + 2nd) Primary tree cover loss (% area)	Primary tree cover area as (ha) 2020	County	Primary tree cover % of total tree cover area 2020
Kirinyaga	19,990	285	25%	1.4	19,705	144,575	13.6%
Embu	11,516	27	1.2%	0.23	11,489	262,959	4.4%
Nyeri	69,639	828	15%	1.2	68,811	322,114	21.4%
All	101,146	1,140		1.13	100,006	729,648	13.7%

Source: Global Forest Watch 2021.

Other studies have estimated that indigenous trees (closed and open canopy) in the Mt. Kenya forest ecosystem (Mt. Kenya Forest Reserve, Mt. Kenya National Park and Ngare Ndare Forest Reserve), without farmlands, occupy 59.4% of total land area of Mt. Kenya Forest Ecosystem (KWS 2010; Nature Kenya 2019).

(O.4.1) Square Meters of vegetation next to water bodies to prevent soil, drainage water or chemical product contamination.

(I.1.3) Kilometers of riparian areas on-farm and off-farm with increased vegetation cover (I.1.3)

Limited room for improving riparian areas for tea farmers without financial compensation as farm sizes are small and farmers are poor. 48% of the intended programme beneficiaries in the tea sector have land bordering a water body. Of those farmers 42% have a riparian strip on 5% of their land, with a size of on average 282 m^2 and 285 m^2 respectively (0.0282 and 0.0285 ha). The small proportion of land with riparian areas was to be expected as farmers have very small tea farms.

Coffee farmers appear to have a relatively higher riparian strip. In the coffee sector, 67% of the programme beneficiaries have land bordering a water body. Of those farmers 68% have a riparian strip on 17% and 24% of their land, with a size of on average 713 m^2 and 588 m^2 respectively (0.0713 and 0.0588 hectare). The proportion of farmsize with a riparian strip appears to be high but could also be because the relative farm sizes that border the rivers

(I.1.4) The number of landslides in the landscape

Landslides occur in parts of Kirinyaga, Embu and Nyeri during periods of heavy rainfall causing loss of arable land, crops and livestock, houses and human lives among other social and economic losses. Kirinyaga, Embu and Nyeri are among counties in Kenya flagged out as landslide prone areas. The landslides occur during periods of heavy rainfall and are accelerated by flooding. Limited databases exist that report systematically on frequency, intensity and impacts of landslides in the three target counties though such incidence rarely escape the attention of the government and media. There has been at least one incidence reported per year in the last 3 years for each of the target counties:

Kirinyaga

- 2018 (May): Kirinyaga, one person killed by landslide at night;
- 2019 (October): Kirinyaga (Kamweiti village), one acre tea farm swept by landslide;
- 2020 (May): Kirinyaga (Mwea); Two people died-aggravated by floods;
- 2020: Kirinyaga (Kamweiti village, Ndia), 100 coffee trees swept by landslide in Ndia Constituency.

Embu

Affected areas in Embu include Manyatta and Runyenjes:

- 2020: Embu (Manyatta), houses swept/buried and 5 persons died crossing a swollen river;
- 2017 (May): Embu, crops worth 3 million destroyed. A huge mudslide washed away a portion of tea farms;
- 2018: Mudslides in coffee zones.

Nyeri

The county is prone to landslides in Mukurweini, Tetu, Nyeri South, Mathira East and West sub counties.

- 2004: Nyeri (Othaya, kihuri), 5 people dead;
- 2010 (May): Nyeri (Mukurwe-ini), 500 people moved to high ground;
- 2013 (April): Nyeri (Mukurweini), residents moved to safer places;
- 2017 (November): Nyeri (Kangiri Village), one Acre Mt. Kenya Forest destroyed;
- 2018 (Nyeri); Heavy rains with landslides;
- 2020 (May): Nyeri (Chania area-Town), one person dead in a landslide;
- 2021: Nyeri, heavy rains with landslides.

Landslides are triggered by rapid saturation of the soil, which in turn reduces cohesion, surface tension and friction. Predisposing factors include poor farming methods where riparian areas have been destroyed and rivers banks left bare, farming on steep slopes without conservation measures in high rainfall areas and inherent soil status.


4

4 Stakeholder analysis and governance

This chapter identifies the actual and potential stakeholders and beneficiaries in the issues to be addressed by the programme (SA26-SA33); how they are engaged in the wider landscape; their level of involvement and influence, and the different existing governance arrangements (SA36-SA42).

4.1 Stakeholder analysis and governance: key findings and lessons for design

This first section provides an overview of the key findings, as presented in more detail in the subsequent sections:

- **131 non-financial different stakeholder groups are identified** in the Mt. Kenya region; 43%, 33% and 24% of these are from Kirinyaga, Embu and Nyeri respectively;
- **Financial stakeholders in the region are predominantly donors and investors**;
- **Farmers, donors and policy actors are key drivers** of project activities and impact;
- Major risks to the programme hinge on the **variety of stakeholders' interest in natural resources** for example usage, sharing, production and management of these resources. This is a potential conflict area for the different stakeholders due to the differentiation in prioritisation of needs. This conflict emerges in project implementation and needs a risk mitigation strategy that uses mutual benefits as leverage points;
- The key challenges for **including very/most vulnerable groups** in the programme design include resource access and the need for advocacy that tackles root barriers for the vulnerable such as gender, age and geographical inaccessibility; and creates access for them to benefit from the programme through inclusion focused programmes that promote empowerment of excluded groups such as gender based agricultural approaches;
- Stakeholders have **interactions across the food system, taking various roles and interacting with a variety of stakeholders**, with all stakeholders working with the farmers;
- An implication for the programme design is the need to **understand the value that each stakeholder adds to the food system** and to incorporate it into the project strategy and activities in order to link project activities to existing activities, learn from lessons from past programmes and build on collective stakeholder resources for effective intervention.

4.2 Identified stakeholders: their role and their interactions

The project Theory of Change relies heavily of the roles, realities and strategies that different stakeholders apply as they seek to improve landscape value, reduce supply chain-related risks, and improve the resilience of rural households in relation to climate change as seen in the Theory of Change diagram (Figure 1.1).

4.2.1 Multilevel and interconnected Stakeholder domains

Local, regional, national and international stakeholders operate in Kirinyaga, Embu and Nyeri Counties. They interact in the landscape at various levels; the major stakeholders identified *include* both financial and non-financial operating in the three counties.

Identified stakeholders include:

- Farmers;
- Tea factories (Kangaita, Ndima, Thumaita, Kimunye etc);
- Research institutions (Tea Research, KALRO, KEFRI);
- County governments;

- Country Departments-Ministry of Agriculture, Environment, Water, Gender etc;
- Financial institutions (Equity, Co-operative, ABSA, KCB, Family);
- Societies (Rwama, Rung'eto, New Ngariama, Thirikwa);
- SACCOS (Muteithia, Fortune, Bingwa, Utheri);
- Investors (Macadamia lumbua, Jungle nuts, Zeni dairy);
- NGOs (Upper Tana);
- National government;
- Politicians.

Table 4.1 Summary of non-financial stakeholders identified

	External	Internal	Total
Kirinyaga County			
SA 29: Companies	6	8	14
SA 29: Company		5	5
SA26: Producer		11	11
SA27: County Government		7	7
SA28: Landscape Change Maker	4	7	11
SA30: National Government	3	5	8
Sub-total	**13**	**43**	**56**
Embu County			
SA 29: Companies	6		6
SA 29: Company		3	3
SA26: Producers		6	6
SA27: County Government		6	6
SA28: Landscape Change Maker	5	5	10
SA30: National Government	4	8	12
Sub-total	**15**	**28**	**43**
Nyeri County			
SA 29: Company		5	5
SA27: County Government		7	7
SA28: Landscape Change Maker	4	6	10
SA30: National Government	2	4	6
SA26: Producers		4	4
Sub-total	**6**	**26**	**32**

Source: this study.

Non-financial stakeholder overview

The situational analysis identified 131 non-financial stakeholders, 43%, 33% and 24% of whom were in Kirinyaga, Embu and Nyeri respectively (Table 4.1). About 74% were internal stakeholders. Details of the stakeholders consulted are included in Annex 3a and Annex 3b (stakeholder matrix).

Development finance stakeholders: donors and investors

Examples of donor-funded programmes in Kirinyaga are presented in Table 4.2. A further discussion on landscape finance is in Chapter 6.

Table 4.2 Donor funded initiatives in Kirinyaga County

#	Sponsoring Organisation/ Promoter	Initiative	Location of implementation within the county
1	Ministry of Water and Irrigation with funding from IFAD and Government of Kenya	Upper Tana Natural Resources Management Project (UTaNRMP)	Entire county as well as other 5 counties: Embu, Muranga, Tharaka Nithi, Nyeri and Meru.
4	African Development Bank (ADB) is funding the Kenya Forest Service (KFS)	Green Zone Development Support Programme. Has 2 components: Environmental conservation; Livelihood	Gazetted forest areas
5	The county government	Agriculture Sector Development Support Programme (ASDSP); and National Agricultural and Rural Inclusive Growth Project (NARIGP)	The entire county
6	National Irrigation Authority	Creating a Rice Map;	Mwea region
7	Rainforest Alliance	Certification	Tea and Coffee growing areas
8	KTDA Foundation	Tree nursery project; Energy	Tea growing areas

Source: this study.

Farmers, factories and donors are the main contributors and key drivers of activities and impact in the tea and coffee food systems

Farmers rated various stakeholders according to their potential contribution to the programme, potential impact of the programme to the stakeholder, the degree of the stakeholder's ability to make or break the programme (power) as well as the interest the of the stakeholder (power-interest tool) in each of the three counties (Figure 4.4). Examples for Kirinyaga are presented in Table 4.3 and Table 4.4.

Table 4.3 Stakeholders' rating (men FGD Ndima)

Stakeholder name	Potential contribution to the programme	Potential impact of the programme to the stakeholder	Degree of the stakeholder's ability to make or break the programme (power)	Stakeholder's potential interest in the programme
Farmers	High	High	High	High
Government	Low	Low	Low	low
SACCOs	Medium	Medium	Medium	medium
Donors	Medium	High	Medium	high

Source: this study.

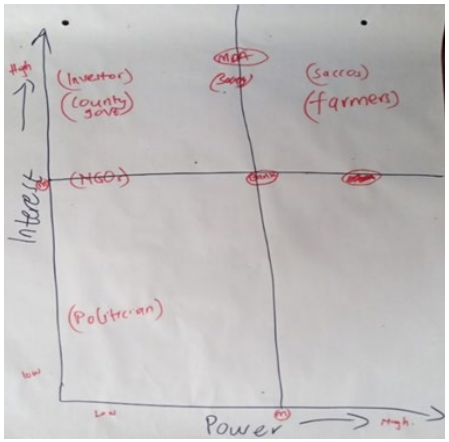

Figure 4.1 Levels of power and interest in the programme, Women FGD, Rwama FCS

Table 4.4 Stakeholders' rating (Men FGD Karithathi)

Stakeholder name	Potential contribution to the programme	Potential impact of the programme to the stakeholder	Degree of the stakeholder's ability to make or break the programme (power)	Stakeholder's potential interest in the programme	Reasons for rating stakeholders' interest in the programme
Farmers	High	High	Medium	High	Main beneficiaries of the programme
Donors	High	High	Medium	Medium	Will increase recognition
Tea and coffee factories	High	High	High	Medium	Will get more farmers on board, hence more returns
County government	Medium	Low	High	Medium	Will increase recognition and achieve their development agenda
National government	Low	Low	High	Medium	Will achieve their development agenda
Financiers	Medium	Medium	Medium	High	Will get more farmers hence higher returns
Research institutions	High	Medium	Low	Medium	Will increase recognition

Source: this study.

Government institutions and civil society associations that govern land and natural resource use

Stakeholders setting rules governing land and natural resources are mainly public bodies and or Civil Society Associations working with public bodies in

terms of implementation of regulations (Appendix 4). These stakeholders include:

- National Environment Management Authority (NEMA);
- Kenya Plant Health Inspectorate Service (KEPHIS);
- Kenya Forestry Service (KFS);
- Kenya Wildlife Service (KWS);
- County Department of land; Agriculture, natural resources and environment;
- Water Resource Users Associations;
- Community Forest Associations;
- Kirinyaga Investment Development Authority(KIDA)- Gives advisory on investment in Kirinyaga County.

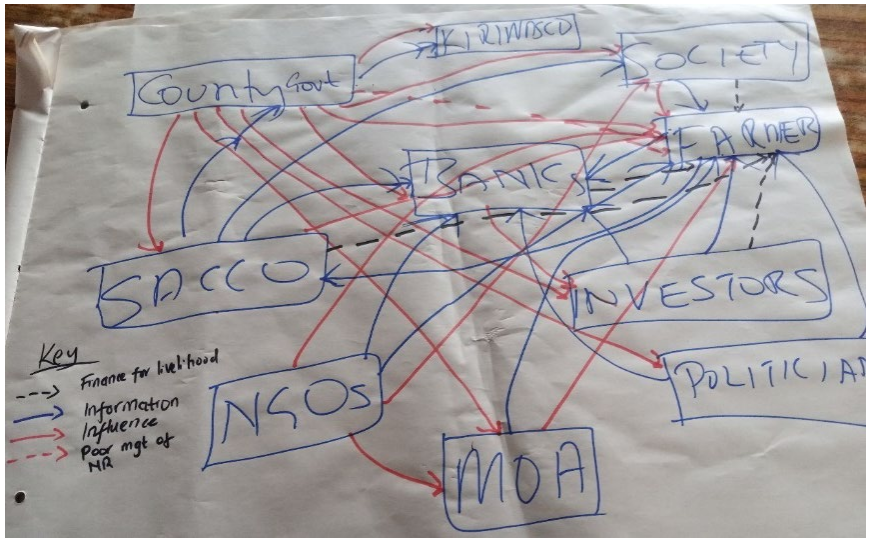

Figure 4.2 Net map for Stakeholders by participants of Women FGD, Rwama FCS

Stakeholders engage in various interactions across the food system and natural resource use, with each stakeholder playing various roles and interacting with a variety of stakeholders; with all stakeholders working with the farmers.

The stakeholders interacted with the landscape by carrying out various activities, which among others included the following: purchase of farm produce, giving advisory services (extension), natural resource management (Community Forest Assocations, Water Resource Users Associations etc.), conservation activities, regulatory functions (e.g. Kenya Forest service, Kenya Wildlife service, KEPHIS), primary production, processing farm products, research (e.g. Kenya Forestry Institute, KALRO etc), funders of programmes, and input market players among others. The interaction between various stakeholders was analysed using social network analysis tool (netmap) with an illustration shown in Figure 4.5.

From power-interest analysis and social network analysis (netmap), interactions among stakeholders took various forms in the tea and coffee zones as summarised in **Fout! Verwijzingsbron niet gevonden.**4.5 for Kirinyaga County. County Departments of Agriculture, Environment, Water etc. were connected to farmers through information sharing.

Table 4.5 Interaction among stakeholders in tea and coffee zones (FGDs in tea and coffee zones), Kirinyaga County

	Nature of connectedness	Stakeholders in question
1	Through information sharing on natural resources	Farmers, Ministry of Agriculture and other county Departments (environment, water)
2	Through influence in the use of natural resources	NGOs, farmers, Ministry of Agriculture and other county Departments (environment, water), Kirinyaga Water and Sanitation Company (KIRWASCO)
3	Through financial products on livelihoods	SACCOs; Farmers; Investors; Politicians
4	Through poor management of natural resources	County Government, farmer

Source: this study.

Stakeholders' interest in natural resources vary according to use, sharing, production and management of these resources; this is a potential conflict area due to the differentiation in priority. This conflict emerges in project implementation and needs a risk mitigation strategy that uses mutual benefits as leverage points.

Stakeholders who might experience a conflict during programme implementation are shown in Table 4.6. It was mentioned that farmers may run into a conflict with SACCOs because of unfavourable interest rates.

Table 4.6 Potential conflicts that arise among stakeholders

Stakeholder name	Stakeholder in conflict with	Nature of conflict
Farmers	SACCOs	Unfavourable interest rates for loans given to farmers
Government	Donor	The government may want funds channelled through them
SACCOs	Donor	SACCOs lack of accountability

Source: this study.

Stakeholder challenges are largely due to resource limitations and are linked to their role in the food system.

Stakeholders in Kirinyaga as well as in Embu and Nyeri face myriad challenges. At farm level (e.g. limited access to land and other inputs), supply chain level (poor market linkages), natural resource management (poor management of natural resources), policy constraints (inadequate implementation of policies on natural resources) and access to finance (e.g. lack of collateral) among others.

Implications for programme design are the need to understand the value that each stakeholder adds to the food system and to incorporate it into the project strategy and activities in order to link project activities to existing activities, learn from lessons from past programmes and build on collective stakeholder resources for effective intervention.

The SA reveals a pool of stakeholders with interests that align themselves well and can contribute to programme objectives through synergetic and complementary partnerships:

- Donor-sponsored projects currently running in the landscape dealing with climate smart agriculture (e.g. Kenya Climate Smart Agriculture Project (KCSAP) in Nyeri); diverse value chains (National Agricultural and Rural Inclusive Growth Project, NARIGP, in Kirinyaga and Embu); and natural resource management (e.g. Upper Tana Natural Resource Management Project) among others
- Cooperative Societies with linkages to beneficiaries i.e., Coffee farmers in the cooperative society; championing or advocating of the programme
- Tea factories that have institutional structures engaging with farmers who can implement Programme activities
- Active Civil Society (NGOs, CBOs, FBO) organisations that can offer synergy to programme activities in terms of new innovations, farmer training and conservation activities (e.g. Nature Kenya)
- County Departments with potential strength in conducting trainings and offering extension services as well as regulatory functions such in conserving the landscape
- Research and regulatory bodies (e.g. Kenya Forest service, Kenya Wildlife, Water Resource Management Authority, National Environmental Management Authority) for conservation of natural resources; Plant health regulators (KEPHIS)
- National Government Ministries and Departments e.g. Department of gender
- Private buyers, investors and marketers, including tea factories and coffee marketers partnering with various societies offer a ready market for produce. The SA also observed private buyers and investors for value chains such as macadamia companies (Limbua group, Jungle Macs EPZ Ltd, Sagana Nuts Company Ltd, Kenya Nut Company Ltd, Afrimac Nuts Company Ltd, Kakuzi Limited) and dairy companies (Zeni dairy) that the programme can partner with.

4.2.2 How social inequality shapes stakeholder interactions

Social inequality evidenced through unequal resource distribution shapes stakeholder interactions differences in resource access between men and women. Social inequality is often attributed to unequal distribution of resources in the society, engendering patterns of social classes and creating dichotomies such as the poor and rich; vulnerable and non-vulnerable; and marginalised and non-marginalised (Ravnborg and Gómez 2015).

At farm level, inequalities reinforced by culture exist and affect interactions at household level. One of the main factors that has created a differentiated impact between men and women is the unequal access to ownership and control of natural resources, which creates a gender gap in natural resource governance. FGDs reveal that women have rights to utilise land but no right to sell or lease. They can only slaughter small animals like chicken and rabbits with permission from the husband. Women have rights to sell utensils and scrap metal from the homestead but no rights to sell or give out farm implements without permission from the husband. Finally, women have less control over coffee earnings, where men were the main decision makers.

FGD and KII in Kirinyaga County revealed that the poor, women, youth and marginalised groups did not have as much say as men or were excluded from major decision making about the benefits of landscape natural resources and how such natural resources were used. Similarly, they bore much of the negative effects associated with the poor use of landscape natural resources (forest, water, and wetland resources e.g. agricultural or feel wood products) since their life are heavily dependent on such resources.

Implications for programme design

The use and control of natural resources has historically generated inequality with advent of climate change exacerbated the situation in terms of differentiated vulnerabilities among women, the youth and the marginalised. The programme should therefore consider a stakeholder engagement strategy that:

- Seeks to empower previously excluded groups and bring them to the programme mainstream;
- Considers specific barriers faced by different stakeholders for targeted interventions. These barriers may be specific to different beneficiary groups;
- Starts early in the programme when scope for successfully influencing options is largest and implementing change to respond to needs of the beneficiaries and the other stakeholders;
- Considers increasing the level of stakeholder engagement throughout the programme implementation: from information-sharing and consultation to deciding together with stakeholders; acting together with stakeholder; and forming partnership to carry out and support independent beneficiary interest where required, in which local groups (women groups, youth groups etc.) are offered funds to implement micro-projects within programme guidelines.

4.2.3 Stakeholders benefiting or at risk from programme activities

The target tea and coffee farmers stand to gain the most from the programme as they are direct beneficiaries, specifically the following categories of farmers and communities, sometimes organised into groups:

- Communities/smallholder farmers organised ;
- Communities/smallholder farmers living/exploiting/farming close to protected forests or community forests;
- Communities/smallholder farmers living or farming close to protected Natural ecosystems, i.e., wetlands, rivers etc;
- Communities/smallholder farmers living or farming in or close to High Conservation Values Area (HCVA);
- Communities/smallholder farmers farming in degraded lands;
- Communities/smallholder farmers with potential for diversification.

From the FGDs, the smallholder tea and coffee farmers rated themselves 'high' with the power to make and or break the programme as they stand to gain from the programme and to implement the interventions.

The marginalised, poor and vulnerable groups were identified as those at risk with or without the investment with limited potential to participate in the programme. The elderly, women and the youth were considered the most vulnerable groups. The elderly were poor farmers with no livestock and lacked the ability to buy food. Ideas from women were not considered in cooperative societies, and men's control over income from coffee often leaves little or no cash for women. Massive migration of the youth from rural areas to urban areas for jobs leaves most farm activities to women.

The youth had limited access to and control over land for farming and to act as collateral for loans, and also lacked financial support from parents and local leaders because their ideas were not valued.

The female youth were often not considered able to buy property such as land. However if they did, it was perceived that they purchased it through

unlawful/immoral ways, and this led to stigmatisation. Similar scenarios were observed by FGDs in Embu and Nyeri.

Implications for programme design
A pro-active stakeholder engagement strategy that takes affirmative action for the poor, vulnerable, the youth and women would help in addressing inclusivity in the programme:

- Ensure to include participation of the women, the youth, the vulnerable and the poor into the programme;
- Conducting a detailed needs assessment and formulating an engagement strategy for the poor, the vulnerable etc.;
- Raising the voice of women through financial literacy trainings during programme implementation, as ideas from women were not considered in cooperative societies, and men's total control of cash from coffee left little or no cash for women;
- Creating opportunities for on-farm income generation for the youth to minimise rural-urban migration through identifying lucrative agricultural value chain nodes that the youth can participate in (horticulture, agro-processing, spraying against pests and diseases at a fee, agro-based businesses, enhancing credit access etc.);
- Sensitisation of the men through public forums would enable the women and youth to have a share of proceeds from cash crops, while technical training for women and youth would offer skills to earn some off-farm income.

4.2.4 Institutions shaping stakeholder' access and control of natural resources

Political and administrative: The political class through formulation of various policies and enacting various laws (e.g. Ministry of Lands and Physical Planning 2016; The National Council for Law Reporting 2016; The National Council for Law Reporting 2012; The National Council for Law Reporting 2016; The National Council for Law Reporting 2010) influence stakeholders access to forest, water and agricultural land resources. The concerned policies and legal framework are described here-after. Some of the laws allow communities to access natural resources through organised and regulated groups such as Community Forest Associations (The National Council for Law Reporting 2016) and Water Resource Users Associations (The National Council for Law Reporting 2016).

The SA observed that access to natural resources such as Forest is regulated through fees paid (to Kenya Forest Service) for grazing, firewood collection, beekeeping in the forest, cultivation of crops in the forest while tendering young trees, fishing in rivers that pass through the forest, and for collecting herbal medicine. Logging for timber is also controlled through permit issuance. Water abstraction from major rivers in the Counties is also regulated by payment of water fees.

Socio-cultural: The major socio-cultural factor determining access and control of natural resource especially on agricultural land is gender.

FGDs revealed that women accessed land and were allowed to utilise it, but could only sell after consent/agreement with their spouses; Unmarried women had full access to their land but could not sell such land; and that men had an upper hand in managing natural resources including controlling access to land, planting of trees and building permanent structures on the land; while in most cases the youth did not have control over land. Similar observations were made for Embu and Kirinyaga.

Implications for programme design
Working with already existing Water Resource Users Associations and Community Forest Associations through enhancing their capacities for natural resource management and supporting implementation of their conservation plans will contribute to sustainable forest and water resources management and utilisation.

At household level, gender plays an important role in determining access and control of land-based agricultural resources and the benefits emanating from them. The SA observed unequal access and control of land between men and women and even between the old (parents) and the youth, thus creating a gender gap in resource governance. Similarly, there was unfair division of labour between the sexes, with women overburdened with reproductive roles. Thus the programme should put emphasis in mainstreaming gender issues in the whole programme cycle.

4.2.5 Opportunities to shape the institutional context for sustainable resource management

Diverse legislations and policies have been formulated in response to land use and land tenure but implementation remains a challenge both at national level and at County level. Though required, the three counties have not fully enacted County Laws ' to domesticate' national legislations and policies where required.

National level legislative framework and policies

Legislative framework and policies on land use (SA37)

Opportunities exist in implementing current national legislation and policies for sustainable natural resource management. The key legislative framework and policies on land use planning are described below.

The Kenya Constitution 2010 (The National Council for Law Reporting 2010): Article 42 of the Constitution provides every Kenyan the right to a clean and healthy environment which includes the right to have the environment protected for the benefit of the present and future generations through legislative measures.

Article 69 (a) provides the State the responsibility to ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources and ensure the equitable sharing of the accruing benefits. Article 69 (d) highlights the importance of public participation in the management, protection and conservation of the environment.

Sessional Paper No. 3 of 2009 on National Land Policy; National Land use policy, 2016: Provides a legal and institutional framework for ensuring optimal and sustainable utilisation of land-based resources at the National, County and local levels (Ministry of Lands and Physical Planning 2016) The policy offers a framework for among other things:

- Land use planning, resource allocation and resource management for sustainable development to promote public good and general welfare;
- Environmental management and sustainable production in the utilisation of land resources;
- Equitable utilisation of land resources to meet governance, social-economic and cultural obligations of the people of Kenya;
- Mainstreaming of gender and special interest groups in land use planning and management;
- Mitigating problems associated with poor land use.

Environmental Management and Co-ordination Act (1999): Established National Environment Management Authority (NEMA) with a mandate to ensure sustainable management of the environment and its resources through exercising general supervision and coordination over all matters relating to the environment (The National Council for Law Reporting 1999; NEMA 2019).

The Water Act 2016: Established Water Resources Authority (WRA) (The National Council for Law Reporting 2016; The National Council for Law Reporting 2016). WRA among others:

- Provide guidelines, frameworks, standards and procedures on how to protect and conserve water resources; and enforces the same;
- Enforces regulations on management and use of water resources;
- Levies water use fees;
- Mobilises communities living in the catchment areas to form Water Resource Users Associations (WRUAs) and to develop responsive sub-catchment management plans-SCMPs for conservation and equitable use of water.

Riparian land legislations: Various statutes define how riparian land can be conserved with different rules on the width of the riparian strip (varying from 2 to 30 metres) and or rules dependent on the width of the water course. Amongst others, these include: Agriculture Act Cap 318; Survey Act 1989, Physical planning Act 1996; Environmental Management and Cordination Act, 1999; Water regulations, 2006; Water Act, 2002 (2016) and Water Resources Management Rules, 2007.

The Forest Act 2005 (Rev 2016), (The National Council for Law Reporting 2016): An Act of Parliament to give effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilisation of all forest resources for the socioeconomic development of the country and for connected purposes.

The Act established Kenya Forest Service (KFS) to among others undertake the following functions:

- Conserve, protect and manage all public forests in accordance with the provisions of the Forest Conservation and Management Act no 34 of 2016;
- Receive and consider applications for licenses or permits in relation to forest resources or management of forests or any other relevant matter in accordance with this act;
- Establish and implement benefit sharing arrangements in accordance with the provisions of the act;
- In consultation with relevant stakeholders, develop programmes for tourism and for recreational and ceremonial use of public forests;
- Approve the provision of credit facilities and technical training for community-based forest industries, and the provision of incentives to persons for the sustainable utilisation of wood and non-wood forest products;
- Implement and enforce rules and regulations governing importation, exportation and trade in forest produce

In addition to Forest Act 2016, Kenya has over 77 statutes that in one way or another touch on the utilisation and management of forest resources. Key among these include the Forest Policy (2014), Land Act (Act No.6 of 2012), Land Policy (2009), Land Use Policy (2016), Environmental Management and Coordination Act (Act No.8 of 1999/Revised 2012) and Wildlife Conservation Act (Cap 367) among others.

National Wildlife Strategy (NWS) 2030 (Ministry of Tourism and Wildlife 2018): Provides a framework for coordination and implementation of Article 69 of the Constitution of Kenya (2010), and the Wildlife Conservation and Management Act (2013). The following are among key priority actions:

1. Protection, rehabilitation, and restoration of wildlife habitats and their connectivity, including forests, savannas, freshwater, marine, and mountain ecosystems to increase the resilience of key habitats and ecosystems;
2. Enhancing the coordination and capacity of security and law enforcement agencies to reduce, and improve responses to, incidents of poaching, illegal wildlife trade and reduce wildlife related crimes;
3. Increasing the land effectively managed by communities for biodiversity conservation;
4. Enhancing the process of granting permit for use of wildlife resources.

Agriculture Act Cap 318 (2012 [1986]) (The National Council for Law Reporting 2012): An Act of Parliament to promote and maintain a stable agriculture, to provide for the conservation of the soil and its fertility and to stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry. Among others the legislation focuses on:

- Preservation of soil fertility and land development;
- Rules for preservation, utilisation and development of agricultural land.

Engagement of communities in sustainable natural resource management

The Water Act (2016) and Forest Act (2016) provides for the participation of communities living in catchment areas in decision-making on the management of natural resources. Through Water Resources Users Associations (WRUAs), Community Forests Associations (CFAs), and Irrigation Water Users Associations (IWUAs) the communities are involved in the development of responsive sub-catchment management activities such as tree planting to increase tree cover in water catchment areas, protection of the water from pollutants, control of sediments, riparian land conservation etc. Additionally, the Water Act (2012) ensures equitable access to resources for vulnerable groups in the society by considering important factors such as quality of water and distance travelled to the water sources when allocating water resources and abstraction permits. In addition, formulated rules allow communities to access forest resources at a cost-grazing in the forest, firewood collection, cultivation of crops while tendering young trees etc.

County Land Boards: The county government is responsible for constituting and managing the operations of Land Boards as provided in regulations formulated by the national government. Counties are also responsible for development planning and control. The critical function is financed through user charges/development plan approval fees.

Land and resource tenure (SA38)

Land in Kenya is currently categorised as either public land, community land or private land and can be accessed and utilised under freehold, leasehold or community hold forms of tenure (Ministry of Lands and Physical Planning 2016). In all the three Counties (Kirinyaga, Embu and Nyeri), much of the smallholder land is under free hold tenure system.

In Kirinyaga County, most land is under free hold and titled:

> 'While 67 percent of farmers in the county (Kirinyaga) have title deeds, 23 percent of the farmers especially in the lower zones of Mwea Constituency are farming on the land owned by National Irrigation Board. Most of the land in the upper parts of the county is ancestral land which has been passed down from one generation to the next over past years, therefore there are no major conflicts as most of the land is inherited. Most of the lower parts of the county comprising Mwea Constituency is owned by NIB and farmers lease the land which is under irrigation.' (Kirinyaga County Integrated Development Plan 2018-2022).

Embu has less titled land compared to Kirinyaga:

> 'The Kenya Integrated Household Budget Survey (2005/06), indicates that 35.9 % of the non-poor in Manyatta and Runyenjes constituencies have title deeds for their land while 31.2 % do not have title deeds for their parcels of land. The remaining 33.0% of the non-poor population do not have land. In Mbeere North and Mbeere South constituencies, 22.3% of the non-poor population have title deeds while 33.6% of the non-poor do not have title deeds. The remaining 44.1% of the non-poor do not own land.' (Embu County Government 2018).

Perceptions on land resource tenure (SA40) and tenure system by indigenous communities (SA41)

Land with secure title deeds was the main land tenure system for smallholders in the communities studied. There was also the land settlement in Mwea rice schemes and in Government forest land, but these systems were not considered secure without land title deeds. Contractual arrangements were also reported but cases of breach of contract were reported, therefore not considered secure.

None of the communities who live in the Kirinyaga, Embu and Nyeri could be strictly classified as indigenous people.

County-level legislative framework and policies

The three counties of Kirinyaga, Embu and Nyeri have limited legislations on land use and natural resource management (COG 2019). The Departments of Environment and Natural Resources; and Lands, Physical Planning and Housing; and Agriculture and Livestock are guided by national regulatory framework and strategies set out in County Integrated Development Plans (Table 4.7).

