ANALYSIS OF EXISTING NATIONAL POLICIES, STRATEGIES AND PRACTICES ON AGROFORESTRY AND FOREST PROTECTION IN KENYAN COFFEE PRODUCTION

KENYA COFFEE PLATFORM

© 2023

A Publication of Kenya Coffee Platform

Consulting Firm:

Email: agrihortfarmsolutions@gmail.com
Cell Phone: +254 721552757

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ANAFE	African Network for Agroforestry Education
ASALs	Arid and Semi Arid Lands
ASTGS	Agriculture Sector Transformation and Growth Strategy
CABI	Centre for Agriculture and Biosciences International
CBD	Coffee Berry Disease
CCAFS	Climate Change Agriculture and Food Security
CIAT	International Center for Tropical Agriculture
CIFOR	Center for International Forestry Research
CLR	Coffee Leaf Rust
CRI	Coffee Research Institute
CSA	Climate Smart Agriculture
EMCA	Environmental Management and Co-ordination Act
ESP	Environmental Soldier Programme
FAO	Food and Agriculture Organization
FFSPAK	Farm Forestry Smallholder Producers' Association of Kenya
FOs	Farmers Organizations
GACSA	Global Alliance for Climate-Smart Agriculture
GCF	Green Climate Fund
GCP	Global Coffee Platform
GDP	Gross Domestic Product
GEF	Global Environment Facility
GESIP	Green Economy Strategy and Implementation Plan
GOK	Government of Kenya
ICC	International Coffee Council
ICIPE	International Centre of Insect Physiology and Ecology
ICO	International Coffee Organization
ICRAF	International Centre for Research in Agroforestry (World Agroforestry Centre)
ILRI	International Livestock Research Institute
ITC	International Trade Centre
KALRO	Kenya Agricultural and Livestock Research Organization
KCP	Kenya Coffee Platform
KEFRI	Kenya Forest Research Institute
KENAFF	Kenya National Farmers' Federation
KFS	Kenya Forest Services
KIRDI	Kenya Industrial Research and Development Institute
KTPA	Kisii Tree Planters Association
MoAL	Ministry of Agriculture and Livestock
MoEF	Ministry of Environment and Forestry

MTPs	Medium Term Plans
NCCAP	National Climate Change Action Plan
NEMA	Natonal Environment Management Authority
NGO	Non Governmental Organization
PELIS	Plantation Establishment and Livelihood Improvement Programme
R&D	Research and Development
RA	Rainforest Alliance
REDD++	Reducing Emissions from Deforestation and forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.
SCOFOA	South Coast Forest Owners Association
SDGs	Sustainable Development Goals
SWOT	Strengths, Weaknesses, Opportunities and Threats
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCD	Value Chain Development
WETPA	Western Tree Planters Association

DEFINITION OF KEY TERMS

- **Afforestation:** Establishment of a tree crop on an area where such trees are absent.

- **Agricultural plantations:** Tree stands in agricultural production systems, such as fruit tree plantations, oil palm plantations, olive orchards and agroforestry systems when crops are grown under tree cover. It includes all plantations of the relevant commodities other than wood. Agricultural plantations are excluded from the definition of 'forest'.

- **Agricultural use:** The use of land for the purpose of agriculture, including for agricultural plantations, and includes livestock and set-aside agricultural areas.

- **Agro-ecological zone:** A land resource mapping unit, defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use

- **Agroforestry systems:** Are multifunctional systems that can provide a wide range of economic, sociocultural, and environmental benefits.

- **Agroforestry:** A dynamic, ecologically based, natural resource management system that, through the integration of trees in farm- and rangeland, diversifies and sustains smallholder production for increased social, economic and environmental benefits.

- **Arboretum:** A botanical garden of trees.

- **Biodiversity conservation:** The protection, upliftment, and management of biodiversity in order to derive sustainable benefits for present and future generations.

- **Biodiversity:** The total diversity of all organisms and ecosystems at various spatial scales (from genes to entire biomass) which is integral to a healthy and stable environment.

- **Carbon sequestration:** The process of removing carbon from the atmosphere and depositing it in a reservoir, such as the soil or trees.

- **Climate action:** Stepped-up efforts to reduce greenhouse gas emissions and strengthen resilience and adaptive capacity to climate-induced impacts, including climate-related hazards in all countries; integrating climate change measures into national policies, strategies and planning; and improving education, awareness-raising and human and institutional capacity with respect to climate change mitigation, adaptation, impact reduction and early warning.

- **Climate change:** A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

- **Climate shock:** The realizations of highly unexpected events that cause welfare losses and encompasses i) unexpectedness, ii) size, iii) high damage due to concentration on persons with high vulnerability and low resilience; iv) exogenous in the source; and v) physical or psychological strain to one or more individuals due to that stress.

- **Climate Smart Agriculture:** Agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes greenhouse gases (mitigation), and enhances the achievement of national food security and development goals.

- **Climate variability:** The variations in the mean state of the climate at all spatial and temporal scales beyond that of individual weather events.

- **Deforestation:** The conversion of forest to another land use or the long-term reduction of tree canopy cover below the 10% threshold.

- **Deforestation-free products:** Products contain, have been fed with or have been made using, commodities that, were produced on land that has not been subject to deforestation after 31 December 2