Table 4.7 County Bills, enacted laws and policies (by Sept 2021)

County Act/Bill	Kirinyaga	Embu	Nyeri
Solid Waste Management	Y	Y	Y
Water Act	NP	Y	N
Environment Management Bill	NP	Y	N
Forest Management and Conservation Bill	NP	N	Y
Climate Change Bill	NP	N	Y
Land use planning and Management	NP	N	N
Disaster Management Bill	NP	N	Y

Source: County Assemby Bills (https://www.nyeriassembly.go.ke/bills/; https://embuassembly.go.ke/assembly-business/bills/;https://www.socattkenya.org/county-bills/); NP= Not published-County Website.

Implications for programme design

Diverse legislations and policies have been formulated in response to land use and land tenure but implementation remains a challenge. The Programme should partner with existing institutions (KFS, Kenya Wildlife, County Governments, WRUAs, CFAs) in terms of awareness creation, lobbying and capacity building in implementing various regulations that can be done at county and at community level (WRUAS, CFAs). Current gaps in policy implementation include:

- Inadequate capacity to adequately implement the existing laws and policies due to inadequate financial allocation and human resources for institutions charged with implementation;

- Weak enforcement that may be as a result of either inadequate capacities of the implementing actors or other issues such as the integrity of enforcing personnel;[3]
- Inadequate coordination among land use legislations and policies. Land use administration and utilisation of natural resources in Kenya is currently governed by a range of sector specific legal instruments and policies. These laws and policies have not been harmonised and thus, there exists rampant duplication. An example is how developers or project proponents are required by the Water Act, 2016 and the Environmental Management Coordination Act (EMCA), 2009 to obtain effluent discharge permits from Water Resource Authority (WRA) and National Environment Management Authority (NEMA) simultaneously;
- Inadequate facilitative policy guidelines, regulations and standards. There are no physical planning guidelines, manuals and standards to operationalise the Physical Act, 2016 nor a harmonised system for collecting, preparing and disseminating information related to land use.

4.2.6 Options to strengthen stakeholder engagement in the programme design

The SA asked various stakeholders (KII) to suggest ways in which they can contribute to the programme, activities they would like the programme to engage them with and at what time of the year. Most of the stakeholders suggest an 'early start' in involving them from the start of programme interventions while a few others specified specific periods in the year, an example is illustrated in Table 4.8. Across the board stakeholders are positively interested to be involved in the programme.

Implications for programme design

The enthusiasm of stakeholders to be involved in this programme from its inception requires to be supported from the start whether through information sharing, involvement in design of interventions and or participation in various programme activities. This will ensure that important stakeholders with a potential contribution to enhance programme effects are not left behind. However, this will require a structured and systematic stakeholder engagement throughout the programme cycle (e.g. through stakeholder fora meetings).

[3] Examples-Okowa, D. 2015. Land Reforms in Kenya: Achievements and the Missing Link. Accessed at ttps://ilegkenya1.wordpress.com/2015/03/02/land-reforms-in-kenya-achievements-and-the-missing-link/

Nature Kenya, 2019. Mount Kenya Forest Restoration Strategy (2019-2029). Nature kenya

Table 4.8 Selected stakeholders perspectives on how they can be engaged in the programme (Kirinyaga)

Organisation	Suggested contribution to Mt. Kenya Landscape and Livelihood Programme	What type of activities would you like this Programme to engage you with?	Time of the year
Mutira Farmers' Cooperative Society	• Linkage to beneficiaries i.e., coffee farmers in the cooperative society; • Championing or advocating of the programme; • Training on behalf of the programme on aspects such as certification.	• Regenerative and climate- smart agriculture; • Landscape management (land and water management); • Rural livelihoods; • Connecting landscape actors to sources of finance.	Throughout the year
Kirinyaga Investment and Development Authority (KIDA)	• Identification and mobilisation of farmers; • Advisory of investment opportunities; • Market linkages.	• Regenerative and climate-smart agriculture; • Rural livelihoods; • Connecting landscape actors to sources of finance.	Anytime of the year
Anglican Development Services (ADS)	• Capacity building on Climate Smart agriculture; • Partner in expanding the scope of ADS's work from the current lower side to other areas of the upper Mt. Kenya Landscape.	• Regenerative and climate-smart agriculture • Landscape management (land and water management); • Rural livelihoods.	Between January and March
Water Resources Authority (WRA)	• Providing technical advice on issues under their mandate such as water resource management and regulation; • Facilitate the process of legal water abstraction; • Help in water conflicts resolution; • Needs to be involved from the word go in, that is, inclusion at every level of especially in the planning and appraisal of interventions in the arena of water regulation and management.	• Landscape management (land and water management)	
County Department of Agriculture and Livestock	• Support with resources such as personnel and equipment where possible; • Mobilisation of communities.	• Regenerative and climate-smart agriculture; • Landscape management (land and water management; • Rural livelihoods; • Connecting landscape actors to sources of finance.	
County Department of Lands, Physical Planning and Housing	• Can only be informed by the objectives and programmes to be rolled out. • Programme to help them reclaim and restore wetlands. They can even involve the youth – support in terms of finances.	• Landscape management (land and water management); • Improvement of basic amenities/infrastructure in rural areas – sanitation facilitation, electricity, water, drainage system.	
Kenya Forest Service	• Provide technical support or advice on tree seedling production and land rehabilitation; • Capacity building and sensitisation of communities; • Security for activities and restored/rehabilitation; • Provide the land for rehabilitation. Provide Linkage to the communities through the Community Forest Associations (CFAs).	• Landscape management (land and water management).	Before the beginning of the financial year when they are in the process of planning their activities for the year.
County Department of trade and cooperatives	• The department is willing to support the project so they are ready to support its implementation through provision of human resources as well as engagement in community mobilisation	• Rural livelihoods	

4.2.7 Other stakeholders who may shape the programme outcomes

The SA did not observe parties that might jeopardise programme implementation in the landscape, especially when the programme is implemented within existing regulatory framework and policies at county and at national level.

Implications for programme design
Implementing the programme within existing regulatory and policy framework will ensure smooth implementation of activities. The programme should embrace regulatory bodies in conservation to be part of stakeholder platform/fora (if such are established).

4.2.8 Stakeholder power dynamics

Based on the stakeholder mapping a power dynamics analysis is carried out using a power-interest/influence grid (Table 4.9). Stakeholders defined as those with an interest in the project, or are likely to be affected by it, were rated according to five criteria based on questions posed to them as well as secondary data about their activities and tacit knowledge of what they are currently doing in the landscape.

To gauge their level of interest stakeholders were rated on a scale of 1-3 (1=low; 2=medium; 3=high) on (i) contribution to the programme - bringing vital information or knowledge (from science, policy, society, special sectors/concerns); (ii) legitimacy - legal, contractual, moral, societal or financial interests or claims that are immediately affected; (iii) willingness to engage with the program (is proactive or already engaged).

To gauge their level of influence and power, identified stakeholders were rated on (i) influence - whether influential to programme activities (ranging from formal decision-making power to informal influence); and the necessity of their involvement. Ratings were done first at county level and then later combined into an overall matrix for the three counties. Ratings of stakeholders who operate at national level with activities in the three counties were then added to the overall matrix. The result of this exercise are presented in Table 4.9, while the four different quadrants are discussed in more detail below.

Table 4.9 Power (Influence)- Interest (stake) Grid

	High stake	Low stake
High power	• Coffee Management Services (CMS) • Coffee Farmers' Cooperative Societies • Community Organisations (CFAs, WRUAs) • County Department (Environment, water and natural resources) • County Department (Agriculture, Livestock, Cooperatives) • County Government • Farmers • Farmers Associations • KTDA • Ministry of Agriculture (National) • Ministry of Interior and Coordination of National Government (Administration) • National Government • Other County Departments • Tea factories	• Politicians/law-makers • Water and sewage companies
Low power	• Certifying bodies • Civil Society Organisation (NGOs, Faith Based Organisations) • Commercial Banks (Equity, Co-operative, ABSA, KCB, Family) • Dairy Cooperatives • Donors • Farm produce traders • Learning institutions • Nature Kenya • Projects and Programmes in the landscape (public, private) • Public Funds (WEF; YEDF) • Regulatory bodies • Research institutions • SACCOs offering financial services	• Input providers • Investors • Micro-finance institutions • Other cooperative societies

Upper left quadrant: High power, High stake (high interest)

Stakeholders in this quadrant are major decision-makers in the landscape and potentially have the largest impact on programme success. Engagement with these stakeholders is essential for the programme success.

- Farmers are the central node in the implementation of the programme. They are the users of forests, waters and farmlands, hence their activities directly affect the landscape;
- Tea factories work closely with farmers and therefore should be actively engaged and supported and ensure they have strong approval;
- CMS focuses on a number of activities that relate to the programme's objectives. These include marketing, certification, financial support service, farm management services, amongst others. On these topics they stand to have a high interest as well as influence on the programme since they have coffee cooperatives that also subscribe to them. Therefore they should be engaged regularly;
- Coffee Farmers' cooperative societies work closely with farmers to promote sale of their coffee produce. They also conduct trainings to encourage good agricultural practices among their farmers. To that extent, they have a strong interest in the programme and if not well engaged, can also have a strong influence to their respective farmers;
- The county department works closely with the national government in order to implement national policies that touch on the environment, forests etc. This makes them very much interested to the projects ambitions and outcomes within their respective county. At the same time they handle devolved functions that will influence Programme operations;
- Guided by the Forest Act and the Water Act, CFAs and WRUAs in Embu County like their counterparts in other counties have entered into a working agreement with KFS and WRA that empowers them to take a lead role in conserving forests and rivers within their communities.

Upper left quadrant: High power, Low stake(low interest)

These stakeholders should be kept informed on the programme's activities. Given the programme's focus, active participation may not be realistic. Nonetheless, they may use their power in ways undesirable to the programme's activities.

- Politicians are very influential people in the community. The programme needs to build an understanding with politicians in order to ensure they retain their support. This may be useful when the programme requires law makers to push for policies. Additionally, law-makers could be engaged to commit a certain percentage of county government budget as complementary funding for environmental conservation activities;
- The water and sewerage company has very little influence over the programme, but it is still an important actor to engage given the fact that they will be among the direct beneficiaries of long-term landscape restoration activities. High quality and quantity of water in water bodies has direct cost implications, allowing the company to reducing costs in making river water potable and accessible.

Lower-left quadrant: Low power, High stake (high interest)

In general these stakeholders should be adequately informed to minimise the chances of adverse issues from arising. Nonetheless, some of these stakeholders are influential in complementing or ensuring success of project interventions.

- Banks are important in offering financial services to farmers, but it is highly unlikely that they hold more power. Farmers too noted that most of these commercial banks do not engage with them as much they wish in matters of agriculture and conservation activities. They therefore prefer to rely on their local SACCOs for financial services such as acquiring loans for farm inputs;
- SACCOs are the preferred financial providers by the farmers. This is because they do not require hefty collaterals (as commercial banks do), and some of them have very low interest rates. These would therefore form a focal point for linking farmers to financial services;
- Public funds (WEF, YEDF) have the potential to radically transform rural livelihoods by providing easy and affordable financial and business development support services to the youth and women groups who are keen on starting or expanding businesses. Their engagement, perhaps even by jointly designing programmes/activities, may empower youth and women by taking advantage of financial facilities offered by these funds;
- Market related challenges are among the key issues farmers in Kenya experience. Engaging traders in farm produce may address some of these

challenges ensuring that farmers earn sustainable and profitable incomes from their agricultural enterprises;
- Civil society organisations (NGOs, Faith Based, CBOs) work in the landscape revolve around enhancing rural livelihoods, environmental conservation and regenerative agriculture. For these reasons, these organisations can form a network serving to help mobilise common resources and information, thereby increasing efficiency while reducing duplication of efforts.

Lower-right quadrant: Low power, Low stake (low interest)

At first sight communication with these non-influential stakeholders can be minimised given their low interest. Nonetheless, activities of some of them can still be important for ensuring programme success, also by diversifying programme activities.

- Other cooperative societies are those focusing on other crops, including fruit production, horticultural activities or other income generating activities. These are activities that diversify rural livelihoods especially for households that do not have enough land to engage in tea and coffee production. In some instances, these have a high interest in rural development programmes but have low power to influence them.
- Micro-finance institutions equally offer favourable financial services to farmers opposed to commercial banks. However, their involvement in the programme to offer farmers financial support is highly unlikely due to the challenges that some farmers may face when repaying loans acquired. Their influence is also low but they could be consulted in order to improve service delivery in terms of offering credit to farmers.
- These private sector actors (investors) have an important role in ensuring that the critical infrastructure for agriculture is developed and maintained. The project could look for opportunities to leverage private sector capital and expertise to ensure that such partnerships create greater returns than either sector could achieve independently. However, generally speakding, they have low power and a low stake in the programme.

Input providers supply agro-inputs and equipment to farm households. Their main goals are to increase profit margins and strengthening this goal is the only way to secure their interest in the programme. The programme could expand the reach of input providers by linking them to (more) programme beneficiaries, or engage them through offering advisory services related to the agropesticides they sell. They could train farmers on correct application of pesticides and disposal of waste.


5

5 Impact pathway: landscape management

This chapter reviews the proposed programme plans on landscape management, the underlying assumptions as defined in the Theory of Change and when these assumptions are valid and may indeed lead to change.

5.1 Impact pathway landscape management – key findings and lessons for design

This first section provides an overview of the key findings, as presented in more detail in the subsequent sections, thereby revealing three key insights:

- There is a **need to go beyond the current jurisdictional focus** of the landscape approach, in order to bring together stakeholders and actions in the counties and cut across commodities – with a cross-cutting focus on stakeholders and ecosystems;
- Stakeholder **expectations need to be well managed** concerning the time lags between setting up the LMB, securing funding and then implementing it with concerted actions and measurable outcomes and impacts occurs;
- **Conflicts and trade-offs are inherent in the landscape approach** and require mechanisms to be in place to recognise these, particularly regarding deforestation, over abstraction of water and land use change, farm productivity and livelihood improvement. Mechanisms could focus on reaching stakeholder consensus about how to deal with such trade-offs and how to mitigate conflicts of interest and realities on-the-ground.

These elements based on the proposed program activities will be discussed in greater detail in the remainder of this chapter. A detailed overview of approaches and experiences from other similar programmes is presented in Chapter 8.

5.2 Impact pathway landscape management – introduction of programme plans

The impact pathway proposed by the programme can be summarised as follows:

- The project's ambition is that integrated landscape management is a suitable approach to reverse declines in ecosystem health while improving a growing population's well-being at a faster pace and that we need to think bigger and collaborate.
- Facilitate greater community participation in natural resource governance, bringing together all stakeholders to develop a shared vision;
- Establish strong multi-stakeholder landscape governance and push for full alignment between the pillars of sustainable production and farmers' livelihoods, forest protection and restoration, and community engagement and social inclusion;
- Generate additional value from improved production practices, price premiums, payments for ecosystem services, private and finance sector investment and livelihood diversification to sustain the participatory structure and create incentives for conservation and restoration initiatives; and
- Align strategies and investments in the Mt. Kenya landscape with other national processes in the country e.g. Kenya Strategic Investment Framework on Sustainable Land Management 2017-2027 and the Kenya National Biodiversity Strategy and Action Plan.

Our field work and literature review has generated insights that can feed into the approach to the landscape management pathway:

Landscape Management Boards (LMB) are the main institutions driving the landscape management pathway in the three counties.

The LMBs are work in progress. Apart from what is briefly presented in RA's proposal to Ikea Foundation,[4] it is understood that RA has held an internal meeting to brainstorm on the shape of LMBs, but nothing is concrete as yet. Two LMBs are foreseen: one for Kirinyaga and one for either Embu or Nyeri depending on the results of SA. RA would like to hold a meeting with stakeholders to get input on the formation of the LMB and coordinate the LMBs. Proposed participants are at least 30 stakeholders in and per county, such as:

- Water Resource Users Associations;
- Community Forest associations;
- Coffee and tea sector;
- Financial institutions;
- Private sector;
- County representatives (Relevant Departments-agriculture, Environment and natural resources etc.);
- National Government representatives.

County-based scope

The Landscape approach proposed by RA indicates that LMBs in each county will cover tea, coffee and some designated lower parts of the county where relevant, with stakeholders from the lower parts of the county represented by WRUAs and other selected enterprises. How the lower parts will be selected and on which criteria should be specified, if a 'real' landscape approach is to be taken.

New landscape governance structures

Each LMB will have its own structure with a Board. RA will be an ex-official member of the Board i.e. a Secretariat. RA will have no voting powers in the Board. The Board will raise funds and also approve Land Development Management Plans submitted by various groups seeking funds for land management. The latter will submit proposals to the Board for approval. The LMBs are thus seen as the main vehicle for landscape level funding. It is envisaged that LMB in the two counties will eventually, grow to form One Apex, a Trust, before the end of the 5-year programme. The LMBs will develop a strategic plan aimed at specifically identifying eco-friendly investment opportunities and the promotion of their adoption by industry and households in the Mt Kenya region, referred to as Sustainable Landscape Development and Management Plans (SLDMPs).

[4] Mount Kenya Sustainable Landscape and Livelihoods Programme: A proposal presented by the Rainforest Alliance to the IKEA Foundation.

5.3 Impact pathway landscape management – reflection on the validity of the (assumptions behind) the Theory of Change

The impact pathway is foreseen around establishing Landscape Management Boards which catalyse and coordinate collective action by all parties that use land or have influence over land use in the Mount Kenya landscape. The results-based, multi-stakeholder governance structure will enable the government, private sector, civil society and local communities to collaborate around a shared vision. This is a hybrid structure between the classical top down development model normally applied by government and development partners, and bottom up approach that empowers local communities and ensures their aspirations are captured by SLDMPs at landscape level.

Our fieldwork and literature review indicate that the following mechanisms to achieve impact could benefit from more precision and reflection, as some of the assumptions are questionable:

Assumption that the LMBs will bring together bottom up and top down governance. The current thinking (e.g. in the RA programme Proposal and outputs in the Landscape management pathway) assumes that it will blend together existing arrangements. The LMBs however will in effect introduce *new* governance arrangements for the landscape on top of already existing (and sometimes ineffective) statutory, customary and market based governance arrangements. The impact and effectiveness of the LMBs as institutions, their legitimacy, authority, power and interaction with existing structures on different levels needs a strong focus on the process and also new indicator metrics so that if the process is ineffective, it is steered and adjusted on time. Such metrics may capture the degree to which the new LMBs and their activities are perceived as being sufficiently inclusive, legitimised and accountable, in addition to metrics that capture adoption of or impact from specific new on-farm activities the LMBs propose.

Assumption that stakeholder involvement can overcome barriers to implementation and enforcement of legislation. Bringing and including together external and internal stakeholders in the programme and especially the LMBs is assumed to enable knowledge of existing legislation and land management policies, and support implementation thereof, resulting in better governance of the landscape. Legislation is in place but difficulties in implementing and enforcing the legislation are assumed to be overcome through stakeholder engagement. *This assumption is risky when the means to incentivise and pay for enforcement of legislation are not provided by the programme and are generally, the domain of government authorities and partially, customary authorities.*

Assumption that changes in soil health are attributable to a landscape approach. The pathway makes an assumption that soil health is critical for tea, coffee and other cropping systems and the result of pollution, deforestation and degradation. And that these can be mitigated, e.g. through training, better trade terms, GAPs, diversification, certification (premiums) and alternative cropping systems which then lead to improved soil quality. However, there is little evidence that such changes in *soil quality which is mainly measured at a plot level is dependent upon and can be attributable to the landscape approach. It is recommended that the scale of this pathway is limited to a plot not landscape level.*

Assumption that women's participation in land decisions will change land cover due to a landscape approach. Joint household and community decisions (O.1.1, O.1.2, O.1.3) about land use and new options (e.g. block farming) mean that although most land is privately owned by the male family members, women's gradual empowerment is assumed to result in women increasingly having some say in what is done with land, important as they are key stakeholders working on tea and coffee harvest and on cash crops. *For this assumption and the impact pathway to hold true, wider cultural changes have to take place. The assumptions that women's participation in the LMBs will improve and better decision land use occur, and also that the programmes landscape approach will result in such major changes in social-cultural practices, seems over estimated and too far fetched.* The aim of the inclusion of women and other marginalised actors in decision making and in the LMB should however remain.

Landscape approach should recognise conflicts and trade-offs of deforestation and land use change. The pathway assumes that an increased awareness through the sensitisation and activities of the LMBs will result in awareness of the impact of pressures that degrade (O.4.1) and deforest riparian areas and the consequences of how these are exacerbated by climate change, resulting in actions such as replanting, forest protection, agroforestry etc. will support actions to revegetate riparian areas (I.1.3) and decrease occurrence of landslides (I.1.4). This presupposes that the current drivers of why these pressures exist (e.g. land scarcity, knowledge of good agricultural practices, access to trees and integration in farming systems) can be addressed by the LMBs in a way that enhances ecosystem services and products and goes beyond county boundaries.

Assumption that a decrease in threatened species and habitats are attributable to a landscape approach. The impact pathway foresees that training, awareness, projects (e.g. PES & Water Fund) will support native tree protection and planting (I.1.2) in government-controlled forests, community forests, tea and coffee farms and farmers' individually owned forests. That such interventions (many of which have been and are ongoing) result in impacts at habitat level which can be attributed to landscape approach (the programme) need to more strongly established and preferably scientifically as well as by local stakeholders.

Roles of Ikea Foundation and RA alongside other stakeholders in the landscape approach requires clarity. RA is implementing the approach on behalf of, and with funding of, the Ikea Foundation. RA is leading the landscape approach (playing the role of a secretariat) - but is also creating distance so that it does not unduly influence the landscape approach. The role of both RA and the Foundation need to be further made explicit during the LMB process to ensure that the impact pathway is not disrupted by any (potential) conflicts of interest.

Stakeholder legitimacy and representativeness should be part of criteria to invite stakeholders into a LMB. Many of the stakeholders, whilst having an interest in the landscape, do not have any elected, 'representative' authority e.g. private sector. For the impact pathway to work, any representative of stakeholders who join the LMBs needs to have legality, credibility and authority. This needs to be established as part of the LMB process. The

situation assessment and stakeholder analysis (Chapter 4) provides a good understanding. For example, the WRUAs and CFAs in Kenya have experienced problems with legitimacy, elite capture and especially with their members having insufficient time and resources to play a representative function in their own organisations, let alone representing their structure in other fora/networks. Capacity building for WRUAs, individual CFAs and the National Alliance for Community Forest Association (NACOFA) will be a pre-requiste for enhanced participation. For the impact pathway to work, details and indicators of the incentives (e.g. finance for transport to meetings, communication) and ways which support or allow representatives to participate in the LMBs are needed. The programme exit strategy should consider how the end of the programme and particularly the coordination (but also financing and governance) will continue (for example, how will costs be covered for LMB members after the programmes end). This should be elaborated in the outputs for the set up the LMB to ensure that the long-term impact of the landscape management pathway do not get stranded at programme end, but are built into the design and stakeholder's expectations.

Risks as funding of landscape activities develop in parallel to the LMB and landscape approach. The timescale to develop financing for landscape finance (Chapter 6) is obviously different from the timescale to set up and then have operational the LMBs and SLDMPs. The mechanisms of up-front financing by the RA programme – until the expected finance is generated – is unclear, particularly the LMB operations and initial costs. Stakeholder expectations need to be well managed concerning the time lags between setting up the LMB, securing funding and then implementing it with concrete actions and measurable outcomes and impacts occurs.

Clarifying steps and indicators after stakeholder identification. The importance of stakeholder identification has been stressed in RAs proposal and in the Situation Analysis. After 'sensitisation' on the need for a participative, inclusive (gender, youth, minorities) landscape governance approach and structure focused on land regeneration, conservation of ecosystem services and biodiversity, and sustainable development of the landscape, it is assumed the conditions will be ready to collaboratively design the LMB structures and develop SLDMPs backed by feasible business plans with full stakeholder participation and buy-in. However, the pathway to keep these stakeholders on board for the five years of the project and, critically, afterwards, needs elaboration so that this pathway can be adequately steered and monitored, including metrics for an exit strategy (e.g. if the programme pays or reimburses participation, what will happen at programme end? And what precedent does this create for the future of the landscape?).


6

6 Impact pathway: landscape finance

This chapter reviews the proposed programme plans on landscape finance, including the key financial stakeholders and financial products on offer; the key opportunities and challenges to integrate the financial sector in the proposed programme; as well as measuring potential programme-induced changes in access to finance (I.2.2).

6.1 Impact pathway landscape finance – key findings and lessons for design

This first section provides an overview of the key findings, as presented in more detail in the subsequent section, thereby revealing the following key insights:

- Farmers have identified **several crops and economic activities with high potential**, which they think may attract investors and financial institutions (e.g. avocado (hass), macadamia, banana, beekeeping, poultry, rabbit and pig farming). The latter were not capital intensive nor require large tracts of land, making them ideal for the youth interested in farming. These crops and animal farming activities may constitute starting points for the project to explore their on-farm profitability and risks, as well as their investibility from a lender's perspective.
- It should be clarified how these (potentially new) economic activities will specifically **contribute to landscape conservation goals**, as defined by the project and by stakeholders in the region themselves.
- Also for the **crops already financed** (coffee, tea, dairy, rice, horticulture), the project might consider how the on-farm and value-chain practices in these sectors could contribute to landscape management and conservation goals. And how the financial institutions can facilitate that.
- Farmers and financial institutions have also identified a series of **conservation activities that might attract investors** (e.g. water conservation (sources, catchment areas etc), organic based inputs, solid waste management, green energy and tree nurseries (fruit and non-fruit trees), tree planting activities, rehabilitation of riparian areas. The provide an avenue to explore how farmers could develop these activities and how these activities could be converted into a portfolio of investment opportunities.
- From the TOC it is not clear what type of **financial model** the project aspires to develop. The programme can build on a positive perception displayed by a number of financial institutions towards sustainable financing. Concrete strategies based on a stakeholder dialogue with the most relevant financial actors in the region need to be elaborated in a dialogue taking account of:
  - *Engagement strategy*: While taking account of risk preferences of the financial institutions, the programme could increase sustainability awareness and mobilise engagement of the financial institutions, around pressing local sustainability issues. The dialogue should focus on jointly developing or aligning practical activities with local actors, while generating engagement and motivation for a long-term and sustainable strategy.
  - *The design of investable portfolio for financial institutions:* how to translate the provision of **ecosystem services** in the Mt. Kenya region into a revenues models and investable portfolios in the project area is key, and can be informed by experiences from the region. In addition, the link between LMBs and SLMDPs, and finance, is not a priori evident and should crystallise further;
  - *Potential financial institutions*: the farmers consider SACCOs as a preferred partner for their farms, while Equity Bank is considered the most farmer-friendly. Also the project could build on the strong presence of government funds (YEDF and WEF);
  - *Financial products for sustainability management*: no specific financial products for landscape and conservation activities exist in the region, but some product offerings fit well within a context of green financing, climate smart agriculture or green energy;
  - *Types of clients for the finance model*: smallholder groups, forest-dependent communities and newly set-up enterprises are considered by the programme, but it requires further consideration if these existing

groups (e.g. CFAs, WRUAs), need to be set up, whether links with financial institutions already exist, or how such groups can become solid and credit-worthy partners for financial institutions;
- *Access to financial services:* access by smallholders is constrained by high interest rates or stringent rules for collateral, especially for the youth and women. Some farmers instead turn to ROSCAS, table banking, shylocks etc. for ease of accessing credit.
- *Youth focus*: as youth are not members of SACCOs for lack of cash crops and collateral, a tailored approach is required to engage this group. Currently, many youth farmers rely on digital lenders, with considerably higher interest rate than charged by commercial banks.

- Impact indicator I.2.2 is too simple to reflect progress on the access to finance goals in the project. The real challenges are often more qualitative than just binary quantitative. The granular information on access to finance in Chapter 6.3 could enable the project to set more granular goals for the finance pathway, and to attach specific targets to them.

6.2 Situation analysis – landscape finance

Before considering the current situation with respect to financial actors in the area targeted by the programme, it serves to consider the formulated impact pathway:

- The project's ambition is to connect landscape management with finance.
- The project will develop a pipeline of investment opportunities, which will help to attract new investments into landscape management.
- It is expected that financial institutions will contribute to a finance model catering to the LMB operation costs and to an SLDMP investment portfolio.
- This will enable LMBs to achieve SLDMP landscape conservation targets.

With these objectives in mind, the remainder of this section documents the key finance actors as well as their products on offer in relation to the programme's scope and ambition.

Mapping of financial actors

Landscape finance actors can be found at national level, rather than in the three counties (Kirinyaga, Embu and Nyeri).At national level the following initiatives and actors are identified:

- In 2020, KCB group received the UN Green Climate Fund (UNGCF) accreditation for the implementation of green financing in Kenya and the EAC region. The funds will be on-lent to beneficiary institutions in the development of green-climate resilient investment assets and projects.
- Funding 'public ecosystems, conservation and biodiversity' from GoK budgetary allocation or user fees, licenses, royalties and grants/loans/donations from the international partners: Kenya Wildlife Service, Kenya Forest Service, Tana and Athi River Development Authority, Kerio Valley Development Authority, among others.
- In the tea sector, the KTDA Power Company limited (a wholly owned subsidiary of the KTDA) secured World Bank funding to finance several small hydropower projects (SHPs) aimed at reducing GHGs. The company has also accessed additional funding under the Carbon Initiative for Development (Ci-Dev), carbon finance which deploys results-based payment as a vehicle for financing clean energy access projects.
- The National Environmental Management Authority (NEMA) obtained accreditation from the Adaptation Fund Board of the UNFCCC as the national implementing entity in the country. The Adaptation Fund is a self-sustaining fund established under the Kyoto Protocol to finance climate adaptation projects.
- A government agency – the National Environment Trust Fund (NETFUND) – has the ambitious goal of bridging the financing gap in the environmental sector by 3% by 2022. Some of the projects undertaken include tree planting, capacity building, environmental awards with a theme on Green Innovation Awards (GIA) with a focus on agribusiness, clean water, energy and waste management among others.

The national government is also stimulating the uptake of renewable energy products with taxation, housing regulations and use of renewable energy in government services. There are many private sector enterprises that market and sell green energy products, e.g. solar powered lighting/pumps, mobile phone chargers, TVs/fridges, water heaters, etc. The uptake of renewable energy products has been on the rise because of taxation policy by the national government and housing regulations (i.e. solar heating), and widespread adoption of solar powered street lighting.

In the three counties, several non-profit projects are investing in land resource conservation. In Focus Group Discussion, farmers in tea and coffee zones

identified known investors/Financiers in the landscape who were involved in conservation activities. An example for Kirinyaga is presented in Table 6.1. Investors/Projects such as as GIZ, UTANRP-Upper Tana Natural Resource Management Project, TARDA etc were identified.

There is a multitude of financial institutions with physical presence in the three counties: 52 financial institutions and 58 bank agents in Kirinyaga alone. These financial institutions offer a variety of financial products for economic activities, but hardly any for environmental purposes. Financial stakeholders in Kirinyaga, Embu and Nyeri were identified and profiled using various criteria: Financial institution number of branches; Category of stakeholder (Commercial bank, micro-finance etc); Financial products offered; potential contribution of stakeholder to project (scoring/rating); etc. About 10 financial institutions with different numbers of branches operating in the counties being targeted by the programme were identified for in-depth interviews: Commercial banks, Microfinance institutions and (deposit-taking SACCOs).

Table 6.1 Land resource conservation projects in Kirinyaga County

No	Project/Programme	Sponsors/Donors/ Funders/Partners	Location of implementation within the county
	Public; and Public-Private Partnerships		
1	WRUAs	WRUAs	Kamugunda ward
2	The International Small Group & Tree Planting Programme (TIST)	Gikumbo primary	Encourage farmers to plant trees on farm; Pay farmers money to plant trees (Carbon credit trading); Focus on exotic trees in
3	Rainforest alliance		Thumaita: tree Seedlings
4	Conservation Projects	Kenya Forest Service	
5	Conservation projects	KTDA tree nursery	Kangaita factory
6		Tana River Development Authority (TARDA)	
7			Kamwangi and Githue; Ministry of Agriculture
8	Training on tree planting		Kathandi Forest Station, Kenya Forest Service
9	Certification	RA together with coffee factories	Establishing of tree nurseries and training on landscape conservation in Ngariama, Rugeto and Rwama
10	Marketing fruit trees	Sagana Nuts Company	
	Civil Society (Local NGOs, International NGOs, Faith Based Groups)		
11	Kathandeini CFA; Tree Seedlings	Kathandeini CFA	Kamugunda ward
12	Kamweti center		Kamugunda: tree planting
13	Energy saving jikos	GIZ	Kangaita
14	Funding community proposals on conservation/natural resource management	UTANRP-Upper Tana Natural Resource Management Project	
15	Training / Tree planting	KTDA Foundation	Kangaita
17	Biogas production		The Coffee Marketing Society project

Source: this study.

In Kirinyaga County, the following financial institutions were identified and mapped:

- Formal actors: 21 bank branches, eight micro finance institutions, eighteen SACCOs, five insurance companies and fifty-eight agents spread out in the main town centers.
- Public funds (Empowerment funds): Youth Enterprise Development Fund (YEDF) and Women Enterprise Fund (WEF) and county funds.
- Informal actors: Rotating Credit and Savings Association (ROSCAS) and Accumulating Savings and Credit Associations (ASCAs); NGOs; faith-based organisations; money lenders; suppliers/Anchors and family/friends.

Products offered were not directly tied to environmental outcomes but general products in agricultural sector and other sectors that can drive livelihood improvements.

Quite a number of financial institutions offer agricultural finance services. This includes commercial banks, social finance institutions (microfinance and SACCOs) and government funds. Key providers of various agricultural finance and the attendant conditionalities are presented in Table 6.2. Similar tables exist for Embu and Nyeri.

The most important source of smallholder credit is informal finance, followed by financing from value chain companies and SACCOs. Financing from microfinance and banks is less predominant. Table 6.3 presents information from FGDs about the most important sources of credit for smallholders in Kirinyaga. It shows clearly that commercial banks focus on services for business people, whereas informal lenders can provide credit to anyone. Tea farmers can get credit from several sources (value-chain companies and SACCOs). Certain financial institutions are more accessible for women (Fortune SACCO, KWFT Microfinance Bank).

Table 6.2 Key providers of agricultural finance in Kirinyaga County

Institution	Clients	Lending conditions
Agricultural Finance Corporation	Small- and large-scale commercial farmers in diverse crops and animal husbandry	Both secured/non-secured, seasonal and long term (development), fixed interest rate.
Kenya Commercial Bank	Small- and large-scale commercial farmers in diverse crops and animal husbandry, e.g. beef, dairy, sugarcane, barley, wheat, coffee, tea, pigs, fishing, agro-processing.	Secured, seasonal and development loans, fixed interest rates
Equity bank	Small scale commercial farmers e.g. tea, coffee, dairy, poultry, maize and sorghum and agro processing	Secured/unsecured, seasonal and medium term fixed interest loans
Family bank	Small scale commercial farmers, e.g. coffee, tea, horticulture, dairy and poultry	Secured/unsecured, seasonal and medium term, fixed interest facilities
Absa bank	Large scale commercial farmers in various value chains, e.g. wheat, maize, fish, pigs, and agro processing	Secured, seasonal and medium term loans
Greenland Fedha limited	Small holder tea farmers	Unsecured, short term, less than three year
Microfinance banks, e.g. Kenya Women Finance bank	Women entrepreneurs/farmers, and employees	Secured/unsecured, short/long term loans
YEDF/WEF/UWEZO, County funds	Youth/women/Persons with Disabilities, for enterprise development including farming	Secured/unsecured, zero or subsidised interest rates, short term.
Saccos e.g. Bigwa and Fortune saccos	Farmers, Small and Medium Enterprises (SMEs), employees	Secured and unsecured, both short/long term

Source: this study.

Table 6.3 Farmers' use of financial institutions in Kirinyaga (ranked in order of importance)

No.	Institution	Name of Institution	Kown product offered	Innovations used to offer the products	Who uses the product
1	Informal lenders	Shylocks	Inputs	Face to face	Anyone
2	Value chain companies/ agribusinesses	KTDA- Greenland Fedha	Inputs	Face to face	Tea farmers
3	Cooperatives/SACCOs	Bingwa	Loans and savings	Mobile platforms	Tea farmers
		Fortune	Loans savings	Mobile platforms	Tea, Coffee, Women groups and dairy
		Ollin		Mobile platforms	Teachers
		Goodway	Loans, savings, Payment of tea returns and coffee, training on financial literacy	Mobile platforms, face to face, ATM, agents	Private school teachers, Payment of old people
4	Micro-finance institution	Bima		Mobile/face to face	Business men
		KWFT Bank		Mobile/face to face	Women
		Faulu		Mobile/face to face	Business people
		Greenland fedha		Digital/face-to face	
5	Commercial banks	KCB	Loans, savings	Mobile, face to face, ATM, agents,	
		Equity	Loans, savings	Mobile, face to face, ATM, agents	Business people
		Family	Loans, savings	Mobile-banking, face to face, ATM, agents	Business people
		Cooperative Bank	Loans, savings	Mobile platforms, face to face, ATM, agents,	Business people

Source: this study.

The SACCOs were the main financial institutions offering services to farmers in the three Counties of Kirinyaga, Embu and Nyeri. Utheri, Bingwa, Mwiitheri and Fortune SACCOs were giving loans for coffee, tea, dairy farming as well as for small businesses. One of the requirements for securing a loan with the SACCOs was having guarantors who held shares equivalent to the loan. Fortune and Bingwa were rated the best SACCOs because of their quick processing, and for charging a modest interest rate of 14-16%.

Youth and women have specific access challenges to finance. The majority of the youth were not members of SACCOs because they had no cash crops and lacked collateral for loans. In Ngariama FCS, women went to informal lenders (shylocks) for loans at high interest rates.[5]

Microfinance institutions and commercial banks only serve few people in the rural communities. Micro-finance institutions (MFIs), e.g. Faulu and KWFT; as well as commercial banks (e.g. The Cooperative Bank, KCB, Equity Bank, Absa Bank and Family Bank) were rated low as they served only a few people in the community due to high interest rates and the type of collateral required. Among the commercial banks, Equity Bank was considered more farmer friendly than the rest[6].

[5] Remarkably the survey data shown in Chapter 6.3 do not confirm that female coffee and tea farmers have less access to finance than their male colleagues.

[6] The survey data shown in Chapter 6.3 do show, however, that tea farmers make substantial use of MFI credit from GFL, the microcredit institution created and owner by KTDA.

Sustainable finance around farming activities

The financing conditions for farming activities are quite diverse, depending on the type of financial institution and the purpose of the financing. The most flexible conditions can be found among the affirmative funds of the government, which offer longer credit periods and lower or zero interest rates. Interest rates at the SACCOs differ per crop and also per SACCO, depending on the risk of the crop and any access to cheaper resources that a SACCO might have. At commercial banks the interest rates also vary with the risk profile of the client.

The government's Youth Development Fund (YEDF) offers a range of products for the youth: Agribiz Loan, Rausha, Inua, CYES and Smart (Table 6.4). Funds lent out to the youth ranges from KES 25,000 to 5 million allowing the youth on both the lower and higher part of the spectrum to access funds with repayments rates of 12-60 months. The mode of lending targeted individuals or persons organised in registered groups, depending on the loan type. However, the fund did not finance purchase or lease of land. Apart from Agribiz loan which had an interest rate of 6% p.a., there was no interest charged for other loan products. However, there was a one-off 5% of gross loan amount management fee charged at the point of loan disbursement.

Some studies (Jagongo 2018; Oduol 2013) have indicated that there was a high default rate for YEDF due to perception that the loans were free government money as well as the fact that the funds had little impact in promoting youth enterprises.

Table 6.4 Financial products offered by public funds (Youth Development Fund; Women Enterprise Funds)

Product Name	Typical clients	Purpose of product	Repayment period (Months)	Mode of lending	Interest rate per year (in %)	Amount per loan (x KES 1,000)	
						Min	Max
YEDF							
Agribiz Loan	Agribusiness	1,2,3,4	12-36	Individual	6	70	5,000
Rausha	Youth	1,2,3,4	12	Group	0	50	100
Inua	Youth	1,2,3,4	12-60	Group	0	100	1,000
CYES	Youth	1,2,3	12-36	Group	0	50	1,000
Smart	Youth	1,2,3,4	12	Individual	0	25	50
WEF							
CWES	Women Groups	All[1]	12-24	Group	0	100	
SACCO Lending	SACCOs	All	36	Individual	1		
LPO Financing	Women	All	3	Individual	0	50	
Bid Bond	Women	All	Tender Period	Individual	0	50	

Source: this study.

YEDF: Youth Enterprise Development Fund;WEF-Women Enterprise Development Fund

[1]Purpose of loan: 1: Agricultural input purchase (seed, fertiliser, pesticide, etc.); 2: Agricultural fixed asset purchase (tractor, land, etc.); 3: Working capital; 4. Other purposes (education, medical bills, small business etc.);

For Women Enterprise Development Fund (WEDF), the main loan product was the Constituency Women Enterprise Scheme (CWES). This product is tailor made for registered groups, where women constituted at least 70% of the members and all leadership positions were controlled by women. There was no interest charged on the loans, though a one-off management fee of 5% of gross loan amount was levied at the time of loan disbursement (Table 6.4).

WEDF partnered with carefully selected SACCOs, who receive wholesale funding at 1% p.a. for onward lending to women entrepreneurs at lower than

market interest rates. Repayment periods depended on the loan product and was in the range of one month to three years depending on the product. A previous study on challenges facing the performance of Women Enterprise Fund indicated that there was a high level of repayment rates, nearing 100% (Ogweno 2016).

The study found nine distinct loan products offered by deposit taking SACCOs to finance various value chains. SACCOs were targeting farmers except for business loans which target SMEs. SACCOs in Kirinyaga had products targeting coffee and tea farmers, whereas dairy and livestock-related loans were offered across the three counties. Kirinyaga SACCOs additionally provided rice loans as part of their loan portfolio. The maximum amount for most of the loan products was a multiplier of four to five times of a member's savings. Some of the products on offer had low interest rates (5-8% p.a.), while some charged at between 15% and 16% (horticulture and business loans), indicating that they were probably considered to have a higher risk of default (Table 6.5). Some of the SACCOs were also able to source cheaper funds and thus able to disburse loans at a lower cost to their customers.

Table 6.5 Financial products offered by SACCOs

Product Name	Target enterprise	Purpose of product	Repayment period (Months)	Mode of lending	Interest rate per year (in %)	Amount per loan (x 1000 KES)	
						Min	Max
Dairy	Agribusiness	All	1-48	Both	5.5-7.7	1	
Poultry	Agribusiness	All	1-48	Both	5.5-7.7	1	
Livestock	Agribusiness	All	1-48	Both	5.5-7.7	1	
Milk advance	Agribusiness	All	1-48	Both	5.5-16	1	
Coffee/Tea	Agribusiness	All	Dec-36	Both	16	10	
Kilimo advance	Horticultural farmers	All	6-12	Individual	16	20	
Horticulture / Rice loans	Rice and Horticultural Farmers	All	6-24	both	15	20	15,000
Business Loans	SMEs	Working Capital	1-60	both	16	20	15,000

Source: this study.

Commercial banks offer mostly short-term loans for one crop cycle. Unlike the affirmative government owned Funds, (WEF & YEDF) interest rates and related loan charges for commercial banks were not uniform for all customers. The latter depended on a base rate and a borrower's risk profile as determined by the individual bank. Secondly, the products were also available for men over thirty-five years, unlike the YEDF and WEF. See an example for Equity Bank in Table 6.6. Equity's Kilimo Biashara product was designed for smallholders.

Sustainable finance around environmental activities

There is hardly any financing offered in the three counties for landscape and conservation activities. There were no known organisations or financial institutions that offered financial services to farmers directly for conservation activities. Further, certain funds such as NETFUND that supports communities for conservation activities seems not to have had a deeper reach in the target counties.

Table 6.6 Equity Bank Financial Products

Product name	Target enterprise	Purpose of loan	Repayment period	Mode of lending
Kilimo Biashara	Agribusiness & smallholders	Farm Inputs	Crop Cycle	individual
Agribusiness	Agribusiness	Farm inputs/other needs	Crop Cycle	individual
Remittance loan	Agribusiness	Farm inputs/other needs	Crop Cycle	individual
Commercial Agriculture	Agribusiness	Farm inputs/other needs	Crop Cycle	individual
Asset Finance	Agribusiness	Farm Equipment	Crop Cycle	individual

Source: this study.

There is some limited offer of financial products for climate-smart agriculture, with just a few financial institutions in the three counties. The products tailored to climate smart agriculture indicated by the respondents are shown in Table 6.7. Taifa SACCO has a green energy product tailor-made for both climate-smart agriculture and green energy. Equity bank has a product called *Kilimo biashara* that caters to commercial cereal farmers, whereas the YEDF

Agribiz has also been used by its customers for climate-smart agriculture purposes. The repayment periods and other loan terms are similar to the other products as demonstrated in the earlier tables (Table 6.4 to Table 6.6).

Table 6.7 Products tailored to Climate Smart Agriculture

Category	Financial Institution	Product	Target Client
SACCOs	Fortune	None	
	Bingwa	Premium financing	Members
	Taifa	Green Energy loan	Farmers
Affirmative funds	WEF - Nyeri & Kirinyaga	None	
	WEF – Embu	None	
	YEDF - Kirinyaga	Agribiz	Youth
	YEDF – Nyeri	Agribiz	Youth
	YEDF – Embu	Agribiz	Youth
Commercial banks	Equity	Kilimo Biashara	Commercial cereal farmers

Source: this study.

Green energy loans are available with three financial institutions in the project region. Three out of the nine organisations interviewed indicated that they had a product geared towards Green Energy. Taifa SACCO had a Green Energy loan product that targets dairy farmers for purposes of constructing biogas units with repayment period capped at four years. The YEDF offered green energy technology products that had a repayment period of between one to six years.

Table 6.8 shows the financial products tailored to green energy indicated by the respondents.

Table 6.8 Products tailored to Green Energy Technology

	Financial Institution	Product	Target Client	Target Activity
SACCOs	Fortune	Jiinue Savings	Savers	Asset Acq.
	Bingwa	None		
	Taifa	Green Energy loan	Farmers	Dairy farmers
Affirmative funds	WEF - Nyeri & Kirinyaga	None		
	WEF – Embu	None		
	YEDF - Kirinyaga	CYES, Rausha, Inua	Youth	All businesses
	YEDF – Nyeri	CYES, Vuka, Agribiz, LPO	Youth	All businesses
	YEDF – Embu	Asset finance	Youth	Biogas, solar, agribusiness equip
Commercial banks	Equity	None		

Source: this study.

Environment-related investments can sometimes be financed with other financial products. For example, it is worth noting that Taifa SACCO offers a development loan, which among other purposes, can also be used to purchase water tanks, drip irrigation systems, pulping (eco-pulpers) and excavation of water pans.

Sustainable finance is gaining interest in Kenya. The Kenya Bankers Association (KBA) which is a lobby group for banking institutions in the country has recently been steering sustainable finance transformation in the sector. The sustainable finance products, instruments and services all have the consideration of environmental and social governance (ESG) as a criterion in bank's investments decisions (Kenya Bankers Association 2021).

Green financing is an emerging market in Kenya, but it is not yet reaching the rural counties of the Mt. Kenya project. Green financing is any financial instrument provided to an entity/client with the intention that the financing will accrue positive benefits to the environment (World Economic Forum 2021).

Green financial instruments include equity, debt instruments e.g. bonds, grants, insurance, and certain derivatives.

The Green Bonds Programme in Kenya, (a programme that brings together Kenya Bankers Association (KBA), Nairobi Securities Exchange (NSE), Climate Bonds Initiative, Financial Sector Deepening (FSD) Africa and FMO - Dutch Development Bank), estimates that green bonds issuance globally totalled between USD 250-350bn as at 2018, indicating a tremendous growth in this segment.

In 2020, Acorn Holdings ltd, a real estate firm, in partnership with Private Equity Fund Helios was able to raise USD 42.5m with the first issuance of a Green Bond instrument in Kenya. The purpose of the bond was to finance the construction of students hostels that are environmentally friendly (KBA, 2021). In the same year, KCB bank was accredited by the Green Climate Fund (GCF), making it eligible to receive GCF funds for onward lending towards green and climate friendly projects.

National Drought Management Authority estimates the value of private sector investments (national and international) in renewable energy sector to be about USD 2.8bn (Odhengo et al. 2019; Government of Kenya 2018) driven mainly by tax incentives provided by the government. The investments are in geothermal, small hydroelectric projects, biomass and solar energy

Finance gaps and challenges in accessing financial services

Farmers and women interviewed in focus groups indicated a series of crops and activities that could attract investment and financing.

- There were crops with high potential for income generation but which are currently not receiving finance: avocado (hass), macadamia, banana as well as horticulture. Currently tea, coffee, dairy, rice and horticulture (French beans) attract funding because of structured cooperatives and or marketing structure. This is partly due to inadequate targeted financial products available in the market e.g. for value chain financing organised around SACCOs/Marketing groups. The financial institutions tend to finance these crops with general business loans requiring collateral, which is not a suitable financial product for this purpose.
- Other value chains with a potential to attract investments include dairy farming; beekeeping because there are diverse species of trees and vegetation that are rich sources of food for bees; poultry, rabbit and pig farming which are not capital intensive nor require large tracts of land, making them really good options for the youth interested in farming.

No institution is funding conservation activities, but farmers indicated that some conservation-related activities are investable and could attract financing.

- No financial institution was funding conservation activities as there is often no immediate financial gain from conservation for the borrower.
- Some conservation activities are likely to attract financing in the future: establishment of tree nurseries (fruit and non-fruit trees), tree planting activities, rehabilitation of riparian areas, conservation of water sources and catchment areas. Tree nurseries generate income while non-profitable conservation activities may be modelled along Payment for Environmental Services, that is, compensation schemes for upstream users for their conservation activities so that downstream users can benefit from sustained water supplies.

Farmers (f/m) mention numerous challenges in accessing financial services for farming and for conservation activities:

- High interest rates that discourage farmers from borrowing from SACCOs and banks;
- Occasional defaults in loan payment due to low tea returns;
- Few farmers are willing to be guarantors for those wishing to take loans. This is because there have been frequent cases where borrowers defaulted on loan repayment, forcing guarantors to pay their debt;
- Those desiring to apply for loans do not have any collateral to support their application;
- Financial institutions refusing to give loans especially when tea production is low;
- Loan applicants are sometimes given less money than the amount requested for;
- Loan application and valuation fee for collaterals is expensive;
- Stringent terms and conditions of borrowing from financial institutions have made some farmers to turn to ROSCAs, table banking, shylocks etc for ease of accessing credit. The youth are increasingly turning to digital lenders such as tala and M-Shwari for credit access (Women FGD, New Ngariama);

- Farming insurance for farming and agribusinesses; insurance products not tailor made to smallholders.

Perceptions of financial institutions about actual and future sustainable finance

Financial institutions interviewed in the project region are aware of environmental challenges, with soil degradation ranking first; but they seem to underestimate the importance of climate change.
About nine financial institutions in the three counties of Kirinyaga, Embu and Nyeri were interviewed and asked to rank problematic environmental issues (degradation of natural resources, degradation of soils for agriculture, climate change, pollution and other environmental issues) experienced in the landscape. From the ranking, it was clear that the financial institutions had a notion of climate change but had a limited understanding of the magnitude of this phenomenon. This therefore might explain the challenges they face in designing appropriate financial products for farmers. A study by the KBA seems to corroborate this position: though 95% of Kenya's banks support attainment of SDGs, only a paltry 4.8% support Climate Action SDG (Kenya Bankers Association 2021).

Financial institutions interviewed identified several business opportunities related to sustainability, specifically in water conservation, organic based inputs, solid waste management, green energy and tree nurseries. The financial institutions were asked whether they saw any possibility of turning sustainability into a business opportunity. The SACCOs saw business opportunities in the areas of water conservation, organic based inputs e.g. seeds. Solid waste management and development of green energy products e.g. biogas were also seen as viable business opportunities. The SACCOs also viewed funding the entrepreneurs investing in sustainability as an opportunity to also increase their revenues. YEDF and WEF mentioned the possible business opportunities in solid waste management through private investments in garbage collection and recycling of waste. Eco-toilet business (public toilet services), establishment of tree nurseries and recycling of rice husks were also mentioned as possible business opportunities.

The financial institutions interviewed show a positive perception about offering sustainable finance, but they also affirm that their clients consider sustainable financial products as riskier than traditional finance products. The nine financial institutions interviewed were asked about their perceptions on twelve statements regarding sustainable portfolio lending/financing on a four-point Likert scale (strongly agree, disagree, agree and strongly disagree). For purposes of analysis, the four-point Likert Scale was collapsed into two nominal categories of Agree and Disagree and number of respondents on either end of the scale counted for each of the 12 questions.

About 70% of the nine financial institutions studied agreed with 9 out of the 12 statements read out to them, indicating that they currently have a positive perception in offering sustainable financing. Examples of statements:

- Our business has a critical role in raising awareness on 'sustainable' financial products in the three counties of Kirinyaga, Embu and Nyeri (affirmative scores: 6 out 9);
- Our business has a strong commitment with sustainability in the three counties of Kirinyaga, Embu and Nyeri (affirmative scores: 8 out 9);
- Our clients (borrowers) currently consider sustainable financial products (green bonds, green lending, climate smart related products, green energy etc.) to be risky compared to traditional finance products (affirmative scores: 3 out 9); the reason is that borrowers perceive that the sustainability projects financed under sustainable finance facilities may take longer to realise cash flow and profits, as compared to traditional investment projects with a faster cash flow and more certain (short-term) profit.
- Our business is successfully building partnerships with government and civil society actors, to address sustainability issues in the three counties of Kirinyaga, Embu and Nyeri (affirmative scores: 5 out 9).

6.3 Impact evaluation – landscape finance

For the impact pathway on landscape finance, only one indicator was planned to be measured during the baseline (Table 6.9). Three additional indicators refer to new activities foreseen under the programme and are thus not being measured in the baseline.[7]

Table 6.9 Baseline figures for landscape finance

		All farmers surveyed	
		N	%
(I.2.2) Percentage of tea and coffee smallholders receiving credit from (regulated) financial institutions.[8]	Tea	276	56.5%
	Coffee	723	29.2%

Source: this study.

A remarkably high percentage of tea farmers borrowed money from financial institutions (56.5%) in the period between July 2020 and June 2021. For coffee farmers this is much lower (29.2%). This should can be explained by the fact that smallholder tea farmers are well organised under KTDA which has its own microcredit company offering tea farmers credit at lower interest rates (Green Land Fedha) but also give farmers input credits paid through green leaf deliveries to factories. Coffee Societes currently do not match this type of structure and assured payments (first payments, second payments/bonus).

In the FGDs, farmers report that they finance their farm activities from returns from cash crops (especially coffee, tea, horticultural crops, dairy), loans from SACCOs, cooperative societies, banks and microfinance institutions, savings, remittances and earnings from employment.

The survey data on access to finance reveal a more granular picture about the use of financial services. Savings are more frequently used than credit, and may constitute a vital element of farmers' financial strategies. Savings groups are used by 70-90% of the farmers surveyed and thus represent the single most important access to finance tool of the tea and coffee farmers. This may imply that it might be equally important for the finance pathway to include actions to stimulate farmers to save and build up capital - for specific farming or landscape-related purposes or for creating buffers against adversities. Semi-formal credit is used, from value-chain actors and from non-profit agencies, but not as frequently as the credit from regulated financial institutions. Savings and credit is overwhelmingly used for purposes other than farm activities: family expenses and shock absorption are the most frequently mentioned purposes. Male and female farmers present small differences in terms of their access to finance, but these figures do not show a clear quantitative bias against women, at least not if measured in a binary sense.

It is questionable whether indicator I.2.2 can capture relevant changes as a result of the finance pathway. With access to finance measured as high as 56.5% for tea farmers, one could wonder to what extent there is scope to further increase the number of tea farmers with credit, as a simple binary variable. For coffee farmers the current access to credit is much lower (29.2%), so indicator I.2.2 can still be a relevant indicator for the coffee farmers. The FGDs indicated that there are certain financing gaps, but these are often more qualitative than merely quantitative. Challenges mentioned in the FGDs are related to occasional profitability problems (specifically in tea), occasional repayment problems, prohibitive lending conditions (high interest rates, requirement for guarantors, limited amounts), and lack of funding for conservation activities. Opportunities mentioned include developing new economic activities that are credit-worthy, operating in contract farming and marketing contracts, selecting certain conservation activities that may attract

[7] These additional indicators relate to the non-programme financing available for the Landscape Management Boards (O.7.1), the investment portfolio in landscape development and management plans (O.7.2), and the non-programme finance channeled through the finance model as loans to farmers, farmer groups and newly created SMEs (O.7.3). These indicators will be captured in the annual monitoring by the project, as well as the midline and endline evaluation studies.

[8] We used two deviations from the original definition of indicator I.2.2. First, the original indicator includes not only tea and coffee smallholders, but also smallholder groups, forest-dependent communities and newly set-up rural enterprises. The survey, however, measures only at individual smallholder level, and not at group level. Second, we specified the financial institutions as 'regulated financial institutions', including banks, microfinance, SACCOs and mobile money. We did not include semi-formal loans from value chain cooperatives and companies, or semi-formal loans from NGOs and government funds (WEF and YEDF). More details about the semi-formal and informal loans can be found in Annex 4.

investments. It is questionable whether these gaps and solution pathways are adequately captured in indicator I.2.2.

A more refined set of indicators is probably needed to capture change in the finance pathway. First, the project could now set some specific goals and targets regarding the finance pathway, based on the baseline information that is now available. Second, some indicator of credit-constrainedness could be introduced, to distinguish those that do not need credit from those who need it but do not get it. This indicator should also distinguish different sources of credit (formal, informal, value-chain finance) and different purposes (farm activities, longer-term investments, family expenses). Third, it would be worthwhile to develop indicators of access to finance that are closer to the project's activities and goals, rather than just a generic binary A2F indicator. Fourth, it would be worthwhile to complement farmer survey data with some portfolio indicators of financial institutions, within the framework of the future partnerships between the project and certain financial institutions.


7

7 Impact pathway: environmental and social resilience

This chapter documents key indicators describing environmental and social resilience, specifically discussing indicators characterising local economies (SA11-SA13); livelihood activities (SA14-SA20); human rights (SA21-SA24); sustainability issues and risks (SA25); and agricultural production (SA43-SA49). In addition, this chapter describes key indicators used for the impact evaluation, including livelihood activities (I.3.1; O.5.1; O.9.1; O.9.2), on-farm estimates of Soil Organic Matter (O.3.1) as well as adoption indicators (O.8.1; O.8.2).

7.1 Environmental and social resilience: key findings and lessons for design

This first section provides an overview of the key findings, as presented in more detail in the subsequent section. The environmental and social resilience impact pathways and the mechanisms behind the impact pathways proposed by the project focus on:

- Soil health
- Riparian ecosystems
- Income.

Our field study (i.e., situation analysis including lifescape elements and baseline impact evaluation) has generated a series of insights that can feed into the project strategies for the environmental and social resilience pathways. We have analysed the indicators from the situational analysis and the indicators for the baseline impact evaluation. The results are presented in Section 7.2 (situation analysis) and 7.3 (baseline impact evaluation). First, a number of notable key findings from this section are presented below.

With respect to the **soil health and riparian ecosystems impact pathways** (i.e., environmental issues) the following findings and key threats are identified:

- Implementing climate smart agriculture technologies **may improve productivity and incomes, but much improvement may not be expected** as farmers in the target area are already implementing many of the practices.
- If there is room to improve CSA practices, **farmers may not afford the required investments in labour and equipment** as their incomes are generally low (Section 7.2).

With respect to the **income impact pathway** (i.e., social resilience issues) the following findings and key threats gare identified:

- **Agricultural production and employment in the formal and informal sectors** are the **main income sources** of the communities. The majority of the residents, men or women are **engaged in more than one livelihood activity**, often farming in combination with provision of services or undertaking some business. So there is some significant diversification of livelihood sources. The smallholders targeted do not depend on tea and coffee only but have diversified livelihoods, though the level of dependency on tea is relatively high compared to coffee.
- Implementing on-farm livelihood diversification may contribute positively to improving economic opportunities of Programme beneficiaries, though the **extent of improvement is likely limited due to small farm sizes**. Diversification may work against specialisation and enhanced productivity in a particular activity.
- About **20% of the farmers earns a living income while more than 70% of the farmers earns below the national poverty line**. Reducing poverty rates significantly therefore is of key importance of improving farmers' resilience.

- A **plethora of activities/projects** were suggested by stakeholders that could be carried out **to improve their community situation and their situation at the household level**. It will be a challenge for the project to address, to some extent, all identified priorities for improving their livelihood situation.
- Smallholders tea and coffee farmers currently hire labour from outside the target counties when needed. **Implementation of programme activities by the beneficiaries will raise labour demand moderately but likely not result in significant labour hire** above the current levels depending on the technology being implemented.
- The poor, marginalised and the vulnerable have a lower potential to participate in the programme without pro-active strategies for targeting. **Market challenges are rampant for other value chains and require pro-poor policy reforms and implementation**.

7.2 Socio-economic conditions per county: Social structure and institutions

Culture, social structure and institutions of Kirinyaga, Embu and Nyeri Counties are summarised in Table 7.1.

Kirinyaga County is located within the Central Region, Kenya and is part of Mt. Kenya Ecosystem. It is mainly inhabited by the *Agikuyu* ethnic group. The main languages spoken in Kirinyaga are Gikuyu and national and official languages (Swahili and English). In terms of social structure, the Community is hierarchical with differences in wealth/poverty levels observable in different pockets of the county (e.g. comparatively higher poverty levels in the lower drier parts of the county compared to other parts of the county). Land ownership is important in defining social structure though increasingly other assets have come into play (dairy, cash crops, built in houses etc).

Embu County is located within the Central Region. It is mainly inhabited by the Embu, Kamba and Mbeere communities. The Embu are found in Manyatta and Runyenjes constituencies while the Kamba and Mbeere are mostly found in Mbeere North and Mbeere South constituencies with the former mainly found in Mbeere South (Makima areas). The Akamba people live in lower parts of Embu County around Makima. While they are natively known for their carving and basketry skills, *Kambas* also do a lot of subsistence farming, beekeeping and goat rearing. The Kamba traditionally organised themselves into clans called *Mbai.*

Nyeri County is dominantly inhabited by the Agikuyu Community though other communities exists. The Kikuyu (also known as Agikuyu) are a central Bantu community. They share common ancestry with the Embu, Kamba, Tharaka, Meru and Mbeere. Majority of the Agiikuyu are predominantly farmers growing tea and coffee as cash crops alongside food crops such as maize, beans, assorted vegetables and potatoes. Originally hunters and gatherers, the Agikuyu later adopted agriculture as their main source of livelihood. Women did the farming and gathering of wild fruits using traditional tools (such as hoes, digging knives) for domestic consumption, while men did the hunting. Today, their main economic activities are trade, agriculture and livestock keeping.

The Kikuyu base their social organisation on their family units (Nyumba), which are ex-tended through marriage. Several related families form the clan (Mbari) and neighbour-hood (Itura).

Table 7.1 Culture, social structure and institutions in Kirinyaga, Embu and Nyeri

Description	Kirinyaga	Embu	Nyeri
Culture (langage)	Agikuyu culture and language	Embu, Kamba and Mbeere cultures and languages	Agikuyu culture and language
	National and official languages (Kiswahili; English)	National and official languages (Kiswahili; English)	National and official languages (Kiswahili; English)
Social structure	Hierarchical society-noticeable differences in wealth and thus pockets of poverty	Hierarchical society-noticeable differences in wealth and thus pockets of poverty	Hierarchical society-noticeable differences in wealth and thus pockets of poverty
	Land ownership (besides commercial enterprises-tea, coffee, dairy, built assets etc) is a major indicator of socioeconomic status	Land ownership (besides commercial enterprises-tea, coffee, dairy, indigenous cattle built assets etc) is a major indicator of socioeconomic status	Land ownership (besides commercial enterprises-tea, coffee, dairy, built assets etc) is a major indicator of socioeconomic status
	Has noticeable differences in roles assigned to men, women and youth in the society	Has noticeable differences in roles assigned to men, women and youth in the society	Has noticeable differences in roles assigned to men, women and youth in the society
Groups and social institutions	86 cooperatives out of which 25 are SACCOs, 4,763 registered self-help groups out of which 1345 are women groups and 1164 are youth groups	28- SACCOS, 13 multi-purpose societies, 1 dairy marketing society, 6 housing societies, 1 cooperative union	143 active and 37 dormant SACCOs. 14,391 social development groups out of which 4,489 are women groups, 8,564 are self-help groups and 1,338 youth groups, about 100,000 Small and Micro-medium enterprises
Local institution**s**	The Kikuyu Council of Elders, clan, family and extended family	Council of Elders, clans, family	Clan, family and extended family

Source: this study.

7.3 Migration trends and demographic issues

Migration trends and demographic issues of Kirinyaga, Embu and Nyeri Counties are summarised in Table 7.2.

Kirinyaga County: Migratory trends in Kirinyaga County mostly reveal in-migration. Out of a population of 610,411, 78% are living in the rural areas. The population density is 502 persons/km^2 (Kenya National Bureau of Statistics (KNBS) 2019). The population structure of Kirinyaga County is transitional with an average household size of 3.0 members. This trend is the result of declining fertility rates among women of reproductive age. The number of young people aged 0-14 years who make up 33% of the total population is declining; while that of productive age group (15-64 years) which represents 62% of the population is increasing.

Embu County has a population of 608,599 with a population density of 216 persons/km^2 (Kenya National Bureau of Statistics (KNBS) 2019. The population structure of Embu County is transitional with an average household size of 3.3 members. This trend is the result of declining fertility rates among women of reproductive age. The number of young people aged 15-34 accounted for 34% of the population while those in reproductive age bracket (15-49 years) and productive labour force (15-64 years) accounted for 52 and 62% of the total population respectively.

Nyeri County has a population of 759,164 with a population density of 228 persons/km^2 (Kenya National Bureau of Statistics (KNBS) 2019). The population structure of Nyeri County is transitional with an average household size of 3.0 members. This trend is the result of declining fertility rates among women of reproductive age. The number of young people aged 15-34 accounted for 31% of the population while those in reproductive age bracket (15-49 years) and productive labour force (15-64 years) accounted for 50 and 62% of the total population respectively.

Table 7.2 Population characteristics of Kirinyaga, Embu and Nyeri

Description	Kirinyaga	Embu	Nyeri
Population	610,411	608, 599	759, 164
Population density (persons/km2)	502	216	228
Household size	3.0	3.3	3.0
% in 0-14 yrs bracket	33		
% in 15-34 yrs bracket	-	34	31
% in 15-49 yrs bracket	-	52	50
% in 15-64 yrs bracket	62	62	62

Source: Kenya National Bureau of Statistics (KNBS) (2019).

7.4 Vulnerable groups

Details of vulnerable groups and the challenges they face and how such can be overcome are presented in Table 7.2.

Kirinyaga County: Focus group participants identified the old, women and the youth, people with disability as the most vulnerable groups in Kirinyaga County. These were in congruent with discussion with key informants though the latter also identified men (landless men, drug addicts) and persons living with HIV as vulnerable (Table 7.2). The old were poor farmers with no livestock and lacked the ability to buy food, therefore welfare programmes for their basic requirements would be appropriate.

Table 7.3 Vulnerable groups in Kirinyaga County, challenges they face and suggestions to overcome the challenges

Vulnerable group	Challenge	How the challenge can be addressed
The elderly	They are not productive and hence not able to engage in farming (physically weak) Slow to embrace new technologies Financial requirement to be able to engage in the programme Not factored in while formulating programmes	Inclusion of the elderly especially in advisory due to their experience Provide economic activities that are not labour intensive
Orphans	Do not have people to support and guide them Drop out of school Financial challenges to cater for their basic needs Sidelined and sometimes physically and mentally abused	Proper identification and facilitation on need by need basis Kitty should be set aside for orphans Identification and assisted in terms of scholarship Linkage to orphanage
People living with disabilities	Secluded from participating in projects Not financially able to engage in IGA due to their disability Deprived off education Sometimes considered as a curse	Identification Linkage to societies and organisation dealing with PLWD Capacity building on soft skills on how they can be engaged Tailor-made interventions like shoe-making
Youth	Unemployed or underemployed Left out in development activities Prone to misuse by politicians Prone to drug addiction Lack capital (credit) to invest in agricultural and business No collateral Financial requirement to be able to engage in the programme Lack of organisation in groups The lack of knowledge of such projects The youth lack access to land because they have to wait to be given land by their parents or inherit	Creation of employment through cottage industry in value addition, more focus on vocational training Rehabilitation of drug addicts Sensitisation of all youths on importance of group formation Sensitisation on embracing agriculture Sensitisation on self-employment Support starter businesses
Women	Limited land ownership and are sometimes denied access by men Limited ownership of productive assets (land, labour, capital) Often not actively involved in commercial farming Greater responsibility for domestic chores The financial limitation Low involvement in decision making forums on natural resources management Some not enlightened/trained Financial requirement/contributions to be able to engage in the programme	Sensitisation on the importance of their inclusion Sensitisation of men through public forums would enable the women and youth to have a share of proceeds from cash crops Technical training for women and youth would offer skills to earn some off-farm income Create opportunities for women to get income such as dairy goat which is not land dependent Building capacities of women through creation of training

Vulnerable group	Challenge	How the challenge can be addressed
	Non-land owning women not allowed to register and have numbers at the factory to sell coffee and tea	centers e.g., Kaitheri Apparel factory
People living with severe illnesses e.g., HIV and AIDs, cancer	Sidelined and stigmatised Face physical challenges due to their illness Expensive medical expenses	Counselling sessions Empowerment on active engagement in IGA
Children from poor Households	Early marriages Early pregnancies Child labour	Scholarships Free education Set aside funds for educating and catering for their needs Enforce policies on child protection
Men (drug addicts; land less)	Limited to cash crops such as coffee Addicted to alcohol Financial obligations Men who did not inherit land from their fathers hence do not own land Men who do not have access to training sessions-thus have little information	Rehabilitation of drug addicts Empowerment on diversification

Source: this study.

Embu County: Mostly similar vulnerable groups as in Kirinyaga were identified at FGD and at KII sessions (Table 7.3). The vulnerable groups identified included persons living with disabilities, orphans, widows, elderly and youth, slum dwellers and disadvantaged men. Slum dwellers in Embu County have limited access to basic needs let alone factors of production. Male FGD participants also identified that men are slowly becoming vulnerable. All projects that come to the landscape focus on empowering women, youth and the girls and excludes men. Men can be supported to access credit, form Village Savings and Credit Associations and to have a social support office for exchanging farming ideas.

Table 7.4 Vulnerable groups in Embu County, challenges they face and suggestions to overcome the challenges

Vulnerable group	Existing challenges	How the challenge can be addressed
Youth	Youths do not own production assets and do not receive sufficient financial support	Youth should be trained and be facilitated to run some enterprises Youths should also be trained on value addition Introduce vertical farming to address limited access to land Support youth to start small business (agricultural and non-agricultural) Support for agribusiness ventures that are not capital intensive: tree nurseries, poultry farming, rearing of dairy goats or aggregation and selling of agriculture produce
	Some parents are unwilling to give the youths pieces of land	Explore interventions that the youth can venture in not pegged on land and does not require high capital investment
Women	Most women do not own assets of production and have a history of marginalisation when it comes to ownership of property	Women should be involved in every project and be supported with funds Support on interventions that the women can venture in: that which is not pegged on land and does not require high capital investment
	Women are less involved in decision making on how to utilise the proceeds from the assets of production	
	Time constraints because of all the responsibilities they assume at home	Invest in enterprises that will put money in their pockets and that are not antagonistic with other responsibilities they are expected to carry out. Otherwise, it will trigger conflicts, GBV incidents
Disabled	Inadequate access to finances and land	The groups can come together, lease land or engage in beekeeping and other farming activities like poultry keeping that do not require large tracts of land Promote poultry and beekeeping or goat keeping that are not labour intensive Beads making Support for agribusiness ventures- tree nurseries, poultry farming or rearing of dairy goats

Vulnerable group	Existing challenges	How the challenge can be addressed
The poor	Unable to have access to natural resources especially land and water	Interventions/enterprises that put incomes in their pockets. But the programme should implement these interventions using proven sustainable models Interventions should consider land leasing options In conjunction with the county government and other stakeholders, the programme should consider water harvesting options especially in the areas prone to prolonged dry seasons
	Acceptance of the programme by the locals	Offer some kind of incentives e.g., when you want to engage a farmer to plant trees, also give him/her some avocado trees for income

Source: this study.

In **Nyeri County**, the following were identified as vulnerable groups in FGDs and KIIs: women, youth, people living with disabilities, elderly in society, internally displaced people (IDPs), HIV- positive persons and AIDS victims, low-income households and people living with chronic illnesses (Table 7.4).

Table 7.5 Vulnerable groups in Nyeri County, challenges they face and suggestions to overcome the challenges

Existing challenge	How the challenge can be addressed
Sociocultural barriers to land ownership and ownership of other assets for women and youth	Education and training on cultural issues; Training the youth to take up segments of value chain that do not need owning land
Sociocultural barriers that make youth and the women not to make decision on how proceeds from farm produce can be used	Education and training on cultural and attitudinal change; Training on sociocultural issues and attitude change
Limited access to land, credit and extension services	Facilitate access to land, credit and extension and training services; Organise the entities in formal groups that help to mitigate risks and attract financiers; Develop loan products for youth and women that do not require title deeds as collateral, and encouraging women and youth to group themselves in informal savings and loan associations
Limited access to knowledge, information and education	Link the groups to training services and build their capacity
Limited participation in development activities	Increase participation of vulnerable groups in development activities
Limited access to markets	Link them to markets
Low attitude and discrimination by members of the community (Persons living with disabilities)	Training, on attitude change, capacity building and empowerment

Source: this study.

7.5 Beneficiary assessment per county

The proposed programme beneficiaries

Criteria of inclusion: Proposed programme beneficiaries are smallholder tea and coffee farmers who meet the following criteria:

- Communities/smallholder farmers organised into groups
- Communities/smallholder farmers living/exploiting/farming close to protected forests or community forests
- Communities/smallholder farmers living or farming close to protected Natural ecosystems, i.e., wetlands, rivers etc.
- Communities/smallholder farmers living or farming in or close to HCVA (overlap with the 2 above): An area designated on the basis of High

Conservation Values (HCVs) which are biological, ecological, social or cultural values considered outstandingly significant at the national, regional or global level
- Communities/smallholder farmers farming in degraded lands
- Communities/smallholder farmers with potential for diversification.

The target beneficiaries have the following characteristics:
- **Smallholder tea farmers:** These are tea growers who grow small plots of tea, deliver their green leaf to Kenya Tea Development Agency (KTDA) managed factories through the structure of tea buying centres. The smallholders receive input credit from KTDA who in turn processes the tea and markets it on behalf of the farmers. The farmers own the factories through their shareholding and grow tea on their own land with tenure security. The growers are registered with KTDA. The farmers grow tea on volcanic soils of the Mt. Kenya Region, enjoying favourable weather patterns all year round. The average green leaf yields of these smallholder farmers are often below those of Estates which stand at an average of 1,800 kg/ha (Gesimba et al. 2005).
- **Smallholder coffee farmers:** The smallholder coffee growers in Kirinyaga, Embu and Nyeri produce Arabic coffee. Varieties found in the region include SL28 but also SL34, K7, Ruiri11, Batian etc. The weather (suitable temperatures and two rainfall patterns in a year) and the loamy volcanic soils are suitable for coffee production. Farmers deliver their cherries to farmers' cooperative societies through the structure of the wet mills, for processing and sales. Opportunities exist to improve on coffee yields which has been on the declining trend. Currently, farms in the country produce 2-3 kgs per tree on average against a potential of over 30 kgs per tree. Other reports have estimated national yields of coffee at 302 kg/ha for smallholders, whereas the average yield in the estate sector is 556 kg/ha (International Coffee Council 2019).
- **Forest dependent communities:** The Programme targets to work with Community Forest Associations. These are legally registered associations of community members living adjacent to forest boundaries. These associations engender community participation in forest management (See Annex 3 for CFAs). Such associations are granted user rights in forest management: collection of medicinal herbs, harvesting of honey, harvesting of timber or fuel wood, grass harvesting and grazing, collection of forest produce for community-based industries, ecotourism and recreational activities, scientific and educational activities, plantation establishment through non-resident cultivation, contracts to assist in carrying out specified silvicultural operations, development of community wood and non-wood forest-based industries, and any other benefits that may from time to time be agreed upon between an association and the Kenya Forest Service (Ongugo et al. 2008).
- **Water Resource Users Associations**: These are registered Associations under the Water Act 2016 to promote controlled and legal water use activities; good management practices that make efficient and sustainable use of water resources; the safeguarding of environmental flows for downstream ecological demands and basic human needs; the reduction of water use conflicts; and catchment participatory management of water resources.
- **Youth groups (male/female youth):** The countries of Kirinyaga, Embu and Nyeri have a pool of registered youth groups that can participate in programme activities should they have interests in tandem with programme activities. In Kenya the youth are defined to be 18-35 years of age. There is also room to form new groups that can participate in programme activities.
- **Women groups**: The target Counties also have registered women groups that can be targeted for Programme interventions in addition to formation of new groups with interests that meet programme objectives.

Priorities for improving the situation

Participants of the FGDs in tea zone and coffee zone as well as Water Resource Users Associations and Community Forest Associations were asked to give suggestions on activities/projects that could be carried out to improve (i) community situation; and (ii) to improve their situation at the household level.

Kirinyaga: Prioritised suggestions for **improving community situations** by the FGD participants in tea and coffee zones as well as the Water Resource Users Associations and Community Forest Associations are presented in Table 7.5.

Table 7.6 Prioritised suggestions for improving community situation, Kirinyaga County

Suggested investment	Men FGD	Women FGD	WRUAs	CFAs
Training school	1	2		
Road infrastructure	2	2	1	
Water project	1	2	1	
Building Health facilities		2		
Tree seedlings		1		1
Financial literacy	1			
Expand coffee value chain (grow more coffee)	1			
Eco-tourism				1

Source: this study.

Key 1= Prioritised in the first 3 categories.

The reasons mentioned related to these suggestions for improving the community situation:

- The main reason for having a **training school** was due to the shortage of basic skills within the community. It was noted that having acquired skills, community members will have the knowledge to start their own ventures. Besides training schools, payment of school fees to the needy was highlighted since some of the bright students fail to attend schools due to inability to pay for the school fees.
- **Road infrastructure** would be instrumental to help reduce the cost of transport (that has increased over time). Additionally, good infrastructure ensures faster transport of perishable goods.
- Initiating the **water project** would ensure the community have access to clean water and thereby reducing diseases. In addition, the water project would reduce over abstraction of water from rivers for irrigation.
- **Building a health facility** within the community saves the people from travelling long distances to access healthcare services.
- Having **tree seedlings**, alongside carrying out conservation rehabilitation, are considered good as they all result to proper management of the landscape. Tree seedlings mean additional income while conservation rehabilitation translates to good forest cover.
- **Financial literacy** is important to ensure proper allocation of money for investments and savings. This can be done through trainings and engaging experts in the sector who can provide guidance.
- The coffee value chain is the main source of livelihood to the community. By expansion, the community would be able to venture in establishing coffee nurseries as well as going for new varieties. It is envisaged that this will increase income.
- **Eco-tourism** is important to the community due to its potential to attract tourists. This will generate income for the community and also for the county.

Table 7.7 Prioritised suggestions for improving individual participant situation, Kirinyaga County

Suggested investment	Men FGD	Women FGD	WRUAs	CFAs
Real estate	1			
Land for cash crops	2	2		1
Agricultural enterprise/Mixed farming	1	1		
Education for children/ School fee	1	2	1	
Tithe		1		
Purchase food		1		
Start a business	1			
Building rental houses		1		
Start a SACCO		1		
Career progression			1	
Car and House			1	
Livestock				1

Source: this study.

Key 1= Prioritised in the first 3 categories.

For **Kirinyaga County**, prioritised suggestions for **improving individual participant situation** are presented in Table 7.6.

The reasons mentioned related to these suggestions for improving the individual participant situation:

- Increase in population was the major factor determining investment in **real estate**. Investing in real estate offers a steady source of income and employment.
- Land would be a valuable asset to serve as collateral for loans and also enable the group to engage in more land-based activities. Additionally, the proximity to factories offers a good investment opportunity to purchase **land for cash crops**.
- **Investment in agricultural enterprises** was chosen because it was considered as the main and popular source of livelihood. Others would however diversify by practicing mixed farming. This means they venture in different value chains. This will reduce their risks in terms of farm yields and also income volatility.
- Paying for **children's education** is of importance as it raises knowledge and reduces illiteracy. This would eventually help in poverty reduction.
- **Tithe** according to the respondents is a way of giving thanks to God for granting one such wealth.
- Starting a business would result in increased income for the households as well as a way of creating employment.
- With **rental houses** in place, the individual would be assured of a steady income as well as collateral for loans. The rental houses also appreciate in value as the demand keeps growing.
- **Forming a SACCO** was chosen because it would be a stable additional income for the whole community, open room for other investments and was also considered easy to start.
- The group voted for **career progression** because they said it would open room for more opportunities. This intervention would eventually improve living standards and eradicate poverty in the household.
- Having **a good house** (and car) improves one's lifestyle and also has an impact on raising children.
- **Livestock** was chosen for income, food security, and its potential to generate biogas. 'It is also a bankable asset', they said.

Embu County: Participants of FGD in Embu Country prioritised hospitals, roads, environmental conservation, enhanced access to farm inputs, electricity, agriculture extension, water projects, education bursaries and livelihood & food security projects (Table 7.7).

Table 7.8 Prioritised suggestions for improving community situation, Embu County

Suggested investment	Men FGD	Women FGD	WRUAs	CFAs
Hospitals		2		1
Roads	1	3		
Environmental conservation			1	
Enhanced access to farm inputs		2		
Agriculture extension	1			
Electricity		1		
Water projects	1	1	1	1
Education bursaries		2		
Livelihood & food security projects		1	1	1

Source: this study.

Key 1= Prioritised in the first 3 categories.

The reasons mentioned related to these suggestions for improving the community situation:

- **Healthcare** was selected because FGD participants stated that the inadequate health care facilities are situated far from farmers' homes. They further revealed that these facilities were under staffed and had inadequate medicals supplies and equipment. Furthermore, they said that treatment from privately owned facilities was very expensive.
- According to participants the existing **roads** are in bad shape something that has made travelling as well as transportation of goods from one place to another very expensive. They reported that they spend so much time on the road and at times perishable farm produce go bad before getting to the market. Additionally, they said that some of the respiratory illnesses the community members have were either caused or worsened by exposure to dust and particulate matter emanating from the dry weather roads.
- Aside from promoting the establishment of tree nurseries as part of **environmental conservation**, FGD participants stated that they would also support other SLM and good agricultural practices so as to ensure that farming lands and the environment supporting the livelihood of rural community is safeguarded.
- Other agricultural related issues they prioritised included enhancing **access to farm inputs and extension services** which they said would significantly improve agricultural productivity.

- Other important investments they underscored include supplying **electricity** to the unreached areas of the community and setting up education bursaries for needy in the community. Investing in the education of the needy students would help them get employment opportunities, become independent, have ability to support their communities and reduce crime and drug abuse. Electricity in the unreached areas would improve security, promote mechanisation of agricultural enterprises and could lead to the introduction of a 24-hour economy.
- Investing in **water projects** would enhance access to adequate amounts of water in the wake of the frequent episodes of water rationing they were experienced during both dry and wet seasons. They said it would give them the opportunity to practise irrigated agriculture.
- Promoting and supporting local communities with **livelihood projects** such as tree nursery production, dairy farming, poultry farming, pig and rabbit farming they said would also improve agricultural productivity. These value chains would attract the youth because they occupy a small proportion of land given the fact that the issue of limited access to land came up several times as one of the main reasons why the youth don't venture into agriculture.

At household level participants in Embu County prioritised education, production/purchase of food, land, livelihood & food security projects, better housing, savings and electricity (Table 7.8).

Table 7.9 Prioritised suggestions for improving individual participant situation, Embu County

Suggested investment	Men FGD	Women	WRUAs	CFAs
Education		4	1	1
Production/purchase of food		2	1	1
Land	1	1		1
Livelihood & food security projects	1	1		
Better housing		2	1	
Savings	1	1		
Electricity		1		

Source: this study.

Key 1= Prioritised in the first 3 categories.

The reasons mentioned related to these suggestions for improving the individual participant situation:

- At the household level FGD participants highlighted **education** among the most important areas for investment. Post primary education was considered expensive for low-income rural farmers. Thus, investing in high quality education for the young generation would empower them with skills to find or create employment opportunities for themselves. It would help them be independent and have the ability to support themselves and their families. A female FGD participant succinctly said that 'it is good to invest in your child rather than for your child'
- Other participants stated that they **would buy land in the lower zones** of Embu County because farm sizes in the landscape were continually becoming smaller. Furthermore, they reported that it would be great to have additional land for **non-farming enterprises** which would cushion rural households from weather related shocks associated with the changing climatic conditions.
- Others stated that they would invest in **diverse crop and livestock enterprises** which would enhance their food and nutritional security as well as create additional streams of income that would impact positively on their general wellbeing. Additional income they said would help households afford more nutritive diets. It would help them buy or rent land for more food production thereby safeguarding **further food and nutrition security** of all the members of their households.
- Some participant prioritised better **housing** either because the ones they had were not in good shape or they just wanted their status to elevate from ordinary to respected members of the society. L
- astly, the participants revealed that they would take a portion of this money and **save it in diverse financial institutions** for future use on their agricultural and other enterprises, to pay school fees, to buy food and to use for future unexpected emergencies.

Nyeri County: Prioritised suggestions from participants of FGD in Nyeri included dairy farming, water, education, poultry, animal feeds, health services, forest conservation, agriculture and dairy farming (Table 7.9).

The reasons mentioned related to these suggestions for improving the community situation:

- **Dairy sub-sector** development was identified as number one priority as farmers said that it had the greatest potential to increase and provide regular household incomes, create employment and improve household nutritional status in particular for children. They said that agriculture being Kenya's backbone, investing in **animal feeds** business would be profitable. One farmer quipped 'Imagine how many people in Kenya take milk in their tea every day. All those people need milk and they provide a ready market for milk.'
- They opined that **water** was essential element for improving agricultural production and productivity through irrigation; improvement of nutrition and human health; and employment creation in numerous sectors across the economy. One responded made a comment that 'water is life'.
- **Education** was considered a powerful agent of change for improving health and livelihoods, contributing to social stability and driving long-term economic growth and sustainable development.
- **Health** was selected to boost growth….' a nation cannot hope to develop and prosper unless its people are healthy'. The discussants opined that investment in heath was critical in improving the community's wellbeing and bolstering local economy
- One farmer opined that **sustainable agriculture** was a natural extension of the goals of sustainable community development and would contribute to stabilising community food needs and surplus would be sold to purchase other necessities.

Prioritised suggestions for implementation at individual and or household level in Nyeri County is presented in Table 7.10.

Table 7.10 Prioritised suggestions for improving community situation, Nyeri County

Suggested investment	Men FGD	Women FDG	WRUAs	CFAs
Dairy farming		2		
Animal feeds		1		
Water		1	1	
Education		3		1
Poultry		1		
Health services		2	1	1
Forest conservation				1
Agriculture		2	1	
Dairy farming		2		

Source: this study.

Key 1= Prioritised in the first 3 categories.

Table 7.11 Prioritised suggestions for improving individual participant situation, Nyeri County

Suggested investment	Men FGD	Women FDG	WRUAs	CFAs
Livestock		1		
Tea farming		1		
Biogas		1		
Education		1		
Dairy		1		
Irrigation		1		
Market for farm produce		2	1	
Input subsidies (affordable farm inputs)		1		
Provision extension services		1		
Credit and soft loans		1		
Business Support fund		1		
Remunerative prices			1	
Training/ Extension Services			1	
Agriculture				1
Housing-Real estate development				1
Support for starting businesses				1

Source: this study.

Key 1= Prioritised in the first 3 categories.

The reasons mentioned related to these suggestions for improving the individual participant situation:

- **Livestock** and in particular dairy farming was selected as it was deemed 'a sure way out of poverty'.
- Investment in **tea** production was rated high because of the incomes associated with tea production. Tea production has contributed significantly to the Kenyan economy and will continue to do so.
- The farmers stated that investments in **biogas** production had the potential to reduce cost on energy requirements, alleviate poverty, generate income and aid social development.
- **Investing in markets** was attractive because it would ensure that farmers remain in business, ensure income to producers and motivate production.
- The focus group participants stated that **farm subsidies** would promote agribusiness, boost yields and increase incomes. Agricultural extension services were deemed to play a crucial role in boosting agricultural productivity, increasing food security, improving rural livelihoods, and promoting agriculture as an engine of pro-poor economic growth.
- A **business support fund** would help the youth who do not own land to engage in development of appropriate segments of the value chain.
- **Real estate investment** was attractive as it was a means of income diversification and unlike agriculture it is not dependent on the weather.
- **Start-up funding** was interesting as it was understood as a means of income diversification and creation of employment.

7.6 Constraints to and opportunities for investment

In the KIIs and FGD, the participants were asked to share their opinions on opportunities that exist within the counties that the programme can exploit and constraints to investment that exist that need to be overcome by the programme. Summaries of KIIs and FGDs are presented in Table 7.11, Table 7.12 and Table 7.13.

Table 7.12 Constraints and opportunities to investment in the Counties-Kirinyaga County

Constraints/ Challenge	Description	Opportunities
People with physical disability	They are neglected and unable to compete for available opportunities	Link them to organisations that deal with PLWD. They can also be equipped with soft skills that can improve their competitive edge.
Brokers	Colludes with County Government Officials to determine who invests in the landscape (e.g. Chinese investors	Sensitisation for conducive business environment in stakeholder fora
Women and children	Women are often subjected to domestic violence; children are exposed to child labour.	Capacity build women and create opportunities for them to earn such as dairy goat farming. Policies on child protection need to be enforced.
Alcohol and drug abuse	Male youth are the majority who have gone into alcoholism and drug use. Resulting to cases of insecurity.	Sensitisation and capacity building. With the aging population being unable to provide maximum labour force, it's the youthful men and women that an investor can rely on for their businesses to run.
Labour intensive	Coffee value chain is laborious with high costs of production	Introduction of field technologies to reduce labour costs. For example, mechanisation and new machines in factories
Devolution	Devolving agricultural functions gave inadequate services to farmers for example, having one extension officer per ward.	Expand service delivery to farmers by providing resources to extension officers e.g. motorcycles to move around.
Political interests within the coffee sector	The system hinders farmers from marketing coffee.	Government should implement a farmer friendly system, where policies that trigger competition in the market are implemented. Friendly systems are able to attract more investors
Limited market information	This affects macadamia and banana farmers thus leading to production losses.	Provision of market linkages for various value chains. Value addition for example, banana wine production. Online marketing and use of ICT to provide market information
Costly conservation activities	Land conservation activities are costly. The financial institutions not willing to finance them.	Promoting bamboo production esp. for WRUA members. This is especially promising because, the 1st bamboo factory is being built in the county.
Low prices/Fluctuating prices	The low prices have contributed to exploitation of farmers especially by brokers. Horticultural crops and macadamia have seen price fluctuations.	Value addition such as processing and packaging as well as direct linkages to buyers. Horticulture farmers can have contract farming with specific companies for certainty of market and prices
Low sustainability of projects	Some projects are left midstream thus affecting value chains	Offering technical capabilities to communities to ensure continuity of projects even after completion.
Laxity in policies	Policies meant to protect riparian land are not enforced to the latter. Politicians have no interest.	Using local opinion leaders as well as county officials to enforce some of the policies. This will help investors suffer from losses due to demolition of their premises as having constructed on riparian land.
Conflicting interests among stakeholders	Several stakeholders have different interests when an investment project is proposed	Investing in areas where stakeholders have a common shared interest. This can be achieved by having dialogue with stakeholders to map such areas.
Licensing	Getting a license is marred with a lot of bureaucracies that pushes investors away	Eradicate bureaucratic processes and ensure smooth acquisition of licenses.
Shortage of land	land is becoming a scarce commodity bringing about competition on what value chain to invest in	Venturing in non-land-based value chains like beekeeping and poultry that require little space.
Financial support	The terms of loans and interest rates of loans available are expensive and not enticing to investors	Set favourable terms and low interest rates that can attract investors
Lack of public knowledge on organic certification	Failure to produce tea or coffee, or any other crop organically hinders access to international markets with certification for organically produced products	Sensitise farmers to practice organic farming. This allows more local farmers to access the competitive high value markets while contributing to reduction of the associated health risks and negative environmental impacts and promoting sustainable. This will act as a pull factor for investors to venture in organically recognised products.

Source: this study.

Table 7.13 Constraints and opportunities to investment in Embu County

Constraints/ Challenge	Description	Opportunities
Brokers collusion	Colludes with County Government Officials to determine who invests in the landscape (e.g. Chinese investors	Sensitisation and policy advocacy a conducive business environment to be created for all stakeholders
Inadequate market information	Farmers don't know where to take their farm produce once it is ready for market.	The programme could leverage existing digital platforms to provide farmers market information or connect them to potential buyers of their produce within and outside the County
Poor road infrastructure	Poor road infrastructure from farms to markets	
High cost of transportation	High cost of transporting farm produce from farmgate to markets	Rehabilitate roads
Quality control issues	Inadequate quality control mechanisms exclude farm produce from export markets	-
Unstable prices	Prices for farm produce fluctuate wildly following their availability in the market Fluctuation of coffee and tea prices at the international markets as influenced by diverse factors such as the COVID 19 pandemic.	Leverage digital marketing to connect farmers directly to markets outside the county
Low surplus	Low volumes don't attract investors because of low return on investment.	Federating farmers into value chain cooperatives Then promote produce aggregation through these groups Provide education and training on intensified agriculture, agribusiness, appropriate husbandry practices and GAPs to increase production
Pest and diseases	Pest and diseased negatively affects agricultural productivity	Promoting crop varieties that are more resistant to pest and diseases
Inadequate water for irrigation	Inadequate water for irrigation because piped water is restricted to domestic purposes only	Promote water and run off harvesting options
Individual marketing	Farmers in nearly all value chains apart from tea and coffee prefer selling their farm produce individually rather than through value chain farmer groups	Sensitise farmers in order to educate them on the importance of forming and conducting their farming business through value chain groups and cooperative Building the capacity of these farmers groups on diverse areas from leadership, transparency, accountability, business development, entrepreneurship to name a few.
Untapped economic opportunities	There are a lot of untapped economic opportunities that if pursued can help advance sustainable management of environmental resources	The programme can empower and help local communities set up income generating ecotourism activities. They can also come in and help them market these activities and services to domestic and international tourists thereby helping them get additional income while they preserve the natural ecosystems Tree nursery development especially for improved fruit varieties
Government bureaucracies and the tax regimes	Discouraging licence and tax regimes related to starting and running businesses in Embu Costly procedures of obtaining and maintaining various licenses	Sensitisation and policy advocacy a conducive business environment to be created for all stakeholders
Inadequate capacity	Inadequate capacity of small holder farmers to start and manage enterprises. This could be in terms of financial resources, other capital investment or technical know-how.	1. Provide education and training on agribusiness, business development, entrepreneurship in order that farmers can commercialise the agricultural activities. 2. Connecting farmers to diverse affordable financial options 3. Promoting enterprises that don't need huge pieces of land 4. Promoting new technologies such as vertical or gunny bag gardening to overcome the issue of limited land
Inadequate policies	Inadequate policies to create an enabling environment for investment	Policy advocacy at the County and national level

Constraints/ Challenge	Description	Opportunities
Untapped value addition opportunities	Farmers selling their produce raw rather than adding value to them thereby getting more income	1. Federating farmers into cooperatives 2. Promote produce aggregation through these groups 3. Provide education and training on value addition 4. Connecting farmer groups to financial sources to procure value addition equipment.
Weather related shocks	Weather related shocks that affect the yields of different agricultural enterprises	1. Promotion of crop and animal varieties and breeds resistant against effects of the changing climatic conditions 2. Promotion of income diversification strategies
Negative attitudes	The Youth have a negative perception towards agriculture	1. Sensitisation in order to empower the youth to realise that they can create employment for themselves in other nodes such as aggregation, web-based marketing or transportation services. 2. Promotion of enterprises that don't need huge pieces of land 3. Promoting new technologies such as vertical or gunny bag gardening to overcome the issue of limited land 4. Target the youth with value chains that yield income after a short period of time 5. Tree nursery development especially for improved fruit varieties
Absence of an accountability system	Absence of an accountability system in place to monitor the activities of different investors in the landscape	1. There is an opportunity to set up a digital system at the County the activities of different investors in the landscape. This will help to recoup dues owed to farmers incase an investor decides leave unexpectedly
Influx of agricultural produce from other counties	Influx of agricultural produce from other counties which makes produce from Embu County lack market	1. Value addition will extend shelf life 2. Aggregation 3. Digital marketing to find market outside the County
Interest of the political class	Businesses in the County can only do well if they have the total support of the political class at the grassroot and County level	Sensitisation and policy advocacy a conducive business environment to be created for all stakeholders

Source: this study.

Table 7.14 Constraints and opportunities to investment in Nyeri County

Constraints/Challenge	Description	Opportunities for
Lack of knowledge and skilss	The farmers indicated that the opportunities for marketing Kenyan commodities include availability of quality products throughout the year in the right quantities. Skills on business planning, lack of appropriate market information, market price fluctuations, high production costs, low yields and unfavourable tax regulations. Linking producers to both export and domestic markets.	Marketing of major agricultural commodities in the area- tea, coffee and milk (dairy).
	Sensitisation for conducive business environment with the buyers. The programme could assist by ensuring that Kenya's produce is competitive in the world market by lowering the cost of production and the cost of doing business	Availability of international buyers.
Lack of investment Capital	lack of investment capital, weaker currency (makes imports e.g., machinery and equipment more expensive), limited start-up capital, lack of information on opportunities, and, unfavourable policies and regulations that hinder investments	Good infrastructure – roads, electricity and water.
Price Fluctuations	Conducive climatic conditions for agricultural production, well established export market, growing domestic demand, and availability of appropriate technologies for value chain development.	Availability of Agricultural produce.
Lack of value addition	Most retailers are mandating supplier certifications.	Quality assurance through certification
Limited technical knowledge and appropriate technologies	Human potential & resource utilisation efficiency	Well-developed research and extension capabilities.
Pest and diseases	High production costs affect farm profitability and makes the products less competitive in the market, while low yields affect household food security and incomes	Training of the farmers on proper agricultural practices from the extension officer and IPM
Inadequate storage and processing facilities	Constraints marketability of perishable goods: dairy, beef, fruits and vegetables.	Availability of agricultural goods e.g. dairy, fruits and vegetables.

Source: this study.

7.7 Community livelihood pattern per county

Social and gender issues impacting the livelihood pattern

Kirinyaga County as well as Embu and Nyeri Counties have five important characteristics that determine and impact on rural livelihoods (IFAD[9] CKDAP[10], MT. Kenya East, CIDPs[11]):

1. Mt. Kenya, which influences local weather, climate and agro-ecological zones and therefore, the fairly advanced agricultural practices and production, cash crops and market based socio-economic organisations (cooperatives) relative to the rest of the rest of the country
2. Relatively high population densities, hence smaller land sizes
3. A highly advanced entrepreneurial culture, proximity to Nairobi and history of being part of the power and economic matrix in the country
4. A population that is highly patriarchal, with increasingly significant external social influences
5. A population with relatively high literacy rates.

Livelihood patterns: A description of livelihood patterns of women and men in the targeted counties and villages

Livelihood patterns of men and women in the three counties of Kirinyaga, Embu and Nyeri are derived from (i) agriculture (including crops, livestock and fisheries), (ii) businesses (entrepreneurship, micro, small, medium and large enterprises at services, processing/manufacturing levels), and (iii) employment (causal, temporary, contractual or permanent). Agriculture plays the greatest role (Ayieko 2015; Kenya National Bureau of Statistics (KNBS) 2019). There is not much differences among the three counties in terms of livelihood patterns.

The majority of the residents, men and women, are engaged in more than one livelihood activity, often farming in combination with provision of services or undertaking some business. So there is some significant diversification of livelihood sources (Ayieko 2015).

SA11: Main economic sectors and activities, focusing on those that depend on land and resource use

Agriculture is the main economic sector in the three counties of Kirinyaga, Embu and Nyeri. Besides agriculture (crop and livestock), the three Counties also have trade, forestry/agro-forestry, tourism and mining as active economic sectors (Table 7.14).

[9] IFAD-Reconnaissance study of Mt. Kenya East 2002;
[10] IFAD-CKDAP baseline survey 2003

[11] Country Integrated Development Programs – Kirinyaga, Nyeri and Embu

Table 7.15 Main economic sectors of Kirinyaga, Embu and Nyeri

Sector	Kirinyaga	Embu	Nyeri
Agriculture	Main economic sector Crop production e.g. tea, coffee, rice Dominantly rainfed but irrigation is also practiced Livestock (dairy, poultry, goat; beekeeping, aquaculture etc.)	Main economic sector Crop production e.g. rice, coffee, tea Dominantly rainfed but irrigation is also practiced Livestock (dairy, poultry, goat; indigenous livestock; Beekeeping, aquaculture etc.	Main economic sector e.g. tea, coffee Crop production Dominantly rainfed but irrigation is also practiced Livestock (dairy, poultry, goat; Aquaculture, beekeeping etc.
Trade and Industry	Has various industries on agriculturally based products: 5 tea factories, 1 coffee miller (KPCU), 2 maize millers, 7 major rice millers; animal feeds processing feeds Renowned rice producers and millers Has over 100,000 MSMEs from hawkers, to large traders, companies and processing industries	Major towns in Embu County have shops, stores and open-air Municipal markets where diverse agricultural products are sold	Has many markets selling fresh agricultural produce Has processing and milling companies- Maisha Flour Mills, Anchor Millers, Coca-Cola bottlers, Highlands Water and Soft Drink Company and Kenya Cooperative Creameries. Has also over 100,000 Micro Small and Medium Enterprises (MSMEs)
Forestry and agro-forestry	Harvesting, production and sale of various timber products, firewood, fruits and honey	The main products harvested from these forest ecosystems include timber, poles, firewood, wood shavings, sawdust, honey, indigenous vegetables, *mushrooms*, herbs and traditional medicine	Tree planting-eco-friendly trees, bamboo, indigenous tree species, fruit trees etc. There are six tea factories in the County that rely on wood fuel as a source of energy for processing. Tree products- timber, poles, firewood, wood shavings, sawdust, honey, indigenous vegetables, *mushrooms*, herbs and traditional medicine
Tourism	Tourist attractions include: Mt. Kenya forest, Mt. Kenya National park, Sagana white water rafting	There are caves, waterfalls and rocky hills for rock climbers; Has the seven forks hydroelectric power dams; Other tourists' sites include Mwenendega site and the Mbui Njeru waterfalls.	Tourist sites include over 30 mapped and documented heritage sites and the rich kikuyu culture; Mt. kenya Forest, Aberdares Forest; Other attractions include Kimathi trench at Kahigaini, Mau caves in Naromoru Has a booming hotel industry with star rated hotels, camps and other entertainment facilities
Mining and extraction industry	Mining-ballast mining and sand mining in Sagana area.	The County has quarries- Ngaduri, Wachoro and Kanyueri area in Ishiara; Has minerals- topaz, coper ore, blue sapphire, Felspar, granite etc.	Mining and quarrying activities-clay, sand, aggregate, gravel and natural building stones

Source**:** Embu County Government 2018, Kirinyaga County Government (2018); Nyeri County Government (2018).

SA12: Total number and/or percentage of people employed by main economic sectors

The main sources of income are farming (around 70% of the households engage in farming, 29 of which are commercial farmers in Kirinyaga County), and wage earning (about a quarter in Emby/Nyeri). Wage earners (from public sector and private sector) as a percentage of working population was less than 30% across the three counties and was at its lowest in Kirinyaga County. In the three counties targeted, those who work in the public and in the private sector were in the minority. Most of the inhabitants (70% and above) were either self-employed, working in agricultural sector and or out of employment (Table 7.15).

Table 7.16 Percentage of people employed by main sectors

Description	Kirinyaga	Embu	Nyeri
Number active labour force	337,519	317,105	330,883
Wage earners (% of working population)	6.7%	24%	28%
Self employed	Total rural self-employment: 49,200 persons; Urban self-employment: 39,365 persons	55 % of working population	Over 100,000 MSMEs employing 1-150 persons per business
Total households	204,188	182,743	248,050
No of farming households	139,866	130,990	164,229
Percentage of farming households in commercial production	29%	12%	13%
Percentage of total households engaged in farming	68%	72%	66%

Source: Embu County Government (2018), Kirinyaga County Government (2018); Nyeri County Government (2018); Kenya National Bureau of Statistics (KNBS) (2019).

SA13: Quantity and/or percentage of total revenue generated by main economic sectors per year

On aggregate basis counties raise about nearly 70% of target revenues from various economic sectors within the counties. Data on revenues generated, disaggregated by sector such as agriculture, trade and industries, tourism, mining and quarrying and forestry was not obtained within the study period. However, the counties experienced fluctuations in 'own' revenue generation in the last five years and in 2019/20 Kirinyaga performed better than the other three counties (Kirinyaga at 78% > Nyeri at 66% > Embu at 63%) (Table 7.16). On aggregate basis Kirinyaga, Embu and Nyeri counties met 74%, 60% and 78% of their revenue targets in the financial period 2015/16 to 2019/20.

Table 7.17 Aggregate revenues raised by Kirinyaga, Embu and Nyeri Counties (all sectors) 2015/16-2019/20 financial year

Financial year	Kirinyaga		Embu		Nyeri	
	Revenue raised (KES) X 10^6	Percent of target met	Revenue raised (KES) X 10^6	Percent of target met	Revenue raised (KES) X 10^6	Percent of target met
2019/20	374.7	78.0	509.7	55.4	664.9	66.5
2018/19	432.6	100.6	950.0	66.3	359.3	96.8
2017/18	344.4	57.4	653.5	63.7	301.4	86.1
2016/17	320.6	43.1	803.8	51.8	661.6	90.4
2015/16	390.4	78.0	630.8	62.9	709.6	65.6

Source: Commission on Revenue Allocation (2021).

SA14: Poverty rates; SA16: Literacy; SA17: Education; SA18: Life expectancy

Embu County has the highest poverty rates and lowest values for human development indices among the three counties being envisioned by the programme for implementation. The Human Development Index (HDI) is a composite statistic of life expectancy, education and income per capita. The

three counties, especially Nyeri, had a relative high quality of life given that the HDI were higher than the national figure of 0.52 (National Council for Population and Development (NCPD), 2017a; MoALF, 2016b). Other component indices are also presented in Table 7.17 and Table 7.18. Based on Child Development Index (CDI) ranking, Kirinyaga County is one of the least marginalised counties in Kenya, rated well off above 0.6 and enjoying better services (Commission on Revenue Allocation 2021), while Embu was the most marginalised County based on the CDI indicator.

Table 7.18 Human Development Index for Kirinyaga, Embu and Nyeri Counties

Index	Kirinyaga	Embu	Nyeri
Poverty Index	0.941	0.858	0.884
Infrastructure Index	0.394	0.369	0.454
Health Index	0.792	0.647	0.766
Education Index	0.433	0.541	0.563
Child Development Index	0.604	0.573	0.580
Human Development Index	0.569	0.552	0.580

Source: Commission on Revenue Allocation (2021); Kirinyaga County Government (2018); National Council for Population and Development (NCPD) (2017a); MoALF (2016b).

With a largely rural population, Embu has a Poverty Index of 0.8580 compared to the National Poverty Index of 0.8098 (Commission on Revenue Allocation, 2021). The poor in Embu County are mainly the landless, unemployed, slum dwellers, female headed households and the physically handicapped. There are many causes of poverty in Embu County: low agricultural productivity and poor marketing, drought and lack of water for irrigation, lack of employment opportunities and low wages, high cost of education, gender imbalance, land sub-division, landlessness and poor infrastructure including roads. High pockets of poverty are found in lower Embu (Mbeere North and Mbeere South sub Counties)

The poverty indices in Kirinyaga County can be attributed to semi-arid conditions of the lower zones of the county where rainfall distribution is poor and population pressure on land leading to land fragmentation in the upper zones. Other factors are unemployment leading to vicious cycle of poverty, failing irrigation infrastructure, poor management of cooperative societies and collapse of the cotton industry among others.

In Nyeri County, high pockets of poverty are found in slums in Nyeri Town e.g. Majengo, Kiawara, colonial villages in Mathira, Kieni and Tetu as well as the landless who reside in many villages next to the forest areas (CIDP, 2012). Unemployment among the youth is high making many of them fall in the poverty bracket.

Table 7.19 Socio-economic characteristics of Kirinyaga, Embu and Nyeri Counties

Livelihood dimension	Kirinyaga	Embu	Nyeri
Poverty rate	20.0 %	28.2%	19.3%
Employment rate (among 15-64 years olds)	3.8%	5.7%	5.3%
Poverty Index	0.941	0.858	0.888
Literacy (% able to read and write)	78%	92%	95%
Education			
Have attained primary education	59%	52%	46%
Have no formal education	14%	8.4%	5.1%
Life Expectancy (years)	62.5	64.5	67.5

Source: Kenya National Bureau of Statistics (KNBS) (2019); Commission on Revenue Allocation (2021).

SA15: Food security

Food poverty stands at 18.8%, 28.3% and 15.5%% in Kirinyaga, Embu and Nyeri Counties respectively, indicating that the three Counties are relatively food secure, but there are pockets within the same counties with a high prevalence of food insecurity.

What is the proportion of coffee and tea farmers who grow their own food crops and types of food crops being produced?

Except for the landless in urban dwellings, all smallholder farmers in the three target Counties produce their own food crops (specific to agro-ecological zones) which includes among others:

- Cereals-maize (predominant in all the three counties), sorghum millet are also produced in the drier parts of the counties
- Roots and tubers-Irish potato, sweet potato; cassava is also produced in drought parts of Embu
- Vegetables-exotic (kales, cabbages, carrots etc.) and traditional vegetables (Amaranth, pumpkins)
- Legumes and pulses (common beans, greengrams, cowpeas etc)

Are the food crops being produced by households enough to provide nutrition security or not?

Food security in Kirinyaga, Embu and Nyeri is linked to interaction of factors such a climatic conditions and shocks (inadequate and unreliable rainfall), natural resource management, access to appropriate inputs, small parcels of land, poor soil fertility, poor coverage by extension services, and concentration in growing of cash crops such as coffee and tea, high prices of farm inputs and poor storage facilities.

The three counties of Kirinyaga, Embu and Nyeri are relatively food secure, but there are pockets within the same counties with a high prevalence of food insecurity. Pockets of tea zones are experiencing food insecurity.

Food poverty stands at 18.8%%, 28.3%% and 15.5%% in Kirinyaga, Embu and Nyeri Counties respectively, indicating that the three counties are relatively food secure (Kenya National Bureau of Statistics (KNBS) 2018). However, these figures masks pockets of food insecurity in the target Counties. For example in Nyeri, Kieni is prone to floods, frost, and droughts which have compromised the food security situation. The female- and youth-headed households are the most affected (Ministry of Agriculture Livestock and Fisheries 2014).

Food poverty has risen from 20% to 28.3% in Embu with 27% of children estimated to be stunted and 3% wasted and under-weight 11% (Embu County Government 2018). Nyeri County Nutrition status were as follows; stunting (15.1%), underweight (2.5 %) and wasting (2.4 %) while for Kirinyaga these figures were 17.2% and 7.7% for stunting and underweight respectively (Kenya National Bureau of Statistics (KNBS) 2015).

[12] Derived from 2015/2016 Kenya Integrated Household Budget: 1 US$= KES 101.3 (Year 2016); I Euro= Kah 101.3 (Year 2016).

Food insecurity is increasingly becoming a problem in the tea zone for farmers with less than 0.5 ha of land (Ndirangu 2017). This is exacerbated by climate change (Karuri 2021), small land sizes below 0.1 ha (optimal 0.13 ha) which are considered uneconomical for growing tea and thus little income to purchase food (Kavoi, Owuor et al. 2002).

Previous studies in Kenya have indicated that the percentage of food secure households is lower in the tea zones than in coffee zones. Income from tea is used in food purchase because of insignificant own production while coffee farmers produce more of own food compared to tea farmers - tea covers most of the land (Kabura Nyaga and Doppler 2009). Other studies have indicated that access to agricultural extension has a significant effect on food security in the tea and coffee zones while the effect of farm size did not have a significant effect on food security in the coffee zone (Ndirangu 2017).

What is the amount of household budget that is spent on food consumption?

We did not assess household expenditure in full detail as that would entail a too long survey. However, existing studies in Kenya have indicated that households and individuals whose monthly adult equivalent food consumption expenditure per person is less than KES 1,954 in rural and peri-urban areas and less than KES 2,551 in core-urban areas respectively are considered to be food poor or live in 'food poverty' (Kenya National Bureau of Statistics (KNBS) 2018).[12] According to 2015/16 Kenya Integrated Household Budget, the proportion of households and individuals whose monthly adult equivalent food consumption expenditure are less than KES 1,954 stands at 18.8%, 28.3% and 15.5% for Kirinyaga, Embu and Nyeri Counties respectively.

SA19: Main income sources of the population

Agricultural production and employment in the formal and informal sectors are the main income sources of the communities. Livelihoods of the communities in the project area largely revolve around agricultural production for both cash and food crops, with greater focus on cash crops on the one hand, and a very strong business and trade inclination. Employment in the formal and informal

sectors either as casuals or fulltime employment significantly support livelihoods (PROFIT,[13] CARE,[14] Ndungu 2015).

At the centre of livelihood activities is the patriarchal nature of the community, where control and access over resources (especially land) is largely concentrated in the hands of men. However, women have access and use over these resources (Githaiga 2020; Maria 2019).

Social and gender issues with regards to the role of women, youth and men in farming activities and in landscape conservation had similar patterns in Kirinyaga, Embu and Nyeri except for limited nuances between tea and coffee zones.

SA20: Other basic socio-economic data

Status of infrastructure and health services coverages in Kirinyaga, Embu and Nyeri Counties are briefly summarised as indicators for other basic socio-economic environment.

Kirinyaga, infrastructure status: The total road network in the County is 1,109 km, out of which 107 km is bitumen, 4,625 km is gravel and 541 km is earth surfaced roads. The County has an established road network with 7 tarmac roads passing through it namely Makutano-Embu road, Kutus-Karatina road, Baricho road, Kiburu road, Kutus – Sagana road, Kutus – Kianyaga road and Kabare – Kimunye road. There is only a 5 km of railway line and one railway station in the County though not in use. There is one airstrip located in Mwea constituency.

Kirinyaga, health services coverage: Kirinyaga County has 202 health facilities, with a total bed capacity of 764, comprising of 109 public health institutions, 39 mission/ NGO institutions (the largest one being Mwea Mission hospital) and 54 private clinics. There are three level four facilities located in Kirinyaga Central, Gichugu and Mwea Constituencies. In addition, there is one private hospital located in Kerugoya town. The County has ten level three facilities, 45 level two facilities and 51 level one facilities which are spread all over the County. The doctor to patient ratio is 1:36,339 and the average distance to the nearest health facility is 5 km (National AIDS Control Council 2016).

Embu, infrastructure status: The road network in the county consists of 914.3 km of earthen surface, 120 km of tarmac which includes the Meru-Embu highway and Embu-Kiritiri road, as well as 548 km of gravel surface. The county has also two airstrips (Embu County Government 2018).

Embu, health services coverage: Embu County is endowed with 168 health facilities inclusive of Government, Private and Faith based facilities (National AIDS Control Council 2016). Out of the 168 facilities, 93 are public. The public health facilities comprise 77 dispensaries (level two), 11 Health Centres (level three), 4 hospitals (level four) and one Teaching and Referral Hospital (level five). Mission hospitals and private clinics also exist within the county.

Nyeri, infrastructure status: The county currently has 3,093 km of classified roads with 478 km of bitumen, 2,493 km gravel and 122 km earth surface (Nyeri County Government 2018).

Nyeri, health services coverage: Health facilities in Nyeri County include 118 public health facilities: 1 County referral hospital (level five); 4 County hospitals (level four); 25 Health Centres (level three); 88 Dispensaries (level two) and 251Community Units (level one). The County also hosts several Private health facilities: 4 private level four hospitals; 1 Nursing Home; 3 Faith Based Organization Hospitals; 16 FBO Health Centre's and dispensaries; and 224 private clinics.

Are smallholder households earning their living exclusively from tea or coffee, or do they have/need several livelihood options annually to survive? The smallholders targeted do not depend on tea and coffee only but have diversified livelihoods, though the level of dependency on tea is relatively high compared to coffee. Kenyan smallholders are still relatively diversified, with farmers growing a variety of crops for both cash (coffee, avocado, vegetables, tea, bananas), as well as for food (e.g. maize, beans, bananas, vegetables) as reported by (Njuki 2001) and the (Ministry of Agriculture Livestock and

[13] Impact Evaluation of the programme for rural outreach of finance and inclusive technologies (PROFIT) – The Treasury, Kenya.

[14] Community Adaptation Action Planning.

Fisheries 2019). To a large extent, men tend to have more livelihood activities than women.

Men engage in farming directly or indirectly and tend to undertake some side activities – businesses or provision of private services. Women on the other hand often oversee farming, but may also get involved in some businesses e.g. selling farm produce or other merchandise.

Both men and women do engage in farming activities during high season (directly or indirectly), and undertake other livelihood activities during the off-season. However, for the project area, the intensive farming systems is such that there is hardly an off-season for farming; people practice relay farming that ensures farms are busy the year round. This also implies that people tend to be busy most of the year.

A study by (UN Women 2015)[15] showed that women worked longer hours than men in livelihood activities by up to three hours a day – and even projects or programmes that were designed to increase benefits to women often ended up increasing women's work load.

Will programme interventions contribute to improve economic opportunities and livelihood of targeted farmer households? Interventions of regenerative and climate smart agriculture, private and public-sector engagement in landscape and conservation activities and livelihoods diversification have a potential to improve economic opportunities of the target farmer households but only when taken up by the beneficiaries.

Implementing climate smart agriculture technologies may improve productivity and incomes, but much improvement may not be expected as farmers in the target area are already implementing many. Climate smart agriculture (CSA) refers to the suite of options and technologies that farmers should adopt in order to adapt to and mitigate against changes in climate. FAO[16] and CCAFS[17] have published widely on CSA, showing improved production, productivity and incomes among farmers adapting CSA. Surveys carried out for KAPSLM[18] and KACCAL[19] show that adoption rates of CSA technologies was rather moderate in most of the countries in Kenya, while in the proposed project area, some of the smallholder farmers had taken up most of the CSA adaptation measures being touted (KAPSLM). In addition, studies in the Upper Tana (CKDAP,[20] IFAD Mt. Kenya, Green Water Credit) show that most smallholders have implemented many of the measures since before climate change became a clarion call to save the planet. This is also confirmed by our baseline data analysis.

Farmers may not afford the required investments in labour and investments. The investments in CSA may be hefty for many smallholder farmers. A survey by Trocaire (UKAM)[21] showed that uptake of CSA technologies was often labour intensive, and needed equipment that many smallholders in lower Embu could not afford.

Implementing conservation activities at landscape level through private and public-sector engagements: limited experiences exist in Kenya's landscape. Kenya has a rich history of private-public engagement in conservation activities but not at landscape level. Most of the Public-private sector engagements are on conservation of wildlife – although in the process, landscape conservation takes place. Examples include the many conservancies e.g. the Northern Rangelands Trust, the Nairobi Water Fund, and many conservancies scattered all over the project area. Key to these partnerships is the initiative being led by the private sector, while the Government provides strategy and policy support.

Implementing on-farm livelihood diversification may contribute positively to improving economic opportunities of Programme beneficiaries though the extent of improvement is likely limited due to small farm sizes. It has been confirmed that smallholders employ diversification strategy as a means of

[15] UN Women report 2015
[16] Climate-Smart Agriculture | Food and Agriculture Organization of the United Nations (fao.org) (http://www.fao.org/climate-smart-agriculture/en/).
[17] CCAFS: CGIAR research program on Climate Change, Agriculture and Food Security (https://ccafs.cgiar.org/).
[18] Kenya Agricultural Productivity and Sustainable Land Management Project (KAPSLM, MoA) – evaluation report 2017.
[19] KACCAL-Kenya Adaptation to Climate Change in Arid Lands evaluation 2018
[20] Central Kenya Dry Area Project, 2003, Ministry of Finance, GoK.
[21] UKAM-Community Resilience And Climate Change Adaptation In Drought Affected Communities In Kitui, Tharaka-Nithi And Embu And The Resilience And Resource Rights Programme (Implemented by Trocaire).

mitigating against climate change, and goes ahead to list some of the key factors associated with diversification (Ayieko 2015).

To a large extent, grey literature (mostly surveys) confirm that farmers have taken to diversification to i) enhance their livelihoods, ii) spread risks, iii) take up opportunities that different diversification products may bring forth, and iv) to earn more income. This may work against specialisation and enhanced productivity in a particular activity. As farm sizes are generally small with less than half a hectare on average for both coffee and tea farmers (See Annex 2) and farmers are contrained in accessing farming finance, the extent of such income improvement potential is limited.

Connecting landscape management and finance may improve economic opportunities of beneficiaries if there will be a buy-in from financial stakeholders. Financial stakeholders in Kirinyaga, Embu and Nyeri currently offer limited products to finance landscape activities but have a range of products for farming and businesses.

The best examples of connecting landscape management come from experiences of Upper Tana Natural Resource management Project in the Upper Tana in project supported by IFAD,[22] and the KAPSLM project that tried out the Payment for Ecosystem Services. The establishment of the Nairobi Water Fund run by TNC is also another case. Other studies have given an in-depth analysis of Financing Mechanisms for green water in the Upper Tana, which showed that smallholders preferred contributing in kind while being supported with grants (Muchena et al. 2011).

Basically, the activities are still at piloting phase without a widescale roll out and limited data to give a clear pathway. Ultimately, the success of such initiatives will depend on two factors-a complete buy in by key stakeholders, especially the local communities, and secondly, the management aspect-governance and sharing of revenues.

As a result of programme interventions, will smallholders need to hire labour and if so, what is the potential increase in job opportunities for landless farmers not currently involved in tea or coffee farm work?

Implementation of programme activities by the beneficiaries will raise labour demand moderately but likely not result in significant labour hire above the current levels depending on the technology being implemented. The main source of labour for tea and coffee farmers is family labour augmented by hired labour during peak periods. The hired labour is currently sourced within the landscape but also away from the landscape (migrant labour).

For tea, labour is needed in land preparation planting seedlings, weeding, pruning, spraying and picking the tea leaves. Once the tea bushes are fully established, most of the labour is needed in maintenance and picking the tea. Even for smallholder farmers, family labour cannot meet the needs of tea production so most farmers often have to hire labour, especially to pick tea. Women provide most of the labour in tea production (Owuor et al. 2007). In most tea growing areas, labour is manual and only multinationals use tea plucking machines (Maina, Mathenge et al. 2015).

In coffee production, labour is needed for various processes from planting through weeding, spraying, picking, drying, semi-processing and even marketing.

Implementation of some of climate smart technologies like conservation practices (terracing, gabion building, rehabilitation of degraded land etc) will raise labour demand at farm level for some households experiencing labour shortage. Farmers in the landscape are currently used to hiring labour for such labour intensive practices and or augmenting family labour with hired labour to carry out management practices in tea and coffee farms.

The increase in labour demand is not envisaged to offer extra and significant opportunities for landless farmers in tea and coffee zones except during periods of rehabilitating conservation structures where such labour might be needed to bridge gaps in family labour.

[22] IFAD Upper Tana Natural Resources Management Project (UTANRMP) – utanrmp.org

If local labour is not available, would there be need to hire labour from outside the area?

Smallholders tea and coffee farmers currently hire labour from outside the target counties when needed. Smallholder farmers source for labour from varied sources-including from counties far away. Before the Post Election Violence (PEV) of 2017, a significant amount of farm labour were from western Kenya and just a few from the project counties. After the PEV, most of the labour is sourced locally, and it is more expensive. Main sources of labour include poorer households, school drop outs and those who are landless (having been kicked out from the Government Forests in the Mountain (shamba system), and who are still staying in pre-colonial settlements.

Labour demand is seasonal, there are peaks for labour demand. However, the price of labour was rated to be high by majority of the farmers (96%) and it ranged from KES 8 to KES 12 per kilo of tea plucked. Similar sentiments were echoed by the key informants such as labour costs are very high when compared to the proceeds from tea. Farmers need adequate monthly payment to organise harvesting of entire crop; Ongoing reforms to address the issue include paying farmers mini-bonus (e.g. for 6 months of delivered green leaf) and or increasing farmers advance (monthly) payments per kg (e.g. from KES 16 to KES 20-21 per kg).

Limited experiences exist with labour plucking gangs (communal labour) in the tea and coffee zones unless for a greed upon communal work though such labour gangs are common in the dry parts of Kirinyaga and Embu during peak periods of labour demand.

SA21: Current legislation related to child labour, forced labour, workers' rights, and other human rights

Human trafficking (forced or coerced labour) are increasingly dwindling from public visibility thanks to various certifications schemes operating in the landscape with clauses that address issues related to labour and workers rights. Child labour is prohibited in Kenya but incidences of child labour are still reported. Child labour is still reported, away from public eye, in some areas where there is high school drop outs.[23] Most of the child labour is sourced from the more marginal parts of the counties-the drier parts, especially Embu and neighbouring lower eastern Countries.

In lower parts of Kirinyaga, irrigation scheme, children have been subjected to rights abuses related to child labour (Kirinyaga County Government 2018). This societal ill is caused by prevalent poverty, illiteracy, corruption and certain undesirable cultural practices like early child marriages. This forces young girls to start working in the rice plantations as means of survival. The rampant poverty levels in the area also compels children to be exploited for labour during planting and harvesting seasons; which exposes them to work-related hazards and diseases-in total disregard of the laws on child labour and children's rights (International Labour Office (ILO) 2021).

About 24% of children in Mbeere North and Mbeere South in Embu County are involved in child labour (Embu County Government 2018). This figure is about 12% for Manyata and Runyejes constituencies. There is no current legislation in Embu County to strictly enforce child labour in Embu County except for national legislation that prohibit child labour.

The three counties of Kirinyaga, Embu and Nyeri has not enacted specific legislation related to child labour but relies on legislation and policies of national government to address issues of child labour.

The national government prohibits worst forms of child labour. The minimum age for work (other than apprenticeships) is 16, and the minimum age for hazardous work is 18. These protections, however, only extend to children engaged under formal employment agreements and do not extend to those children working informally.

The GoK has published a list of specific jobs considered hazardous that would constitute the worst forms of child labour. This list includes but is not limited to scavenging, carrying stones and rocks, metalwork, working with machinery, mining and stone crushing. The law explicitly prohibits forced labour, trafficking, and other practices similar to slavery; child soldiering; prostitution; the use, procuring, or offering of a child for the production of pornography or

[23] Kenya Child Labour Report, Bureau of International Labor Affairs, US Government (https://www.dol.gov/sites/dolgov/files/ILAB/child_labor_reports/tda2019/Kenya.pdf).

for pornographic performances; and the use by an adult for illegal activities (such as drug trafficking) of any child up to age 18. The law applies equally to girls and boys.

Acts of Parliament (ANPPCAN 2018; Kathure Grace 2011):

- The Children's Act 2001 was instituted to uphold the basic rights of children in Kenya. It seeks to enhance the welfare of children in Kenya and to combat child labour by serving as a deterrent to economic exploitation of children (has preventive measures and punitive actions)
- The employment Act chapter 226, Revised Edition 2012 [2007]: Defines a 'child' as an individual, male or female, who has not attained the age of 16 years. This is contrary to the Children's act that defines a child as an individual who has not attained the age of 18 years. The act prohibits the employment of a child, whether gainfully or otherwise, in an industrial undertaking. Children may however participate in family business, including agriculture. The provisions of this act does not portray domestic work as child labour which poses some major challenges in the fight against child labour.
- Counter Trafficking in Persons Act (2010) which provides protection of children from being trafficked within and outside Kenya.
- Education Act 2013 and revised 2014, which provides Children in Kenya with free and compulsory Basic Education while aligning other rights accorded to children, such as, the right to protection from exploitation and abuse.

GoK policies (ANPPCAN 2018)

- National Action Plan for Elimination of Child Labour (2004-2015) which aimed at eliminating the Worst Forms of Child Labour by 2015, where the root causes of child labour, such as, poverty and access to basic education are effectively dealt with, while raising awareness. Since its expiry no action plan has been developed. Its implementation also faced a challenge mainly due to lack of resources.
- National Plan of Action against Sexual Exploitation of Children in Kenya (2013-2017) aiming at preventing, protecting and reintegrating child victims of commercial sexual exploitation, as well as, raising awareness.
- Vision 2030: Second Medium Term Plan (2013-2017), where child labour is identified as a major challenge in Kenya and aims at finalising and implementing the National Policy on Child Labour. Efforts have been made in 2016 to mainstream SDGs into Vision 2030, as well as, the Third Medium Term Plan (2018-2022) of Vision 2030.
- County Integrated Development Plans which serve as a guide for the development of counties. Here all the 47 Counties in Kenya are required to address child labour targeting the sectors children are working in.
- National Children's Policy (2010), which seeks to protect children from exploitative labour, human trafficking and commercial sexual exploitation through the enforcement of laws and the provision of services.
- National Education Support Programme (2013-2018), which aims to enhance access to quality basic education.
- National Plan of Action for Children in Kenya (2015-2022), which is well informed with the information from studies that have been done on violence against children in Kenya.
- A Framework for the National Child Protection System for Kenya (2011) that describes laws and policies that protect children from violence and exploitation, as well as, roles and responsibilities of the Government to protect children.
- Sessional Paper Number 1 of 2015 on the National Policy on Elimination of Child Labour: Summarises the government's commitment to fulfilment of its obligations under various international instruments towards the elimination of child labour and addresses the various perspectives of child labour (ANPPCAN 2018).

What are the household livelihood strategies, and what are the key constraints reducing beneficiary potential to add value to the landscape approach, especially of the poor and marginalised individuals/groups with limited knowledge and access to social and physical assets?

Is there exclusion of certain groups from economic and other activities, and if so why?

Do women and vulnerable groups have access to agricultural training, inputs and extension services?

The poor, marginalised and the vulnerable have a lower potential to participate in the programme without pro-active strategies for targeting.

Livelihood strategies in the landscape are derived from farming (tea, coffee, other crops), small businesses and off-farm employment (see IV.3 (3)-livelihood patterns). The potential of the poor, marginalised and vulnerable to participate in the programme is lowered by a myriad of factors (See Chapter 4):

- They are excluded from major decision making about the benefits of landscape natural resources and how such natural resources were used
- They bear much of the negative effects associated with the poor use of landscape natural resources) since their life are heavily dependent on such resources
- They own limited production capital (land, livestock etc.)
- They have limited financial capital and or lack collateral to access credit
- Some of the vulnerables struggle to pay for group membership and or make financial contributions in community groups (selfhelp groups, welfare and benrevolenece groups, CBOs, SACCOs, Savings and Internal lending Communities, SILC; table banking groups, Village Savings and Loan Association, VSLA etc). These exclude them from programmes that work with groups where financial contrition is mandatory
- Due to lack of alternatives, they are often exploited in terms of providing cheap labour
- With the lack of access to agricultural information and training opportunities, the vulnerable groups often become passive members in communities and or in programmes, because they do not have a basis for informed decision making
- Traditional practices which discriminate against women and the youth (see Social issues and gender- Chapter IV.3 have potential to further marginalise women and youth from full participation in programmes.

Most projects do not invest in gender analysis to understand gender dynamics before implementation. Thus categories of societies such as women and the youth are often either excluded or are not fully involved in some development Projects (agricultural training and extension services, inputs access etc.) compared to their men counterparts.

A thorough gender analysis will help understand contextual issues including those of marginalised and vulnerable groups and propose appropriate options for remedies including training and inputs, capital and access to land, issues of labour and extension (Rekha and Rojas 2008).

Integrating elements of a human rights-based approach to programming will also lead to better and more sustainable outcomes by analyzing and addressing the inequalities, discriminatory practices and unjust power relations which are often at the heart of development problems (Samuels et al. 2009).

SA22: Women's rights and gender dynamics

Men disproportionately benefit from agricultural activities in the three Counties of Kirinyaga, Embu and Nyeri. Women and men have unequal access and control of productive resources (land) and earnings from cash crops (tea, coffee) and other high income generating enterprises (e.g. dairy) based on societal roles ascribed to each of them in the Mt. Kenya landscape. Secondly there is unfair division of labour where women have a higher labour input in farming coupled with domestic chores. The main farming activities carried out by women were: tea picking and sending to collection centre; tending to the kitchen garden, tearing poultry, and growing of food crops such as maize, beans and potatoes.

Women provided much of the labour force in land preparation, ploughing, planting, weeding, harvesting and marketing. They also actively participated in rearing and tending livestock- fetching fodder and feeds for the animals, provision of water, milking, cleaning the livestock unit and taking milk to the market or cooling plant. Decisions to sell large animals like sheep, goats and cows were reserved for men or were done in consultation with the head of the household if a man.

With regards to conservation, the tea farmers stated that the main role for women in the community is planting trees, especially fruit trees within the farm. In both tea and coffee zones, the women were reported to be involved in tree planting, preservation of biodiversity (they keep the seeds), watering of the trees, riverbank protection, spring protection and water harvesting, though men did much of the tree planting. However, it is interesting to note that the women in the FGD Ngiriambu, Kirinyaga (coffee zone) stated that they did not participate in any activities towards conserving landscape resources.

Women face a myriad of challenges in farming including: limited capital especially for inputs and transport; inadequate support from men in accessing land; inadequate knowledge on agronomic practices; domestic chores that take

a lot of time giving little room to attend training sessions; needs to consult men in major decision making; lack collateral thus men sometimes take loan on behalf of their spouses and that 'cash ends up being misused'.

In the tea zone women are intensively involved in tea plucking compared to men and the youth. It is a common thing to find them picking tea very early in the morning, very late in the evening or even with the rains during the rainy season.

Across the three counties, women were barred from leasing or selling land, unless the land was inherited from their parents or they purchased it; building permanent structures on the farm; buying or selling cattle without permission from husbands'; slaughtering goat or cattle in the homestead; and selling or giving out high value farm implements.

Challenges faced by women in agricultural value chains were diverse:

- Lack of access to inadequate capital/credit
- Lack collateral to take financial credit (loans)
- Poor access to markets
- Discrimination and restricted mobility to distant markets unless there is permission from their husband.

Focus Groups in the three counties revealed that women had limited rights to earnings from coffee, tea and dairy. Generally, the revenues from cash crops and milk were registered under the man's name, meaning that the man received the payment and makes major decision on how the proceeds were used. Some men shared the proceeds with their wives, some planned together with their wives while the majority did not. Some were not disclosing the amount received to their wives, and only provided cash for consumption needs.

Men also controlled proceeds from macadamia and avocado while women-controlled proceeds from poultry products and rabbits (small stock) and bananas. Generally, farm enterprises that attracted a lot of money were controlled by men.

It was stated that women had rights to utilise land (but no right to sell or lease); rights to sell land inherited from her parents or through succession; rights to inherit land from her parents; rights to sell or slaughter small animals like chicken and rabbits but with permission from husband; and rights to sell utensils and scrap metal from the homestead.

Gender issues and men's role in farming. In farming, men were involved in similar activities as women: land preparation, planting, weeding, spraying, harvesting and marketing, while in animal agriculture, the men were involved in construction of the livestock unit, fetching fodder, feeding, milking and marketing.

In Kangaita Women FGD (Kirinyaga) some members said that coffee was more specific to men while women had a bigger role to play in tea farming than in coffee.

Generally, men were involved in labour intensive farming activities while controlling the activities and proceeds of the main cash crops (coffee and tea). Men were mainly involved in planting, spraying, pruning and applying manure in coffee. They were also involved in planting Napier grass.

Men were actively involved in conservation of landscape resources: making tree nurseries, planting trees, making terraces, excavating furrows as well as managing water bodies. They also build trenches and build gabbions.

With regards to conservation, men plant trees but not always for conservation purposes. They plant trees for income that comes with the sale of charcoal, timber and fruits. They also plant shade trees for their coffee plantations and beautify homestands.

Further discussions revealed that the roles that men play in conserving the landscape resources (forests, water, wetlands etc) include construction of soil conservation structures (terraces, cut-off drains), tree planting, spring protection, water harvesting and construction of biogas units.

The main challenges men faced in the use of land for farming and in conserving landscape resources in the tea zone was limited land to plant trees. 'If you plant trees, you will have no place to cultivate', one man from the group acknowledged. Other challenges mentioned were limited information on good agricultural practices (GAPs), limited access to loans and conflicts in families. Other challenges faced by men were mentioned as:

- The PPEs for spraying were costly, thus eating into their returns. Men who sprayed without PPEs developed health problems;
- Land fragmentation for sons and land inheritance for women was reducing men's access to land thus bringing conflicts in the family;
- Ownership of land title deeds – not all men have title deeds for the land that they farm, and this discourages undertaking long-term investments on the land;
- Heavy financial burden during farming while meeting family obligations;
- Poor financial control over income;
- Alcoholism among some men leading to poor decision making and violence against women in the households;
- Men were less willing to attend meetings on farming….alleged one woman in Mutira, 'Men prefer political gatherings';
- Limited capital to engage in farming and conservation activities, limited access to inputs, limited access to markets as well as inadequate training on GAPs.

In some women FGDs, the participants were of the opinion that men did not face many challenges in farming and in conserving the landscape compared to women and the youth.

Further, the participants were asked to identify the barriers the men in the community face in participating in agricultural value chains. Barriers were identified as inadequate financial literacy, poor access to market information and to markets, poor access to quality farm inputs, inadequate technical knowhow on value chain development, lack of information on available opportunities, poor access to credit for value chain development and, inadequate entrepreneurial confidence.

Gender inequality undermines progress toward sustainable agricultural development across multiple dimensions. Adriana and Chit Tun recommend the following (Adriana and Chit Tun 2019):

- Sensitisation on land tenure rights especially for women
- Develop innovative strategies to improve access to credit and agricultural services for marginalised farm populations including women
- On-farm sensitisation and training target beneficiaries on gender issues
- Training on financial literacy including use of proceeds from tea and coffee sales for the benefit of whole family
- Raising awareness on policy matters on women and youth empowerment through deploying various tools such as Women's Empowerment in Agricultural Index (pro-WEAI)
- Pro-active targeting of women, youth and marginalised groups through tailored services and targeted delivery, including gender sensitive and pro-poor targeting.

Gender issues and youth' role in farming. The youth provides little farm labour and prefer activities that bring quick returns, though not all youth were in this category.

The farming activities engaged in by some male youth were horticulture, poultry and pig farming while male youth who were still living with their parents assisted in coffee farming (especially spraying) and dairy farming. Some female youth were engaged in selling eggs and or helping parents on the farm and in the household.

The general observation was that the youth liked to engage in enterprises that bring quick money and not necessarily doing farming. An example given was transport business - use of motorbikes *(boda boda).*

In Embu, just like senior men, youth engage in land preparation, ploughing, planting, weeding, spraying and harvesting. They transport agricultural products to the markets, participate in selling agricultural produce. They tend livestock by cleaning for them, feeding and providing water for them.

FGDs in Nyeri also mentioned similar activities in addition to expounding the role of youth in livestock production - involved in fetching fodder, feeding, watering, milking and delivering produce to the market.

Regarding landscape conservation the male youth did most of the activities done by their seniors across the three counties; tree planting, raising tree nurseries, making terraces and trenches and building gabbions.

In Nyeri the FGDs also mentioned that the youth were assisting in the construction of water harvesting structures (gabbions, terraces etc) and construction of biogas units.

Just like the women, the youth faced various challenges in farming and access and control of productive resources. The challenges faced by the youth included:

- Limited access to land. Land inheritance was the only way most youth could access land but some parents were reluctant to subdivide land to their children. One youth complained that unmarried men had to marry first before they could inherit land from their fathers.
- The youth had limited access to land and to coffee trees because their fathers were reluctant to share. Said one male youth from Mutira, 'Some men are reluctant to subdivide land or allocate coffee trees to their children'
- The reproductive roles of young mothers hampered farming
- Some female youth worked little on the farm, preferring the use of electronic gadgets all day
- However some adults in the group said that the youth leased land after being given by their parents and do not make use of it and that is why they are not given land
- Some male youth were involved in alcoholism and drugs, thus allocating less time to farming activities
- Limited knowledge on Good Agricultural Practices (GAPs)
- Limited access to land therefore lacked collateral for loans
- Limited commodity markets.

Barriers afflicting the youth to be fully involved in agricultural value chains included limited capital because of lack of collateral to take loans; inadequate farm implements and seedlings; limited training in agriculture and financial management; limited access to markets and limited access and control of land for production.

SA23: Known incidents of political and/or social conflict

Several incidences of political and social conflicts disrupted the communities.

Kirinyaga: The conflicts that the community had experienced were:

- The *mungiki* terror gang: caused mayhem in Mutira in 2008/2009. 'Our men used to spend the night outside the house to guard their families', said one woman in Mutira FGD
- Low coffee prices led to cutting down of coffee trees in the year 2000
- Unrest associated with new Coffee Regulation (Crops (Coffee) General Regulations, 2019) and Tea Regulations (Crops (Tea Industry) Regulations, 2020)
- Engagement in alcohol and drug abuse by the youth was a constant vice in the area, leading to theft, violence and dropping out from school
- Early/unwanted pregnancies causing conflict in families
- The corona pandemic from the year 2020 onwards affected farming, leading to job losses and fear in the community and increased incidences of domestic abuse.

Other known incidents of conflict include:

- Coffee smuggling syndicates of the 1970s referred to as the coffee boom
- The price boom of 2011 which led to record prices for farmers and an escalation of coffee theft in farms, in stores and in transit claiming fatalities from coffee robbers
- In 2019, Kirinyaga coffee cooperative societies leaders rejected new regulations aimed at streamlining the ailing sector. The 2019 regulations had already been gazetted by the national government when 15 chairmen of the local coffee cooperative societies complained that the Coffee Task Force formed by President Uhuru Kenyatta did not seek their views. They threatened to move to court to block the implementation of the regulations which they claimed will be worse than the old ones.
- Land feuds between communities in the lower parts of the County (Mwea area).

Embu

- Land conflicts among family and sometimes neighbours and/or community members in the tea zone (FGD, Mungania). The small land sizes are usually a constant source of land conflicts between neighbours, siblings, other family members. Cases of disinheriting women who inherited land from their kin are very common.

Nyeri: Known incidents of conflict include:

- Coffee smuggling syndicates of the 1970's referred to as the coffee boom
- The price boom of 2011 which led to record prices for farmers and an escalation of coffee theft in farms, in stores and in transit claiming fatalities from coffee robbers.

- In 2016, Nyeri coffee cooperative societies leaders rejected new regulations. In 2016 Othaya Farmers Coffee Society Nyeri rejected Nyeri County Coffee Bill 2016[24].

SA24: Known incidents of human rights abuses

Several incidences of human rights abuses were known in the communities.

Kirinyaga: No cases of human rights abuse were reported in the FGDs but diverse cases were reported by KIIs in Kirinyaga County spanning the last 25 years:

- Insecurity due to conflict over land: Ownership of the land in Mwea has been in dispute for decades after people were forced off the land by the British. The dispute over the sharing of 42,000 acres of land in Mwea settlement scheme is threatening to turn the area in a battleground, sucking in Embu, Mbeere, Kikuyu and Kamba ethnic communities into a fatal conflict that could result in many deaths and delay the economic utilisation of the vast land.
- Domestic Violence: With the ever-increasing hardships brought about by the ever-dwindling economic opportunities and aggravated by the Covid-19, there is increasing domestic violence.
- Widow and women disinheritance: Culture does not accept the transfer of land to a widow when the husband dies. In most cases, the clan or the extended family usually reclaims that land hence denying the widow the ability to use that land. Inheritance of land is also limited to men. Women are perceived not to be rightful owners as they will be married elsewhere.

Women are mostly not allowed to own or inherit family property and property is distributed only to sons and not daughters.

- Vulnerable groups: The elderly, people living with disabilities, child headed households, people living with terminal conditions such as HIV and Aids, cancer, etc. are discriminated against in term of participation in water resource management. They are often not present in negotiation meetings.
- School dropouts and early marriages: Education is a basic human right. Despite various initiatives by the government such as free secondary and primary education, school dropout continues to be on the rise. Among the factors contributing to this is the advent of boda-boda attracting mostly youth males who are enticed by the quick money. Further, the finances derived from 'muguka' farming further worsens the situation. Young girls also get enticed by youths leading to early pregnancies and early marriages.
- Insecurity: With the general unemployment and hardships brought about by covid-19, many youths have been rendered idle and without money. This has contributed to an increase in crime through mugging of people and theft in homes.
- Child labour: Child labour had been observed in Mwea rice farms, the not so vivid child labour in tea zones and coffee zones, in horticultural production e.g. French beans and in *muguka/Miraa* production. Children and youth in general find miraa production to be lucrative because of good pay to harvest *muguka*. For example, children earn KES 100 for every kg harvested hence they can earn even KES 1,000 per day.

Embu: the following issues were mentioned:

- Gender based violence against women that is characterised by both physical and emotional abuse. This has been exacerbated by stay-at-home directive of COVID, alcohol abuse and loss of jobs
- Justice system (Judiciary) in the County is slow and inefficient with backlog of cases e.g. on land disputes and corruption
- Limited cases of rape and violence against women and children has been reported
- In some parts of the county, young girls still undergo female genital mutilation (in secret) then they are married off to older men when they are still very young and should be attending school
- There are reported incidences where young girls and women are raped or forced into sexual relationships by men who are usually very close relatives and friends
- People living with disabilities have also been left out in the sense that majority of planning and development of infrastructure in Embu County is done without integrating the needs of people living with disabilities.

Nyeri: No cases of human rights abuse were reported in the FGDs. However, the KIIs reported the following:

- Domestic and gender based violence; women beating up their drunk husbands and vice versa

[24] https://www.standardmedia.co.ke/kenya/article/2000196526/angry-farmers-storm-out-of-meeting-on-coffee-bill

- Criminalisation of same-sex sexual conduct
- Poor prison and detention centre conditions
- Child labour and abuse

Other studies have indicated the following:
- Forced labour, teenage pregnancy, and sexual gender-based violence (SGBV) and son preference are harmful practices in Nyeri-part of human rights violations (National Council For Population And Development (NCPD) 2020);
- A study in Nyeri has indicated that sex-tourism-child prostitution is prevalent in Nyeri (Bureau of International Labor Affairs 2011).

SA25: Known sustainability issues and risks related to human wellbeing within the landscape

Several sustainability issues and related to human wellbeing within the landscape were known in the communities.

Kirinyaga: In KIIs and FGDs the following were mentioned:
- Political instability and uncertainty; Post election violence,
- Youth shifting from farming to urban areas; and
- Effects of COVID-19 pandemic leading to slowing down of economic activities from job cuts. There has been significant job losses, both for casual workers in informal sector and daily-wage earners in the formal sector, both of which employ a high proportion of women

Embu: From KIIs, the following were flagged out:
- The closure of markets due to COVID-19 has affected farmers' income and so is the loss of jobs which reduces household economic power thereby affecting their well-being. The youths' well-being has been affected by the inadequate labour supply-demand and a lack of financial support.
- Legal and policy reforms in the coffee sector. This has caused a lot of confusion and agitation from the players in the coffee value chain which ultimately affects coffee production.
- The coffee and tea farmers have also experienced a decrease in per capita income because of low production and unstable prices for their produce.
- As a result of the shift in economic well-being within families, there has been an increase in cases of gender-based violence.
- The increasing population has led to increased demand of scarce resources such as land which have rendered some people landless. There is massive subdivision of land and now many households are left with small pieces of land which cannot be put to commercial use.
- Alcohol and drug abuse especially miraa and muguka. Alcohol and drug abuse were cited by the respondents as the major initiator of gender-based violence among households in the County.

Nyeri: From KII and FGDs issues raised were similar to those raised in Embu County. Other sustainability issues with regards to women in Nyeri are lack of sufficient resources include access to finance, land ownership, and lack of autonomy in decision-making regarding farming. Another factor undermining sustainability is the lack of knowledge and inability to use modern farming methods and technology despite their availability (Mwathi, Aseey et al. 2013).

7.8 Production context: Markets access and investment opportunities

Do farming households and local population have easy market access and investment opportunities?

If not, what are the constraints and how can these be reduced?

Households and local population in the three study counties have a structured market access for tea, coffee and dairy but not so for other value chains which are characterised by diverse challenges. Smallholder tea is marketed through Kenya Tea Development Agency (KTDA). Smallholders deliver their Greenleaf to nearest buying centre through the KTDA structures, which transports, processes and markets tea on behalf of farmers through an auction system and or direct sales. Several adverse forces presently threaten the tea industry and marketing. These include fluctuating and weak trends in the export price of tea, rising costs of production (electricity, labour etc) and inadequate credit for small scale growers among others (Gesimba, Langat et al. 2005). KTDA has dopted cost-cutting strategies including planting own fuel wood, investing in hydropower plants and investing in various innovations e.g. Electronic green leaf Weighing Solutions (EWS), use of continuous fermenting machines (CFU) etc.

Coffee is marketed through Farmers' Cooperative Societies through appointed Marketers. Just like tea, coffee is marketed through an auction system. The cooperatives process and market smallholder coffee through the Nairobi Coffee Auction and appointed marketing agents.

Previous studies have indicated that fast changing, consumer tastes and preferences, economic uncertainty and declining terms of trade at the international level are the main challenges affecting coffee marketing and that market expansions, exhibitions as a promotion strategy, pricing rationalisation and product innovation are the main marketing strategies adopted by the firms to deal with the challenges (Chokera 2011).

Market challenges are rampant for other value chains and require pro-poor policy reforms and implementation.

Low (international) prices of commodities is the biggest problem that most farmers face –in both cash and food crop markets, particularly in the case of the main cash crops of tea, coffee, avocado, French beans and bananas. The prices are low in comparison to the production costs. There is need to innovate low-cost production technologies as well as effecting policy decisions on costing of fuel and taxes to agricultural inputs. Effecting value addition, increasing storage and warehouse capacity and identifying new international markets would contribute to offesting the contraints.

Middlemen and cartels: The majority of agricultural market observers acknowledge the critical role that middlemen play in facilitating farmers to access markets. However, most have practices that border on exploitation when farmers are not organised to have 'one voice'.

Poorly structured markets: Many farmers sell their produce as individuals, and desperation for quick money often leads to low and poor prices. Produce aggregation and collective marketing through groups/cooperatives. Except for dairy the level of sectoral organisation by farmers is often low. Kirinyaga County has carried out feasibility studies on a processing center for avocados, but so far this has led to activities on the ground. Value addition and linkages with the private sector are key areas requiring to be addressed.

Poor governance of marketing groups and cooperatives: The cooperatives need support to retool themselves in private market-oriented entities with enhanced ICT systems and governance structures. There may be need for policy interventions and effective implementation of the legal frameworks to stem poor governance. Oversight by respective bodies must be stepped up.

High taxes by county and national governments: The national and county governments need to re-evaluate their taxation measures e.g. on fuel that has a multiplier effect in crop and livestock value chains.

SA43: Agricultural crops produced in the region; including total quantity/year, yield and/or share of national production, disaggregated by crop

The counties of Kirinyaga, Embu and Nyeri produces diverse food and cash crops in mixed farming system where livestock forms an integral part of the system.

Kirinyaga: the dominant cash crops include tea, coffee and rice production. The latter is done in the lower parts of Kirinyaga County. Only about 70% of arable land is being used for crop and livestock production in Kirinyaga County.

The majority of small-scale farmers grow food crops such as maize, beans, Irish potatoes, rice, sweet potatoes, bananas, tomatoes, onions, cabbages and kales. Among the cash crops grown in the county include tea, grown in the upper zone of Kirinyaga County and coffee grown in the upper and middle regions Table 7.19 and Table 7.20). The share of households growing maize to the national figures was 2%, 2% and 3% for Kirinyaga, Embu and Nyeri. Kirinyaga, Embu and Nyeri contributed about 5%, 4% and 5% of total households growing tea nationwide. These figures were 10%, 6% and 12% for coffee.

Most of the land in the upper and middle zones of the County are smaller and are owned as freehold by individuals. In contrast, land holdings in lower parts of the County, Mwea constituency, are larger but are owned and leased out to farmers by the National Irrigation Board (NIB). The number of households utilising basin irrigation system to produce rice in the County is 21,557. Other

crops grown using sprinkler and furrow irrigation systems include, Sweet potatoes, French beans, bananas, tomatoes, onions and cut flowers

The main livestock enterprises in Kirinyaga county include dairy, poultry and pig farming. Other livestock reared in the county includes goats, sheep and donkeys. Beekeeping and rearing of other small animals such as rabbits and guinea pigs is also in the rise. With the various governmental and non-governmental interventions, aquaculture is also picking up well as farmers are receiving support in the form of fishing infrastructure and equipment, fingerlings and, education and extension services to encourage fish farming for improved nutrition and household incomes.

Table 7.20 Number of households growing major crops in Kirinyaga, Embu and Nyeri

County	Kenya	Embu	Nyeri	Kirinyaga
Maize	5,104,967	109,171	138,426	100,197
Sorghum	904,945	22,883	3,354	8,880
Rice	50,484		-	21,557
Potatoes	1,170,170	31,032	108,919	22,133
Beans	3,600,840	89,278	125,889	83,440
Cassava	1,050,352	27,641	13,597	20,215
Sweet Potatoes	1,134,102	20,905	34,618	25,556
Wheat	67,720	-	2,536	-
Green grams	571,426	30,437	2,311	4,285
Bananas	2,139,421	55,970	81,891	73,990
Cabbages	490,588	8,247	45,430	18,370
Tomatoes	410,224	8,734	12,864	15,866
Onions	707,182	8,517	27,917	10,460
Ground Nuts	480,812	1,215	-	-
Millet	540,353	12,819	-	2,643
Watermelons	84,077	1,884	-	2,049
Kales	1,916,898	27,825	71,714	40,338
Sugarcane	654,468	17,631	23,622	19,104
Cotton	22,920	-	-	-

Source: Kenya National Bureau of Statistics (KNBS) (2019).

Table 7.21 Number of households growing major cash crops grown in Kirinyaga, Embu and Nyeri

Crop	Kenya	Embu	Nyeri	Kirinyaga
Tea	476,613	18,664	23,300	25,135
Coffee	478,936	28,996	57,983	47,835
Avocado	966,976	19,355	22,810	19,691
Citrus	177,445	3,581	2,521	2,429
Mango	796,867	26,771	10,228	15,311
Macadamia	195,999	27,488	25,436	28,508
Khat (Miraa)	134,148	34,900	-	5,821

Source: Kenya National Bureau of Statistics (KNBS) (2019).

Embu: The majority of small-scale farmers grow food crops such as maize, sorghum, millet, beans, cow peas, green grams, sweet potatoes, cassava, kales, tomatoes, carrots, and Irish potatoes (Table 7.21 and Table 7.22). Among the cash crops grown in the county include tea, coffee, Macadamia nuts and *Miraa* (Khat).

Examples of levels of crop production and associated earnings in the landscape are presented in Table 7.22 and Table 7.23. The tables shows that both horticultural crops and industrial crops have a high potential to generate income for farmers within the landscape.

Table 7.22 Horticultural crop production in Embu County and associated earnings

Crop	2015/2016 Production			2016/2017 Production		
	In ha	In tonnes	In KES '000'	In ha	In tonnes	In KES '000'
Mangoes	3,185	112,640	16,890	3,185	112,711	1,690
Bananas	3,712	200,250	2,255	3,593	162,450	5,581
Passion fruits	30	500	29	25	300	37
Avocadoes	529	8,808	146	529	10,200	428
Kales	225	3,750	55	120	4,672	163
Tomatoes	225	2,835	69	207	4,180	152
Carrots	64	1,736	20.72	47	1,350	22
Butternuts	25	1,000	15	20	600	60
Watermelons	160	1,640	66	148	1,950	93
Total	**8,155**	**333,159**	**4344.5**	**7,873.5**	**298,413**	**8,226.71**

Source: Embu County Government (2018).

Table 7.23 Main cash crops in Embu and associated earnings

Industrial Crops	2017 Production		
	In ha	In tonnes	In KES '000'
Coffee	3,864	21,000	1,365,000,000
Tea	2,595	27,590.6	1,623,704,338
Macadamia nuts	724	5,800	348,000,000
Miraa	159	600	300,000,000

Source: Embu County Government (2018).

[25] Cultivated land-Kirinyaga: In 2019, 139,866 farming households in Kirinyaga County operated 80,166 ha of farming land, translating into **0.57 ha** per household (Kenya 2019 Census, Vol IV).

SA44: Data on farm characteristics (e.g. size and types of agricultural production systems) in the landscape

Smallholder farmers cultivate small farm sizes less than 1 ha under dominantly rainfed production systems. In the small farm sizes, farmers practice mixed farming, growing crops and raising livestock. Crop production is dominantly under rainfed production system with a focus on food and cash crops. Note that the baseline IE data reveal that coffee and tea farmers in Kirinyaga county cultivate coffee and tea on 0.24-0.31 ha, while possibly remaining land is used for other crops.

Table 7.24 Farm characteristics

Description	Kirinyaga	Embu	Nyeri
Cultivated land-smallholders (ha/farm)	0.6[25]	0.9[26]	0.6[27]
Cultivated land large scale farmers (ha?farm)	5.2	-	4.0
Area under food crops (Ha)	50,864	60,487	80,943
Area under cash crops (Ha)	31,244	7,342	18,521

Source: Kenya National Bureau of Statistics (KNBS) (2019); Kirinyaga County Government (2018).

SA45: Prevalence of subsistence agriculture

About 71%, 88% and 87% of farming households in Kirinyaga, Embu and Nyeri do farming at subsistence level. In Kirinyaga, Embu and Nyeri, only about 29.3%, 12% and 13.1% of farming households do commercial farming (Table 7.23). Thus about 71%, 88% and 87% of farming households in Kirinyaga, Embu and Nyeri do farming at subsistence level (Kenya National Bureau of Statistics (KNBS) 2019). However, it was observed in the landscape that even subsistence farmers also sell part of their produce or surplus to cater for other basic necessities even if the farming orientation is not purely commercial.

[26] Cultivated land: In 2019, 130,990 farming households in Embu County operated 122,114 ha of farming land, translating into **0.93 ha** per household (Kenya 2019 Census, Vol IV).

[27] Cultivated land: In 2019, 98,512 farming households in Nyeri County operated 164,229 ha of farming land, translating into **0.60 ha** per household (Kenya 2019 Census, Vol IV).

SA46: Extractive industries located within the landscape

Several extractive industries are present in the Counties. In Kirinyaga, the mining activities carried out in the county are ballast and sand mining yielding about 456,000 tonnes and 294,00 tonnes respectively annually. All mining activities are concentrated at Sagana area of the County.

There are quite a number of small-scale mining activities going on in Embu County. Additionally, quite a number of quarries exist within the County the major ones being Ngaduri, Wachoro and Kanyueri area in Ishiara. In the upper parts of Embu, logging activities have been reported (Embu County Government 2014).

The main mining and quarrying activities on Nyeri include; clay, sand, aggregate, gravel and natural building stones mining in Mukurwe-ini, Nyeri Town, Kieni East, Kieni West, and Mathira West Sub Counties. The County produces roughly 2.3 million tonnes of gravel every year employing about 1,431 persons. Clay mining has the lowest yields at 2,555 tonnes per year employing 756 people (Nyeri County Government 2018). There is a small ceramic processing plant in Mukurwe-ini sub-county.

SA47: International markets (percentage of agricultural goods and commodities produced for export, disaggregated by crop) and SA48: Information about other exported goods or services

Farmers in Kirinyaga, Embu and Nyeri produce for local market consumption within the Country except for industrial crops such as tea and coffee that are exported through auction markets. Crop and livestock produce from the three Counties are majorly consumed in local markets and other markets like Nairobi. The three counties, however, produce tea and coffee which are sold through the relevant auctions for export. Similarly, macadamia, avocado and French beans are also produced especially in Kirinyaga for local consumption and for export. Figures for export volumes disaggregated by the three Counties were not readily available.

SA49: Known sustainability issues and risks (other than climate) related to production within the landscape

COVID-19, HIV, conflicts in tea and coffee sector, social ills like drug abuse and fluctuating commodity prices pose risks and influence sustainability of production in the landscape.

Kirinyaga: Kirinyaga County continues to face many challenges as a result of HIV and AIDS. The County is classified as a medium HIV burden County with a prevalence rate of 3.1%.[28] Studies indicate that HIV negatively affects agricultural production due to loss of labour resulting in production losses and income among others (Kwaramba 1997).

In addition to climate risks, other shocks, stresses and uncertainties that had affected the community were mentioned as:

- COVID-19
- Fluctuating commodity prices
- Presence of middlemen
- Bad roads
- High cost of living
- Post-harvest losses due to lack of storage facilities
- Gender based violence
- Alcohol and drug abuse
- Conflicts in the tea sector
- Youth unemployment
- Youth's disinterest in marriage
- Effects of the 2008 post-election violence and political uncertainty.

The most worrisome shocks for the future were:

- Health shocks, such as novel COVID-19 strains;
- Politics around coffee production (which may affect household income) as well as the increasing cost of living amid reducing commodity prices. Coffee sector has been undergoing reforms under Coffee (General) Regulations, 2016 (L.N. No. 120 of 2016), eliciting mixed reactions from coffee farmers and societies in Mt. Kenya region;

[28] June, 2021-Kirinyaga Records Reduced HIV Prevalence; https://www.kenyanews.go.ke/kirinyaga-records-reduced-hiv-prevalence/

- Conflicts in the tea sector following Presidential Executive Order No. 3 of 2021 on Friday 12th March 2021 on revitalisation of the tea sub-sector and subsequent implementation of Crops (Tea Industry) Regulations, 2020, and policy reforms in the tea sub-sector. Some of the reforms were opposed by industry players and marketers causing upheaval in the tea sector;
- Drugs leading to theft and irresponsibility in families;
- Population increase may increase pressure on land and 'destroy the landscape';
- Single parenthood disrupts normal family set-ups;
- Insecurity leads to stifled development.

Embu County: Issues and risks were same as in Kirinyaga. Embu continues to face many challenges as a result of HIV and AIDS. The County is classified as a medium HIV burden County with a prevalence rate of at 3.7% (National AIDS Control Council 2016). It is higher among women (5.0%) than among men (2.2%). Studies indicate that HIV negatively affects agricultural production due to loss of labour resulting in production losses and income among others (Kwaramba 1997).

The FGD participants stated that they are very concerned that HIV prevalence in the area is on the increase. The fear is that it is one of the conditions that makes people vulnerable to COVID-19 and other similar illness that could emerge in future

The prevalence of other illnesses such as HIV, Malaria and Typhoid were other shocks that have affected the communities in the recent past

In the Coffee zone, incidences of high blood pressure, typhoid and HPV were flagged out as having gone up.

The high prevalence of crime and drug abuse has pushed the youth into life of crime, drug abuse and unemployment. Peer pressure and availability of drugs including *miraa* and *muguka* were the causes.

Nyeri: Issues and risks were same as in Kirinyaga. Shocks, stresses and uncertainties that had affected the community included Covid 19 pandemic; HIV/AIDS; malaria outbreaks; increase in cancer and diabetes; increased conflicts over land; and political interferences on farmers' activities.

7.9 Indicators from the baseline impact evaluation (IE)

This section presents baseline impact evaluation data for a total of six relevant indicators (Table 7.24) as agreed upon in the workplan. A full list of all indicators available with respect to the (baseline of) adoption of sustainable and climate-smart cropping practices is available in Annex 2. This includes detailed information on the indicators. The discussion in this section highlights a number of key observations, either signalling already high adoption rates of certain practices, as well as low adoption rates and listed reasons. The discussion lists averages and data as reported for the group of intended programme participants.

O.8.1(KPI 3.2): Number of new non-RA certified programme-supported coffee and tea farmers in process of adopting key regenerative and other climate-smart agricultural practices

O.8.2(KPI 3.2): Number of RA certified programme- supported coffee and tea farmers in process of adopting key regenerative and other climate- smart agricultural practices

For both these indicators (O.8.1 and O.8.2) the IE data presents the key baseline cropping practices of both tea and coffee farmers in the regions. Note that all tea farmers are RA certified, but not all coffee farmers are. The treatment and the comparison groups of coffee farmers contain both certified and non-certified farmers.

The application of sustainable cropping practices is common amongst tea and coffee producers. The use of cover crops, soil mulching with prunings from coffee and tea crops, and the integration of various tree species on coffee and tea farms are commonly practiced by both tea and coffee producers. The application of water storage methods and the application of Integrated Pest Management (IPM) techniques are less frequent.

The use of cover crops is common on the small portion of plots where (currently) no crops are grown. Both 13% of the coffee and tea producers have plots at which no other crops are being grown, currently. Amongst this group,

81% of the coffee producers and 68% of the tea producers use cover crops on these plots. The remaining producers mostly report the use of cover crops is not necessary in these plots.

The majority of coffee and tea producers prune their crops regularly and keep the litter as soil mulch in the fields. Ninety-two per cent of tea producers prune their tea bushes every three years and the large majority (95%) retain prunings as a cover/mulch in their fields. Ninety-seven per cent of the tea fields are covered with prunings in this way. Sixty-nine per cent of tea producers apply litter from prunings on their soils and these farmers do so on 61% of their farms. All coffee producers prune their crops annually and 77% of coffee producers use the prunings as a soil mulch on 64% of their fields.

Table 7.25 Indicators from the baseline impact evaluation (IE)

Category	IE indicator number	Recommended minimum data and information per county
Adoption	O.8.1 (KPI 3.2)	Number of new non-RA certified programme-supported coffee and tea farmers in process of adopting key regenerative and other climate-smart agricultural practices
Adoption	O.8.2 (KPI 3.2)	Number of RA certified programme- supported coffee and tea farmers in process of adopting key regenerative and other climate- smart agricultural practices
Livelihoods	I.3.1	(Percent increase in) Resilience Index status
Livelihoods	O.5.1.	Number of practice-adopting farmers experiencing higher net incomes
Livelihoods	O.9.1	Number of companies and public sector entities that reward certified farmers through additional benefits and support
Ecosystems	O.3.1	Increase in soil organic matter, as indicated by change toward darker and more intense soil color in the Munsell Soil Color Chart.

Integrating various tree species in coffee and tea production is practised by the majority of producers. The majority of tea producers (94%) integrate tea production with the cultivation of various tree species, the dominant types being fuelwood trees, food trees as well as plantain/banana crops. On average this amounts to 246 trees per hectare. Forty per cent of tea producers plant trees as a wind protection, with on average 33 trees per hectare (16 foot distance between the trees) surrounding the tea production farms. Producers not planting trees for wind production mention mostly that planting such wind breaks is, in fact, unnecessary. The low tree density observed in this study corroborated other studies in Central Kenya which have reported 177 trees per hectare (Gachie et al. 2019) and other parts of Kenya which has reported 120-150 trees and shrubs and between 30-35 tall trees per ha on the farm either as borders or integrated within the cropping system (De Jager et al. 2001).

Similarly, most coffee producers integrate coffee farms with various tree types. 88% of producers use food trees and 81% of producers banana/plantain. The total number of non-coffee trees amounts to 215 per hectare coffee farm. The number of trees around the coffee fields, for instance, for wind damage protection amounts to 13 trees per hectare, with an average spacing of 15 feet between trees. The two key reasons for not using such trees include the statement that it is not necessary, or being advised against doing so.

Most coffee farmers weed their crops by hand. Practically all coffee producers weed their coffee farm. Seventy-five per cent remove weeds by hand, the vast majority of which state that their fields are covered by less than 10% of tall weeds. 18% of coffee producers use herbicides for weed control.

Adoption of water storage is more common amongst tea producers than coffee producers. Sixty-four per cent of tea producers use water storage technologies (tanks, lagoons or other water sources). Stored water is (on average) only applied to 2% of field, while the dominant use of stored water is for domestic purposes. Dominant reasons for not storing water include a lack of financial resources, a lack of knowledge or because producers do not deem it necessary. Only 23% of coffee producers collect water. The major reasons for doing not so include the feeling it's not necessary, next to a lack of financial resources.

Practically all coffee producers (99%) practice regular pest and disease monitoring on 84% of coffee fields. Fifty-four per cent of tea producers practice regular pest and diseases monitoring on half of their fields (51%). A majority of coffee and tea producers not practicing regular pest and disease monitoring indicate they feel it is also not necessary to do so.

Most coffee farmers report on practicing IPM methods, but this is less common amongst tea farmers. Eighty-three per cent of coffee producers practice Integrated Pest Management (IPM) methods. Often cited elements of IPM applied include: regular (53%) and less regular (24%) monitoring of pests; the selection of pesticides (32%) as well as bio control options (natural enemies) (20%). To the contrary, a majority of tea producers (76%) do not apply (IPM) techniques. The minority who do mostly report practicing regular pest monitoring or reduced pesticide use. Key reasons for not applying IPM by tea producers include the feeling that it is not necessary, or that they lack the knowledge to do so.

But record keeping on incidences of pest and diseases is uncommon in either group. Only 9% of tea farmers keep records of incidences of pest and diseases and used control methods, while 27% of coffee farmers do. The dominant reasons for not doing so include lack of knowledge and the perception it's unnecessary,

About half of producers are aware of natural enemies and their role in pest control. Forty-four per cent of tea producers are aware of natural enemies and their role in pest control and 57% of coffee producers. 17% of coffee producers use chameleons in pest control.

Both coffee and tea farmers desire new seedlings that are better adapted to future climate conditions and pests and diseases. Higher yields, adaptability to future climate as well as greater resistance to pests and diseases are the key characteristics that coffee and tea producers seek in new tea seedlings. But, 30% of tea producers and 16% of coffee producers do not foresee to plant new seedlings in the future.

O.3.1 (Increase in) soil organic matter, as indicated by change toward darker and more intense soil colour in the Munsell Soil Colour Chart.

The study observe that the most limiting soil characteristics in the study sites were pH, soil phosphorus, Magnesium and Potassium. Based on the calculated quantities of nutrients in the soil derived from laboratory analysis there is a clear indication that the soil is in poor chemical health. This could be attributed to high acidity.

Results of rapid methods for soil characteristics estimated using Munsell Colour chart for top soil colour (Value and Chroma) are presented in Table 7.25 and 7.26. The more 'darker' the top soil (and higher soil organic matter content) is the lower is the Value from Munsell Colour Chart. Although the mean value was 3 across the zones, soils in the tea zone tended to have darker colour (maximum value= 3). The value from Munsell Colour Chart tended to predict soil organic matter in combination with other soil parameters.

Table 7.26 Field estimated soil characteristics of the study area-by zone

		Valid N	Mean	Minimum	Maximum
Coffee	Value	16	3	3	5
	Chroma	16	3.69	2.00	6.00
	Bulk density (g/cc)	16	1.12	.95	1.30
	pH_Field	16	4.36	3.40*	5.50
Tea	Value	15	3	3	3
	Chroma	15	3.87	3.00	4.00
	Bulk density (g/cc)	15	1.18	1.00	1.40
	pH_Field	15	5.21	4.40	6.50
Total	Value	31	3	3	5
	Chroma	31	3.77	2.00	6.00
	Bulk density (g/cc)	31	1.15	.95	1.40
	pH_Field	31	4.77	3.40	6.50

Source: this study.

*Outlier value.

Table 7.27 Estimated Soil characteristics of the study area-by zone

			Count	Column N %
Coffee	Texture	Clay	7	43.8
		Clay loam	8	50.0
		Silt clay loam	1	6.3
		Total	16	100.0
Tea	Texture	Clay	15	100.0
		Total	15	100.0
Total	Texture	Clay	22	71.0
		Clay loam	8	25.8
		Silt clay loam	1	3.2
		Total	31	100.0

Source: this study.

Although the colour of the top soil as measured using 'Value' from Munsell Colour Chart corroborated well with soil organic carbon, the study concludes that the use of Munsell Colour Chart alone and or in combination with soil texture is inadequate in estimating soil organic carbon in situations where soils are near uniform in terms textural, structural, and morphological landscape processes and formations.

Irrespective of the way in which changes in organic matter are assessed, land conservation activities may have a positive impact on soil organic matter content in soils, but the precise size of impact may be limited given soil types and current management practices

I.3.1 (Percent increase in) Resilience Index status

The baseline resilience index suggest tea farmers are considerably more resilient than coffee farmers. The Resilience Index Status (0-14) of a household is computed by combining the scores of five separate pillars: food security, assets, the use of specific agricultural practices, adaptive capacity and social networks (see Annex A.1 for more details). The aggregate resilience index of tea farmers amounts to 1,14 as compared to 0,03 for coffee farmers.

Regarding the five pillars, particularly the scores on ownership of assets, use of agricultural practices and adaptive capacity are notably higher for tea farmers as compared with coffee farmers. Specific reasons for the differences between tea and coffee farmers could originate from greater past policy attention for tea; higher prices and more continues flows of income in tea due to continuous harvesting. Yet, determining the true origins of these differences requires a more detailed study.

O.5.1 Number of practice adopting farmers experiencing higher net incomes

Baseline input and labour costs are higher, and profit margins smaller, in coffee than in tea production. Full details of the baseline average gross and net incomes from tea and coffee production are provided in Annex 2. Tea crop yields average 11,570 kg/ha and input and labour costs average 35% of gross incomes. Net income from tea averages about KES 65,000 (approximately USD 600)[21] per year. 20% and 24% of the tea farmers in the beneficiary group and the comparison group, respectively, earn a living income.[29] About 75% of the tea farmers earns less than the national poverty line. Compared with tea production, input and labour costs in coffee are higher, and profit margins smaller. Coffee crop yields average 2,940 kg/ha (fresh berries) and 156 kg/ha for (dry-processed) mbuni coffee. Input and labour costs amount to 61% of gross income, leading to a net coffee income of, on average about KES 35,000 (approximately USD 322) per year. Twenty per cent and 19% of the coffee farmers in the beneficiary group and the comparison group respectively earn a living income. About 77% of the coffee farmers earns less than the national poverty line.

No production data from Embu or Nyeri County were directly available, but national reference data on coffee and tea yields are. National tea yields amount to 15,000 kg/ha (Agriculture and Food Authority Kenya 2021). National coffee yields are estimated at 380 kg/ha for green beans for 2019/2020 (KTDA 2021). Typically conversion rates from green beans to fresh

[29] A living income is defined as an income that allows people to minimally have a decent standard of living. This means being able to afford food for a model diet and a decent house. Other essential needs, such as education, transport, clothing and medical care should also be within financial reach. Earning a living income also means that families can build up a financial buffer for unexpected events such as illness or harvest failures because of climate change. A living income is a human right. See for more information Waarts et al. (2021).

berries are in the order of 1:6,[30] implying coffee yields in the region (2,940 kg/ha) are higher than the national average (2,280 kg/ha). Possible explanations for this difference could arise from the fact that national level estimates are less accurate in capturing lower than actual presumed acreages due to overcounting of farm acreages due to intercropping, abandoned plots and switches to other crops altogether.

O.9.1 Number of companies and public sector entities that reward certified farmers through additional benefits and support

The following third party certification programmes/standards are implemented in the programme area:

- Fair Trade (Flocert)
- Rainforest Alliance.

Other certification schemes especially for coffee exist in Kenya but were not actively observed in the target programme area (Cooperative Societies): 4C (Common Code Coffee Certification) is not widespread in the Project area; KEBS Mark of Origin (Established Coffee Directorate-Kenya); C.A.F.E. Practices ensures that Starbucks is sourcing sustainably grown and processed coffee; IMO (Institute for Marketecology).[31] Other initiatives include organic certification of Coffee in Kenya (Spearheaded by Solidaridad).[32]

The certification programmes currently do not include premiums for Rainforest Alliance certified volumes sold to the market. But do include support programmes such as training and technical assistance. However, future premiums are foreseen in the Sustainable Agriculture standard, which will be assessed during the midterm and endline evaluation: In the 2020 Sustainable Agriculture Standard, the Sustainability Differential is introduced which is a 'mandatory additional cash payment made to certified producers over and above the market price of the commodity',[33] as well as the Sustainability Investments, 'mandatory cash or in-kind investments from buyers of Rainforest Alliance Certified products to certified producers for the specific purpose of helping them meet the Farm Requirements of the Sustainable Agriculture Standard'.

According to Rainforest Alliance 'The amount of the Sustainability Differential is not fixed. When possible, it should be negotiated between the farm group/farmer and the market actor responsible for making the payment, which, in most instances, is the first buyer. The intention is that this payment recognises the efforts and specific activities undertaken by the producer to meet the Farm Requirements of the Sustainable Agriculture Standard. It should incentivise the continued adoption of the sustainable production practices embodied in our standard.'[34] In the coffee sector, all buyers of Rainforest Alliance certified coffee are required to pay the Sustainability Differential and the Sustainability Investments for new Rainforest Alliance certified volumes as from July 1, 2022. Payments for the two differentials in the tea sector are required to be made from 1 April 2023 onwards 'based on volumes sourced in the previous 12 months from farms certified under the 2020 Rainforest Alliance standard'[35].

[30] The Coffee Guide: What is the conversion ratio of fresh cherry to green bean (clean coffee) (https://www.thecoffeeguide.org/QA-108/)
[31] Sustainable Management Services (SMS): certification (coffee) in Kenya; http://www.ecomtrading.co.ke/certification/
[32] Solidaridad,2020. Bridging the gaps towards organic coffee certification in Kenya; https://www.solidaridadnetwork.org/news/bridging-the-gaps-towards-organic-coffee-certification-in-kenya/
[33] Rainforest Alliance Sustainable Agriculture Standard (https://www.rainforest-alliance.org/wp-content/uploads/2020/06/2020-Sustainable-Agriculture-Standard_Farm-Requirements_Rainforest-Alliance.pdf)
[34] Rainforest Alliance – What's in our 2020 certification program (https://www.rainforest-alliance.org/wp-content/uploads/2020/06/2020-program-shared-responsibility.pdf)
[35] Rainforest Alliance – Timelines: implementation of the Sustainability Differential and investments under the 2020 certification program (https://www.rainforest-alliance.org/business/certification/timelines-implementation-of-the-sustainability-differential-and-investments-under-the-2020-certification-program/)


8

8 Development context – knowledge capital

8.1 Key lessons learned from similar and related interventions

This chapter lists a number of key observations with respect to other projects that operate in the targeted counties, having similar objectives aimed at improving agricultural production and improved natural resource management. In addition, some key observations from other landscape approaches are discussed. Based on these more detailed discussions in Sections 8.2 and 8.3, the following key observations emerge:

- Various projects, programmes and policies, including programmes with a landscape orientation, exist or operate in the region and a potential to explore synergies with proposed RA programme activities exist. Further opportunities exist to engage specific private sector actors working on key commodities;
- Considering specific field-level interventions implemented under a broader landscape approach, sometimes also aimed at increasing climate change resilience: such practices are often labour intensive; actual returns may only materialise in the long run; the impacts may be difficult to attribute to interventions; and challenges with respect to self-financing of projects exist;
- With respect to inclusion, and as also observed in previous chapters, specific challenges exist to engage women farmers (due to limited autonomy in decision-making and competing labour demands) and youth (due to a lack of access to land and capital, as well as less interest in agriculture);
- Setting up Land Management Boards (LMB) is a potentially effective mechanism to coordinate activities across a broader set of actors in order to improve joint management of natural resources. But learning from similar projects and interventions highlights the need to:
  - Ensure that the end terms of the LMB are negotiated and agreed upon by broad range stakeholders;
  - RA needs to be clear and transparent about their role in steering the LMB. Soft skills are essential to balance diverse interests amongst a diverse set of actors. This also includes an understanding of where the economic incentives of specific groups diverge from the crop focus on coffee and tea as chosen by RA, and how such differences potentially affect the effectiveness of the LMB. Explicit consideration of how to accommodate on-farm alternatives (macadamia, avocado) or off- and non-farm employment in the landscape approach is required;
  - There need to be checks and balances in ensuring the landscape approach is inclusive and does not further aggravate existing inequalities or strengthen unfavourable power relations. This is particularly important when partnering with some WRUAs and CFAs where legitimacy of representation is, in some instances, questionable.

8.2 Development context: related projects, policies and programmes present in the region

8.2.1 Non-Programme projects or regional programmes that can potentially synergise with or otherwise impact Programme interventions and results

Relevant policies, projects and programmes with potential synergies include:

- Activities carried out by County Government Departments, National Government and Civil Society organisations (see SAs Appendix 1 for each county)
- Regulations enforced by National Environment Management Authority (NEMA), Kenya Plant Health Inspectorate Service (KEPHIS), Kenya Forestry Service (KFS) and Kenya Wildlife Service (KWS);
- Current project based activities in the landscape focussing on farming and marketing agricultural commodities, and natural resource management activities – while potential stakeholders carrying out similar activities to this programme are presented in Table 8.10).

Table 8.1 Overview of current projects focusing on farming, agricultural marketing and natural resource management in the selected counties

Initiative/Project	Sponsor	Focus	Location	Counties covered			Comments
				Kirinyaga	Embu	Nyeri	Others
Upper Tana Natural Resources Management Project (UTaNRMP)	Ministry of Water and Irrigation with funding from IFAD GoK, Spanish Trust Fund and Local Communities	Sustainable water and natural resource management; Rural livelihoods; Community empowerment	Entire counties	Y	Y	Y	Covers six counties; Others- Muranga, Tharaka Nithi and Meru Counties; Main Field Office-Embu
Green Zone Development Support Project	African Development Bank (ADB) funding the Kenya Forest Service (KFS)	Forest conservation; livelihood support for climate change ; selected value chains (timber, bamboo, potato, cereals and pulses)	Gazetted forests and surrounding communities	Y	Y	Y	Covers 15 Counties
Agriculture Sector Development Support Programme (ASDSP II)	The County Government, GoK, Embassy of Sweden (SIDA);European Union (EU)-	Priority value chains-productivity, entrepreneurial skills and Access to markets	Entire counties	Y	Y	Y	**Kirinyaga**-Cow milk; Banana, rice **Embu**-Cow milk, banana, Indigenous chicken **Nyeri**-Cow milk, Irish Potato, Indigenous chicken
National Agricultural and Rural Inclusive Project (NARIGP)	World Bank, GoK, County Governments	Support Community Driven development; Strengthening producer organisations to support member CIGs and VMGs; Supporting County-Community led investments	Entire Counties	Y	Y	N	21 Counties
Rice Map Project	National Irrigation Authority		Mwea region	Y	Y	N	
One Stop Shop for investments	Kirinyaga Investment Development Authority	Streamlines the investment value chain for businesses	Entire County	Y	N	N	Priorities for investment-Tea, Coffee, Tomato, Dairy, Banana, Manufacturing (Industrial park) and Tourism
Kenya Cereal Enhancement Project (KCEP)	EU; IFAD, FAO and GoK	Climate-smart productivity & natural resource management; Access agricultural inputs/technologies; Post-harvest management; market linkages; Financial services	3 Sub-counties in Embu	N	Y	N	Targets ASAL Counties
Kenya Climate Smart Agriculture Project	The World Bank and GoK	Up-scaling climate smart agricultural practices; Strengthening climate smart agriculture Research and Seed Systems; Supporting agro-weather, market and Advisory services; Contingency emergency response-Control and management of Desert Locusts	Entire County; Some Components target 6 Wards per county	N	N	Y	Focus on Climate Smart Agriculture
The National Value Chain Support program (NVSP)	GoK	Targeted Input Subsidy; Inclusive Structured Market; e-voucher for subsidised input access	Coffee farmers; Rice farmers	Y	Y	Y	Targets Coffee in Embu and Nyeri; Rice in Kirinyaga
Nairobi Water Fund	The Nature Conservancy and Partners (The Nairobi Water Company, Private Sector, bilateral donors)	Upper Tana; conservation of farms upstream for the benefit of downstream users (Nairobi dwellers; Hydropower)	Upper tana Catchment	N	N	Y	Covers Nyeri, Muranga, Kiambu; Priority catchments-Sagana/Gura-Maragua and Thika/Chania

Initiative/Project	Sponsor	Focus	Location	Counties covered			Comments
				Kirinyaga	Embu	Nyeri	Others
Tree nursery project	KTDA Foundation	Environmental and Natural resources empowerment	Entire County	Y	Y	Y	Runs Tree Nursery and Energy Projects
Conservation: International Tree Foundation	International Tree Foundation; Works with Kenya Forest Service (Foundation)	Conservation-community forestry; Planting trees and restore forests; Bamboo; livelihoods; Markets;	Mt. Kenya Forest Ecosystem	Y	Y	Y	Work in other Counties in Kenya
Partnership with Business for Restoration of Mt. Kenya Ecosystem Services	Nature Kenya (NGO)	Biodiversity conservation; Mt. Kenya Forest Restoration Strategy (2019-2029); Mt. Kenya Conservation Business Case; Capacity building of CFAs; Policy on biodiversity conservation	Mt. Kenya Forest Ecosystem	Y	Y	Y	
Mount Kenya Environmental Conservation	Mount Kenya Environmental Conservation (MKEC) (NGO)	Livelihood; conservation activities Value addition Reforestation; Greening of schools; Women empowerment	Mt. Kenya Forest Ecosystem	Y	Y	Y	Also works in Meru and Tharaka Nithi Counties
Coffee platform	Kenya Coffee Platform	Training of Cooperatives-governance and financial management; Conduct field days to promote good agricultural practices; Advocacy on climate change ; Platform for private and public coffee stakeholders	National	N	Y	N	Platform has members drawn at County and at national level Works in Coffee Zone-Embu
Rural livelihoods and market linkages	Hand-in Hand East Africa (NGO)	Rural livelihoods; poultry, Bananas and Dairy value chains; Income generation; Financial management; Market linkages; Climate resilience technologies	County wide	Y	Y	N	More activities in Embu compared to Kirinyaga
Dairy Value Chain development	Heifer International (NGO)	Dairy cows; Training, Market linkages	Upper Zones of Embu	*	Y	*	Information available for Embu
Village Based Advisor Model (Private extension Model)	Local Development Research Institute (LDRI); and AGRA	Uses Village based Advisors as extension agents (Private led-extension service) to bridge yield gaps; Access to Inputs and market linkages (Private sector)	County-wide	N	Y		N Upper parts of Embu
Regenerative Agriculture Project	FARM Africa and AGRA; Funding IKEA Foundation through AGRA	Promoting regenerative agriculture technologies; Private led extension service; Access to Inputs and market linkages (Private sector)	Upper parts of Embu	N	Y	N	Upper parts of Embu
Solar powered irrigation	SunCulture	AgroSolar Irrigation Kit; Drip irrigation; Pay-As-You-Grow payment method	Upper parts of Embu	N	Y	N	Upper parts of Embu; Works Nationwide
Bamboo Project	GreenPot Enterprises Limited	Gated Community of Forest-developing co-owned bamboo forest and farming community outgrowers; Employment and business for youth and women	Nyeri	N	Y	N	Other programmes are promoting Bamboo in Kirinyaga, Embu and Nyeri- International Tree Foundation; Kenya Forest Service

8.2.2 Non-Programme projects or regional programmes that potentially will be impacted by Programme interventions and results

Projects and programmes which are potentially impacted by the RA programme include all the above plus the existing institutions and organisations:

- County governments;
- Water Resource Users Association (WRUAs);
- CFAs; National Alliance for Community Forest Association (NACOFA);
- Kenya Tea Development Agency (KTDA);
- Commodity companies.

Their engagement in the LMB has already been foreseen.

8.2.3 Opportunities for the Programme to create positive synergies through appropriate coordination with the above non-Programme initiatives in the landscape

Roundtables and coordination meetings to synergise national and county government laws and policies (as identified in Chapter 4) which, if enacted by County Government within their mandate, could create positive synergies with non-programme initiatives in the landscape include:

- Support the government and communities to enforce regulations regarding environmental protection. Examples are encroachment into the forest, deforestation and land grabbing (in the wider county).
- Support awareness among communities on regulations and issues on water resource management and environment issues in general to change behaviours that are detrimental to the environment (e.g. farming methods).
- Support via working with different agencies and ministries to harmonise statutes relating to land use administration and utilisation of natural resources which is governed by a range of sector specific legal instruments and policies and thus is challenging to implement e.g. developers or project proponents are required by the Water Act, 2016 and the EMCA, 2009 to obtain effluent discharge permits from Water Resource Authority (WRA) and National Environment Management Authority (NEMA) simultaneously.

Bring different companies along commodity value chains together (e.g. KTDA, Farmchem Twiga, Osho, Bayer Crop Science, Sygenta, Frigoken, Joymax millers-Maize Miller, Mwea Rice Mills, Boma Rice millers, Nice rice millers, Top grade rice millers, Victory Rice millers, Tai Rice Mills, John Kaburo Animal Feeds) to go beyond farm/plot level, aid mutual exchange and learning, and explore possibilities for pre-competitive collaboration planning that takes a cross-commodity approach. This would help planning, taking into consideration how different cash crops affect farmer land use decisions. This is needed as there seems to be no private sector level roundtable in the landscape. This action can be a precursor to having them join the LMBs in each county and aids crosscutting across county boundaries to a true landscape scale, rather than now a jurisdictional, county level approach.

Bring together producer organisations from the three counties for exchange and learning and explore possibilities for collaboration across-commodities, bearing in mind farmer realities where diversification can be important for livelihoods, but not in the interests of commodity buying companies. This is needed as there seems to be no producer organisation level roundtable in the landscape. This action can be a precursor to having them join the LMBs in each county and aids crosscutting across county boundaries to a true landscape scale. Current population of producer organisation/groups in each County is presented in Chapter 7 while examples are given in Table 8.2.

Table 8.2 Examples of producer organisations present in the landscape

Nyeri	Kirinyanga	Embu
Gikanda FCS	Mutira Farmers Cooperative	Kagaari North FCS
Gathaithi FCS	Society, Kithunguru Coffee	Barichu FCS
Barichu FCS	Cooperative Society, Kibungu	Kanjugu FCS
Hombe CFA (CBO)	Farmers c ooperative Society,	Kibugu FCS
	Baragwi Farmers Cooperative	Muramuki FCS
	Society Limited, Kirima Slopes	Kithungururu FCS
	Dairy Co-operative Aociety	
	Limited, Kenya Planters	
	Cooperative Union	
	Kibirigwi Coffee Growers	
	Cooperative Society, Nyayo Tea	
	zones	

Source: this study.

8.3 Lessons learnt from similar initiatives - (past and ongoing) (SA34 and SA35)

The analysis of lessons learned from similar initiatives is based on a quick scan of literature and expert judgement of WUR and ETC staff.

Lessons from similar situations

Payment for Ecosystem Services, Mt. Kenya Project mobilised private sector to raise funds for conservation of wetlands and forests. With funding of USD 100,000 from Critical Ecosystem Partnership Fund, Nature Kenya implemented a Water Payment for Ecosystem Services Scheme in Mt. Kenya (May 2016 to December 2018) that resulted in securing funding for community Forest Associations and development of Mt. Kenya Forest Restoration Business Case that was presented to four potential buyers of water services: East African Breweries Limited (EABL), TPS Serene, Vivo Energy and Orange Telkom (see Section 3.2.1 Part I-Literature review). Implementation of technologies for riverine protection appear to work best when communities with farms bordering such water bodies up- and downstream are mobilised in one go (together), and follow-up monitoring and maintained responsibilities and timelines are understood and allocated among communities.

Nairobi Water Fund, Upper Tana with the Government of Kenya, Coca Cola East Africa, East African Breweries Ltd, International Centre for Tropical Agriculture, Global Environmental Fund, IFAD & Frigoken Kenya supported conservation of the Tana River catchment area and established mechanisms for land conservation upstream that led to annual water yields increase of 15% across priority watersheds during the dry season, private sector mobilisation for conservation activities and an estimated USD 3 million per year in the value of increased agricultural yields for smallholders.

Nature Kenya, and the Community Forest Association model introduced, provides an interesting business model that is similar to the activities proposed by the project, also being on a landscape level[36] but also demonstrates challenges particularly of self-financing.[37, 38]. However, long-running projects such as MaMaSe[39] in the Mau Mara Serengeti watershed, which have also used a CFA model, have shown weaknesses in the approach and question the efficiency, democracy and representativeness of these structures.

The KACCAL[40] and Trocaire (UKAM)[41] programmes show that capital and labour intensive technologies for climate change adaption/climate agriculture are implemented well when farmers work together in groups, labour is provided as 'group labour'[42] with either moral support and or in some situations cash incentives (cash for work; food for work) support by stakeholders (e.g. government, NGOs, community organisations, and extension researchers), with mechanisms to ensure continued maintenance of conservation structures (e.g. bunding, terraces) built into community works and or encouraged by local leaders. Some technologies for climate change adaptation are beyond the capacity of beneficiaries to implement as individuals, such as soil and water conservation structures. Not all climate change adaptation measures (climate smart agriculture) yield immediate returns e.g. tree planting. Trees take time to grow before results are realised. However, if farmers understand and see demonstrations of the long- and short-term costs and benefits of climate smart agriculture and different cropping/farming systems e.g. agroforestry, adaption and mitigation measures are more likely to be taken up. Farm level innovations on climate change

[36] Forest guardians and nature's nurseries on Mount Kenya (https://news.globallandscapesforum.org/53638/forest-guardians-and-natures-nurseries-on-mount-kenya/)

[37] Koech et al., 2009. Community Forest Associations in Kenya: challenges and opportunities. (https://www.fornis.net/sites/default/files/documents/Community%20Forest%20Associations%20in%20Kenya%20challenges%20and%20oppo-205_0.pdf)

[38] Community Forest Association Development & Financing Cycle Framework Launched, Kenya Forest Service 2017. (http://www.kenyaforestservice.org/index.php?option=com_content&view=article&id=594:community-forest-association-development-financing-cycle-framework-launched-by-michael-muratha&catid=81&Itemid=538).

[39] Mau Mara Serengeti (MaMaSe) Sustainable Water Initiative | IHE Delft Institute for Water Education (https://www.un-ihe.org/projects/mau-mara-serengeti-mamase-sustainable-water-initiative)

[40] Adaptation to climate change in Arid lands (KACCAL). (https://www.thegef.org/project/adaptation-climate-change-arid-lands-kaccal)

[41] UK Aid – Trócaire (https://www.trocaire.org)

[42] Members of a group provide pool labour to undertake labour-intensive practices in members farm e.g. terracing with weak members assigned light duties during the group work.

technologies generally exist that have not been fully documented at farm level e.g. some forms of micro-catchment adaptations by farmers in dry areas.

UKAM showed that in 60-70% of households, spouses often work together and women often participate in decision making regarding farming activities, even if they do not make the final decision. Most farm households are controlled by male household heads who may not be physically present on the farm all times. In such situations, women spouses may not be able to make decisions on long-term farm investments without the approval of the male household head. Using participatory techniques to understand the impact pathways and gendered impacts of a programme, can mean that interventions can be better designed to deliver positive impacts for both men and women.

Lessons from other RA projects implemented in the area

Measurement and attribution of off-farm impacts is difficult RA's experiences with tea certification in the Upper Tana River Basin[43] and in the programme proposal, highlight that role of certification in achieving sustainability outcomes is not limited to the farm-level. However, it can be difficult to measure and map the aggregate impacts of certification since adoption often varies and landscapes are complex. The RA tea impact study shows how cumulative impacts of certification can be quantified at the landscape scale using ecosystem service modelling, and the influence on water quality in Kenya's Tana River watershed, with implications for downstream hydropower and drinking water infrastructure.

RA's project on Renewable Energy[44] (also financed by IKEA Foundation) is ongoing so impacts are not yet reported, but potentially can have important lessons for the landscape in terms of introducing energy-efficient cookstoves to farmers and entrepreneurs, access to financing to purchase these stoves; centres that make no-smoke briquettes out of forestry and agricultural waste that provide safe fuel to families, and employment opportunities.

Rainforest Alliance Community Honouree Awards[45] and using lead farmers highlight the positive role of farmer-to-farmer learning and demonstration of (new) Good Agricultural Practices (GAPs), especially for women, which can be replicated and probably scaled up more in this landscape project.

As agriculture and ecosystem services are expected to be strongly affected by climate change in Mt. Kenya, the use of and lessons from employing the Climate Smart tool[46] in the tea growing area of Kericho[47] is relevant. This tool assess climate-smart landscape needs and opportunities in key activity domains, could be well applied to Mt. Kenya.

Lessons from landscape approaches or similar fora, if activities already commenced in project location;

Lessons from landscape approaches in landscape area include that:

New institutional structures such as LMBs create both advantages and disadvantages: Even a decade is a short timescale to set up effective and functioning new governance structures e.g. catchment protection, watershed bodies, community forestry committees[39].

A power analysis has been conducted in the stakeholder analysis (Chapter 4) and needs to be considered closely during the process of putting together the LMBs – as existing governance structures may reinforce existing inequalities and the exclusion of certain groups in land and resource use decision making.

[43] Aggregate effects on Ecosystem Services from Certification of Tea Farming in the Upper Tana River Basin, Kenya. Rainforest Alliance (https://www.rainforest-alliance.org/resource-item/effects-on-ecosystem-services-from-tea-farm-certification-in-tana-river-basin-kenya-impact-study/)

[44] Kenyan Tea Farmers Switch to Renewable Energy. Rainforest Alliance (https://www.rainforest-alliance.org/in-the-field/kenyan-tea-farmers-switch-to-renewable-energy/)

[45] Kenyan Coffee Farmer Shows Sustainability and Prosperity Go Hand-In-Hand. Rainforest Alliance (https://www.rainforest-alliance.org/in-the-field/kenyan-coffee-farmer-shows-sustainability-and-prosperity-go-hand-in-hand/)

[46] Operationalizing Climate-Smart Tea Landscapes in Kericho, Kenya | Rainforest Alliance (https://www.rainforest-alliance.org/resource-item/climate-smart-agricultural-landscapes-kenya-impact-study/)

[47] Operationalizing climate smart-agricultural landscapes: the case of a tea-producing landscape in Kericho, Kenya. (https://www.rainforest-alliance.org/wp-content/uploads/2021/07/climate-smart-agriculture-Kericho-Kenya-1.pdf)

Certified nurseries are limited, and farmers buy fruit tree and other tree seedlings along the roadside. Establishing nurseries with selectively breeding, climate proof varieties and gaining certification status can provide good quality seedlings for planting in degraded lands and/or for fruit production. Multipurpose species should be prioritised. Training and provisions of information by nurseries to support and inform farmers and their groups and collective organisations on the selection of approaches trees for specific uses, altitudes and soil conditions and post-planting care should be provided as part of nursery establishment.

Gender issues need attention to ensure implementing GAP does not unduly burden women. Soil conservation structures are labour intensive. Using a group approach and labour gangs (e.g. youths trained in soil conservation and supplied with appropriate tools and equipment – for example on a credit or credit basis) in which women also participate, helps to address such labour constraints. To address gender issues effectively in the programme, it is necessary to understand the typology of the beneficiaries and contemporary gender dynamics.

Divergent options exist on youth participation in agriculture. While on one hand, youth often do not own land, for those who would like to participate in agricultural value chains, it appears that:

- When given land, parents force them to grow crops that they are not interested in;
- Youths often lease out land when given and are not interested in labour intensive activities;
- Youth are interested in activities that give quick returns;
- Youths often have inadequate skills and lack credit;
- Youths do participate in enterprises that do not necessarily require large tracks of land and or in value addition activities;
- Youths who have received agricultural or business education and have access to finance, can be innovators in implementing new farming models, providing role models for other youths.

Functioning, financing and representativeness of existing community-based CF and WRUA structures needs a critical review. The MaMaSe Mau Mara Serengeti watershed project[39] which used a CFA model, and a recent study (Wambua et al. 2021) has shown weaknesses in the CFA and WRUA approach and question the efficiency, democracy and representativeness of some structures, and highlight the challenges they face such as the structures not being functional and lacking soft skills, also not performing well, associated with high and continued degradation. The programme needs to either take account of such weaknesses, but also their strengths and could address some of the challenges facing CFA and WRUA sustainability and institutional empowerment.

RA's role needs to be ongoing and critically reviewed and transparent for stakeholders. Questions need to be asked and answered during the LMB set up process to ensure transparency, as a precursors of trust and collaboration, such as:

- Who is really leading the integrated, sustainable Landscape approach process?
- If RA stops leading this, who else can/should lead/coordinate and why?
- What role does RA have with the government and would a different role help implement the landscape approach?

Taking different stakeholder perspectives and interests in alternative and competing crops and land uses is important. Given that RA and many partners focus on the 'traditional' cash crops of tea and coffee, the drivers and impacts of farmers switching to 'newer' crops such as avocado and macadamia need to be evaluated from both farmer, socio-economic and ecological impacts at farm scale and landscape scale, as well as the macro level and market impacts, such as how different cropping patterns influencing short and longer term demand and prices.

Transparency about RA/IKEA roles and exit strategy upfront. The team's experiences indicate that programmes with clear entry, implementation and exit plans that have transparency to their beneficiaries, in terms of information sharing throughout the programme cycle, appear to succeed and have lasting impacts. Beneficiaries often expect immediate results unless told otherwise, and thus programmes should not skip or underestimate the need for lengthy beneficiary sensitisation on what the programme will do, when and what it will not do, and when results and outcomes can be expected.

From a review of experiences[48, 49, 50] with management boards (LMBs) (also known as governance, coordination, co-management or advisory boards, committees, platforms or groups) and literature[51, 52] on longer running multi-stakeholder landscape approaches, lessons learned and practical advice on setting up an and operating an LMB include:

1. *Clear remit for the LMB*; LMBs are responsible for facilitating the management of landscapes as a space where public, private, and civil society actors can discuss their respective agendas, and collaboratively identify options to balance the various interests that exist in a landscape in partnership with key stakeholders. The LMB should be responsible for integrating the management of different resources and sectors, exploring and linking with initiatives outside the landscape (e.g. relevant global initiatives);
2. *LMBs should steer to and ensure a common agenda;* Failure to develop a common agenda, and effectively engage different stakeholders is the main cause of poor performance of landscape approaches;
3. *LMBs initial focus should be on building capacity and trust first; C*onsider carefully whether these necessary conditions for effective and inclusive multi-stakeholder processes are in place among actors;
4. *Legal status of LMB; F*ormalise with an appropriate (and easy to achieve) legal status;
5. *How members and chair are selected can change over time;* Members may start by being appointed by a government or other actor, and then later be elected by the community (except where it is determined special circumstances apply). The convening organisation or initiator is not necessarily the best Board chairperson;
6. *Develop simple and accessible five-year landscape plans with a few (e.g. five) priorities;* The simple plans ensure a balance between the needs of communities, other stakeholders and sustainable management of the resources and the environment;
7. *Make local, indigenous perspectives explicit as well as local terms, interests and values to encourage recognition for buying-in ownership; F*or example in Adelaide, the Aboriginal perspective of landscape management is commonly known as 'caring for country' an integrated and holistic approach;
8. *Select members with different roles/skills/experiences;* Include members with respect to implementation, replication or scaling (e.g. Olam, Cocobod and government authorities in the Juabosa-Bia landscape), connection and coordination with other levels of policy and government processes and agencies;
9. *Transparency on LMB functions and communication on positive and negative results;* For instance, a website and other media explaining LMB members and roles, aims and regular reporting on results, both positive and remaining challenges;
10. *LMBs have a key coordinating role across sectoral levels and actors;* Horizontal coordination across sectors and jurisdictions, Vertical coordination among levels, Connectivity to national and international developments, and coordination of customary and formal governance processes. Make these roles formal and specific among LMB members, for example, as performance indicators and reporting;
11. *Use performance indicators for the landscape processes and LMB;* See Guidelines for Assessing Landscape Governance A Participatory Approach.[52] Indicators are ideally determined with stakeholders in the LMB further stimulating agreement and ownership on the LMB focus and purpose;
12. *Clarity about goals and expectations;* Multi-stakeholder processes have high opportunity and transaction costs for all involved and stakeholders. They are more likely to engage if they expect that the long-term rewards will outweigh the costs, monetary or otherwise;
13. *Consider the limits new arrangements/institutions;* New LMBs where landscape actors can meet on a regular basis can raise complex questions

[48] Green Adelaide, Australia https://www.environment.sa.gov.au/about-us/boards-and-committees/landscape-boards and other LMBs in Ausralia https://nrmregionsaustralia.com.au/lclb/

[49] Juaboso-Bia Landscape Management Board, Ghana https://www.equatorinitiative.org/2020/04/24/solution11004/
Sewfi Landscape management Baord, Ghana https://twitter.com/sefwilmb?lang=en
Naivasha Management Board

[50] https://worldagroforestry.org/sites/default/files/Public%20Policy%20Dialogue%20for%20Integrated%20Landscape%20Management%20in%20Kenya.pdf

[51] Kusters et al 2020 Inclusive Landscape Governance for Sustainable Development: Assessment Methodology and Lessons for Civil Society Organizations https://www.mdpi.com/2073-445X/9/4/128/pdf

[52] de Graaf et al 2017 Assessing Landscape Governance A Participatory Approach. https://www.tropenbos.org/resources/publications/guidelines:+assessing+landscape+governance+%E2%80%93+a+participatory+approach

concerning participation (who is invited? who shows up?) and representation (who represents who? are representatives accountable?). There is a risk that the institutional arrangement becomes a goal in itself—a box-ticking exercise to satisfy funder demands;

14. *Institutional embeddedness of LMBs;* To ensure that arrangements continue operating after donor support ends requires firm embeddedness with an institutional host and continued facilitation. Build on what is already there, strengthening existing forms of collaboration and coordination in the landscape. This ensures embeddedness and local ownership. Emphasis should be on increasing the possibilities for local stakeholders to take a role in ongoing governance processes, by building trust and capacity, including understanding of governance processes. This demands a flexible and adaptive role of the LMB, which is harder to plan for, and does not fit in well with more rigid project cycles;
15. *LMB meeting logistics; S*pecific and detailed guidelines on how to organise and conduct meetings, frequency, modes of steering discussions etc for LMBs specifically do not seem to exist. This is perhaps because this is so culturally and context-specific. Although the Australian LMB websites offers[48] a lot of data and are most advanced, the context is not directly transferable to Kenya. Experiences with similar, long-running multi-stakeholder projects in Kenya such as community forest and water rural catchment committees,[53] suggest that issues such as financing, institutional arrangements and capacity are just as important for the long-term success of landscape focused, multi-stakeholder partnerships.

Local, national or global lessons learned from RAs past challenges and failures?

Lessons include:

- More investments in human resource development, capacity building and extension technologies. An evaluation of Farmer Field Schools (FFS) in Kenya,[54] which were used to promote good agricultural practices in tea indicated that maintaining the certification and FFS systems with improvements was the best option for up-scaling FFS and RA certification. These improvements concerned increasing resources, improving communication, training and educating non-FFS members using different methods. Up-scaling training for certification and FFS need additional investments and eventually are foreseen to alter KTDA's cost and revenue model of the sustainable tea production. The true costs and benefits of sustainable tea need to thus be incorporated in the KTDA business model, which implies that both donors (such as Ikea Foundation) and other commodity buyers/transformers change from subsidising costs to strategic investments in human resource development, capacity building and extension technologies.
- Certification alongside platforms, training, risk assessment and weather information can work as scaling mechanisms for climate smart agriculture in coffee and cocoa (Climate Smart Coffee and Cocoa Value Chain Project (CSVC).[55]
- Rainforest Alliance Tea certification has been perceived of as tokenism (Ochieng et al. 2013). While certification was found to bring some important social and environmental benefits to certified tea farms (improved work conditions and to a limited extent, natural resource conservation), the lack of differences between certified and non-certified farms on aspects such as access to health services and employee living conditions indicate more efforts are needed to achieve sustainability on certified farms and that certified farmers should earn sufficient benefits to justify their changed practices.

[53] WRUA institutional governance & integrity training module https://ceowatermandate.org/wp-content/uploads/2019/02/WRUA_Institutional_Governance_and_Integrity_training_module_interactive.pdf and Integrated water Resources Assessment in East Africa https://www.gwp.org/globalassets/global/toolbox/publications/technical-focus-papers/p1238_gwp_tfp_ea_121015_web.pdf

[54] Up-scaling farmer field schools and rainforest alliance certification among smallholders tea producers in Kenya: options, opportunities and emerging lessons. (https://scientiasocialis.lt/pec/node/files/pdf/vol43/141-158.Wambugu-Maina_Vol.43.pdf)

[55] Scaling climate-smart coffee and cocoa (https://cgspace.cgiar.org/bitstream/handle/10568/100190/Rainforest_Alliance_P57_outcome%204.pdf?sequence=3)

8.4 What similar initiatives did not work well in the past, and how can this investment build on workable solutions from successful projects.

Key lessons from similar types of landscape level approaches for this programme are that:

- Acknowledging indigenous and local knowledge can facilitate collaboration (Adade Williams et al. 2020) – especially given the ethnic diversity in the area and local knowledge. At the moment this is only weakly made explicit in RA's project proposal and the LMB process.
- The target outcomes of the landscape approach need to be iterated by all stakeholders – as the moment these appear (in the project proposal) to originate from RA and thus do not confirm with current thinking (Reed et al. 2016; Adeyanju et al. 2021)) on the ownership that is needed for a landscape approach to work.
- The processes in LMB formation & and checks and balances by stakeholders (particularly on inclusion) during the set up and operation of the LMB can be more explicit
- Power analysis is very important if communities are really to be involved in the approach- lessons from other projects and countries indicate that inclusive, equitable multi-actor collaboration and sustainability are key but that in practice, donors, government agencies, NGOs and community elites often control decision-making. Ongoing collaboration across actors and scales requires long-term support and engagement – thus a longer timescale for intervention maybe needed (at least 10 years) and that learning and documenting processes is needed for adaptive management.


9

9 Discussion and recommendations

From research questions to implication for the different impact pathways. To support the implementation of the Sustainable Landscape and Livelihoods Programme, Wageningen University & Research and ETC Consulting conducted a Situation Analysis and set the baseline for an Impact evaluation. Several interconnected questions guided this research (see Chapter 1) related to stakeholders and the landscape(s) they are connected to; different impact pathways to improved land and water management including enablers and barriers; and indicators required to capture progress and impact. The preceding chapters give detailed implications for future programme design for each impact pathway. This chapter summarises these implications and provides recommendations for the overall design and evaluation of the proposed landscape approach.[56]

Key recommendations on scope, management and evaluation of the Sustainable Landscape and Livelihoods Programme. Reflecting on, and integrating, the findings presented in the previous chapter we summarise the implications for programme design from the separate chapters into three key recommendations: defining the **scope** and boundaries of the landscape programme more clearly in the design (9.1); addressing tensions and trade-offs in the **management** of the programme for a diverse set of actors (9.2); and setting additional targets and indicators for effective **evaluation** of the programme (Section 9.3).

9.1 Defining the scope of the landscape approach

Boundaries of the landscape approach and planned intervention need to be more clearly defined (All chapters). A landscape approach aims to mobilise various actors, including policy-makers, financial institutions, smallholder farmers as well as local cooperatives and associations, in order to work towards a common goal of more sustainable landscape management. It is therefore essential that the precise scope of the landscape approach and associated interventions are set, not only in geographical terms, but also with respect to the actors or actor groups targeted. In the current programme design this is not entirely clear: this report aims to contribute to such decisions. Our findings imply a clearer specification of the 1) key environmental pressures that the programme envisages to target; 2) mapping the specific geographical regions and ecosystems (e.g. water catchments, farm lands, forested areas etc) in which the programme intends to address these pressures; and 3) all relevant actors that are impacted by, or can impact, changes in these environmental pressures. The findings presented in this report need to be carefully reflected on. Doing so sets the boundaries within the landscape approach to develop or align joint activities, generate engagement and motivation for a long-term and sustainable strategy.

Build greater understanding based on the situational analysis of where a landscape approach has added value over alternatives (All chapters). Setting boundaries more clearly, should be informed by the key environmental pressures present in the three counties, as well as the key institutional or policy limitations that currently hinder any change with respect to the former. In other words, this defines the scope in which a landscape approach has an added value over other types of interventions. In general, a landscape approach adds value to addressing issues that surround the supply of public environmental goods, such as guaranteeing a clean and stable water supply or the management of biodiversity, forest or soil resources, whereby the incentives of individual actors for managing these resources do not lead to an optimal social and environmental outcome.

Important for the scope of the programme is to include interventions that target securing clean and stable water supply (Chapter 3). The data from the

[56] Annex 1, Table 12 and Table 13 includes an overview of the elements specified in the ToR for the Situational Analysis, and in which chapters of this report these are discussed.

SA suggest that due to an increasing population in Mt. Kenya landscape there is an increase in water demand for irrigation, domestic and commercial use leading to over abstraction during dry periods, increased degradation of water catchment areas and riparian areas (encroachment), pollution of water bodies from agrochemicals use in farmlands and siltation of rivers/wetlands attributed to poor farming methods. Moreover, the negative impacts of climate change are being felt, with changes in rainfall patterns, frequency and amounts. The programme provides options to address some of these challenges in a landscape approach by incentivizing restoration of degraded lands, managing over-abstraction of water by strengthening the Water Resource users Associations, and promote rain-water harvesting and reduce pollution of water bodies by working with relevant bodies (County Department of Agriculture, environment and natural resources and Public Health; National Environment Management Authority e.g. in reducing water pollution emanating from poor sewerage systems; Water Resources Authority e.g. for Water management Action Plan etc). To enhance water quality, options exist for support on IPM practices and reduced pesticide use through relevant County Departments and County stakeholders in the agricultural sector (e.g. Certification agencies, Civil Society and the Private Sector). Finally, by working with downstream water users (e.g. hydropower generators) conservation strategies of water catchments areas can be developed.

Important for the scope of the programme is to include interventions that target forest and soil conservation (Chapter 3 and 7). The SA reveals encroachment into forest areas; deforestation; as well as encroachment in riverine areas and wetlands. The review indicated that the land cover of cultivated land and built-up areas increased while that that of forests and shrublands decreased between year 2000-2020 for Kirinyaga County. The decrease in forest cover by 2.5% (% area change) in Kirinyaga is corroborated by Global Forest Watch citing a 2.6% decrease in tree cover from 2001 to 2020. Similarly in Embu and Nyeri there was a decrease by 1.2% and 3.4% respectively (Global Forest Watch). Soil conditions are increasingly becoming a major concern with declining soil fertility and increasing acidification reported in different parts. In addition, diverse threats to biodiversity exist, including wildlife poaching, wildfires and habitat loss due to deforestation resulting from illegal logging and overgrazing. Climate change, in turn, aggravates some of these challenges also since it affects the agricultural production potential, not only for tea and other crops but also other crops with which farmers could diversify.

Important for the scope of the programme is to include interventions that improve farmer and household resilience and income (Chapter 7). There is a high incidence of poverty in the three counties, and few options for significantly improving household incomes from farming, as farm sizes are small. As income and resilience are a precondition for environmental conservation it is important to address how to significantly improve incomes for the targeted households. This includes looking beyond the agricultural sectors for income earning possibilities, especially for youth. Another aspect is the reward farmers receive for environmental conservation. Until date, such rewards are limited financially, and often only received as in-kind support. A financial model should be found that incentivises stakeholders for environmental conservation, such as international buyers with environmental targets or downstream stakeholders financing water conservation practices by farmers upstream.

A fragmented and sometimes ineffective policy environment aggravates these environmental trends (Chapter 4 and 7). Enforcement of regulations regarding environmental protection is a challenge. Awareness amongst communities on environmental or water management policies and regulations is generally inadequate. At the same time, enforcement of policies by authorities is inadequate. The latter further being aggravated by unharmonised statutes in some instances. For instance, different and partially overlapping national policies regulating land use exist. These factors together serve to explain why environment degradation continues, even though legislation exists on paper. The programme may consider addressing and narrowing this gap with local public and private stakeholders.

A collective problem statement on current and future landscape use needed to define the scope and boundaries of the approach more clearly (Chapter 5 and 8). Landscape and conservation activities targeting soil quality and riparian ecosystems, including a stable and safe water supply, have a potential to improve economic conditions at targeted households. However, it is essential that a considerable group of actors share this view. Such a shared problem statement has not (yet) become apparent from the data presented in this report, most of the conservation activities being driven by large, donor funded,

top-down projects. But it is a prerequisite for a successful design of the programme in terms of scope. If conservation activities are not seen to result in (short term) economic benefits and rather incur short term costs, then the risk of non-acceptance due to trade-offs of conservation and livelihood indicators is high.

9.2 Managing the landscape approach effectively

More clearly identifying the role of RA in the landscape approach (Chapter 5 and 8). After more clearly defining the scope and boundaries of the landscape approach, relevant actors can be engaged in specific programme activities and the LMBs. A successful landscape approach first recognises and incorporates the challenges faced by specific groups of actors, including youth and women farmers, as well as vulnerable and asset poor producers. This report provides a good starting point. However, setting up platforms with all relevant stakeholders is a delicate task. It requires strong diplomatic skills in balancing the interests of a group of various actors, with various sometimes conflicting objectives, often comprised of less powerful voices. The role of RA (other others who take a mediating and facilitating role) - in doing this should be clarified, as well as mechanisms to identify and resolve conflicts and grievances, and balance trade-offs and conflicts of interest.

9.2.1 Guiding a diverse set of actors with specific interests and incentives

The programme should offer real incentives for people in the short term to change their activities, but doing so requires a tailor-made approach, particularly so for the poorest and most vulnerable groups (Chapter 5, 7 and 8). Farmers' and household's personal and contextual factors should be addressed to enable behaviour change to occur. Such factors include accounting for differences between small and larger farmers as different types of opportunities for improvement exist for different types of farmers. For instance, the potential for farmers to invest in new coffee/tea practices or diversification, including risk, is likely to be considerably lower for the poorest and most vulnerable groups who need support the most. Different types of farmers are dispersed throughout the area. In addition, specific contextual factors apply to young people and women in the region (see below).

The programme should recognise that persistent challenges in coffee and tea value chains make large income gains from these crops unlikely (Chapter 7). Low farm-gate prices, small farm sizes, high seasonality of labour demand and (resulting) youth migration to urban areas make up for the challenges in raising production and productivity from coffee and tea production. Opportunities for coffee and tea diversification into high-end markets for these products may exist, potentially leading to significant income changes, but doing so at scale requires the creation of new market/supply chain linkages. Hence, the current conditions are such that even if incomes from crop production increase due to programme activities, it remains an open question whether or not such increases are sufficient to ensure the required significant increases in resilience for many of the farmers. In turn, many of the more realistic options to raise incomes lie outside of primary coffee and tea production. This should be addressed by the programme.

Proposed programme activities should assess the potential impact on labour allocation and productivity (Chapter 7). To guarantee long-term success of the programme, it should be understood how the proposed activities impact current household labour allocations, i.e., the time spent on different activities, and income for different people in the household. Could proposed activities result in lower labour productivity? If so, are such negative changes outweighed by gains in environmental benefits accruing to the household affected? Are these gains sufficient to compensate for reduced labour productivity, or are additional incentives (price premiums) required?

Take into account in programme design that the youth prefer engaging in activities that bring quick income (Chapter 7). This report reveals that many young people do not own land, and by consequence lack collateral for loans. Opportunities for young farmers to engage in primary production remain limited. Those few young farmers who are involved in agriculture often engage in new technologies or crops, for instance, high value horticultural value chains, others engage in production that require little land, including livestock farming. Moreover, or because of this, most young people explore opportunities outside of primary production. They engage in different types of agricultural employment than older generations, sometimes including more lucrative opportunities in agricultural processing and value chains. Even so, such off-farm and non-farm opportunities remain limited. The programme design, if it includes activities geared towards young people, should

acknowledge that the youth prefer to engage in activities that bring quick income and or lucrative nodes of agricultural value chains.

Explore employment creation opportunities for women that do not create adverse effects in terms of conflicting roles and safety (Chapter 7). Many women farmers lack or have limited access to resources, such as land and, by consequence, lack (access) finance to invest. Even though women have access in theory, the reality is different. Moreover, women lack time to spend on agricultural practices due to responsibility for various domestic chores. Women sometimes have limited autonomy when it comes to own income, and decision-making on how to spend it. These factors should be taken into account, in order to ensure women benefit from programme activities or the programme would not further imbalance the gender situation. The most promising avenues is to explore options for employment creation, taking into account possible adverse effects on their current task and roles, and their safety (e.g. when they have to travel).

Explore option to create non-farm and off-farm employment as well as crop diversification for raising incomes (Chapter 7). For many, non-farm and off-farm employment may, if available, offer the most realistic opportunities for improving household incomes significantly. Farm sizes are small and the realistic gains in income due to productivity enhancements are limited. Diversification into own food production, engaging into high-value alternative commodities (among others horticulture, avocado, macadamia), or off-farm employment allow households to better weather income fluctuations (for instance due to fluctuating coffee or tea prices) thereby enhancing their resilience. This is not only true for youth and women as mentioned above. Against this background the programme should explore options to create off-farm and non-farm employment opportunities around specific enterprises by facilitation linkages to financial institutions and non-financial services such as business development services (agribusiness, nature-based activities etc). In addition, options exist to expand agricultural production profitably into several non-tea and non-coffee crops. Such enterprises include avocado, macadamia, khat, dairy production as well as horticulture, on the premises that the calendar of these enterprises does not conflict with tea and coffee production.

Capitalise on the positive attitude towards green financing by linking to the design of financial products for sustainability management or conservation activities (Chapter 6). The banks operating in the region commonly provide loans to farmers to raise production in a number of key commodities, including coffee, tea, dairy, rice and horticulture. A majority of farmers in the baseline survey reported having access to such loans, in part by institutional design of the tea sector. Yet, many others report turning to digital lenders, with higher interest rates, due to stringent conditions for collateral of traditional banks. In addition, some forms of green financing exist, at some financial institutions more so than others, including products targeting green energy or climate-smart agriculture. Farmers and financial institutions have identified several conservation activities, like rehabilitation of riparian areas, that could attract additional investment, yet no specific financial product offerings currently exist for such purposes. There is, however, a general positive attitude towards green financing, among others for climate-smart agriculture and green energy, that the programme could capitalise on.

9.2.2 Managing tensions and resolving trade-offs

Address trade-offs between actors and outcomes to make the landscape approach successful (Chapter 4 and 5). Multi-level and interconnected stakeholders are present in the landscape each with unique, and sometimes similar interests. The stakeholders incentives for usage, sharing and managing of natural resources often differs and only rarely will all the incentives of all the actors be aligned. If the latter is to hold, the case for this project would not exist. Rather, trade-offs between outcomes, such as agricultural productivity or conservation, as well as between actors are the norm. Navigating such trade-offs is a central feature of using a landscape approach and identifying these at an early stage is essential for guaranteeing programme success. This section provides a number of key leads to follow-up.

Link options to improve income more clearly to benefits of improving landscape values (Chapter 6 and 7). As argued (preceding section) many of the more concrete options to raise incomes, for a considerable part of the rural population, rest with activities that are alternative to primary coffee and tea production, including alternative smallholder primary production (avocado, macadamia, poultry or pig farming), non-farm employment (potentially in coffee and tea value chains) or non-farm employment altogether. The data underlying this report revealed a plethora of potential programme activities, many outside the scope of coffee and tea production, that are illustrative of the

wide range of diversification strategies practiced by the rural population in target counties. Whether or not such activities contribute to the landscape goals set out in the project, at scale and how, needs to be defined in greater detail.

Identify business models to develop financial products for landscape conservation and identify trade-offs with other goals (Chapter 6). Several conservation activities that could potentially attract finance have been identified, including tree nurseries, tree planting or rehabilitation of riparian areas. Mobilising financial actors for designing actual products to support such activities remains challenging, but can be pursued based on the elements discussed in Chapter 6. It requires a the development of a business case linking conservation and enhanced ecosystem services to an actual income stream. In turn this requires a full understanding of activities' long-term economic benefits, and to whom these accrue and where. Such insight also gauges the best institutional set-up (smallholder groups, or newly set-up enterprises) through which to channel such loans for landscape conservation. In addition, the design should actively consider potential trade-offs. Currently, most finance is in the form of small loans aimed at the purchase of inputs for raising agricultural productivity. But enhancing landscape values may not always maximise agricultural output and financing conservation activities may render loans for enhancing agricultural productivity riskier. That is unless farmers can attract a price premium for coffee and tea produced in sustainably managed landscapes.

Learn from, and connect to, past or existing conservation projects in the region for the design of the landscape approach (Chapter 8). Even though experiences with conducting landscape approaches in the region has been limited, scope exist to learn from other conservation projects that operate(d) in the region. One, the Mt. Kenya project run by Nature Kenya mobilises communities, forest associations as well as the private sector to raise funds for conservation purposes. The latter included a Payment for Ecosystem Services (PES) scheme. A link to the Nairobi Water Fund, a mechanisms for financing land conservation upstream that has led to an increase of annual by 15% downstream, across priority watersheds during the dry season.

9.3 Assessing the potential success of the landscape approach

Additional indicators on landscape level governance to assess progress on a number of key outcomes are required (Chapter 8). Conducting a landscape approach is a means to achieve sustainable impact for smallholder farmers, by altering the systems by which common environmental resources are governed. The process of conducting landscape approach requires diligent and diplomatic skills in mobilising the interests of all relevant actors groups in the landscape, as well as navigating trade-offs that may arise between these actors and/or programme outcomes. In order to assess whether the programme is on track in delivering the overall goals, the setting of indicators and metrics that measure progress with respect to landscape governance is required- such as the use and identification of conflicts of interest, setting up and use of conflict resolution and grievance mechanisms, monitoring of agreements (see e.g. Sayer et al. 2015). Preferably the identification of useful and relevant metrics will be done with stakeholders, for example in the LMBs.

More refined impact indicators are required to capture changes in the finance impact pathway (Chapter 6). The current impact indicator capturing the percentage of farmers receiving credit is unlikely to capture the all relevant aspects of the finance impact pathway. Additional metrics should be included that assess creditworthiness, i.e. the share of farmers seeking credit but unable to obtain it (creditworthiness), as well as indicators that more clearly reflect the programmes ambition of mobilising finance for landscape and conservation purposes. Metrics should further determine the sources of loans as well as their key purposes. Finally, more detailed information about the portfolios of financial institutions could reveal more suitable partners in achieving the programmes ambitions.

Add targets for the impact evaluation to clarify level of ambition for indicators and metrics that currently lack this (Chapter 7). Various indicators in the list with 'Impact and Outcome Key Performance Indicators' presented in the Terms of Reference have targets that are to be developed. for example, there is no stated ambition with how much the resilience amongst smallholder farmers in programme is expected to be increased. A clear quantification of the level of ambition for the different output, outcome and impact indicators (i.e. a

targeted x% rise in resilience) is required to understand the impact achieved, also as a function of the amount of resources spent in order to compare it with other types of interventions. Ex-post, reference to a quantified level of ambition allows for better evaluation of why the intervention proved to fare better or worse than expected.

Conflict of interest should be evaluated – now and in the future (Chapter 4, 5 and 8). Identify possible conflicts of interest that may arise in working with tea and coffee cooperatives/associations and mills, as well as other stakeholders, including how to mitigate such conflict of interest. An example is that wet mills/tea factories may not favour a focus shift to other activities than coffee and tea, even if the wet mills are not in operation outside of harvest periods or tea factories process lower leaf volumes in the dry periods.

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Annexes

1. Extended methodology
2. Table with information on indicator values for the IE (survey)
3. Stakeholders consulted.
4. Finance indicators: a closer look

Wageningen Economic Research
P.O. Box 29703
2502 LS The Hague
The Netherlands
T +31 (0)70 335 83 30
E communications.ssg@wur.nl
wur.eu/economic-research

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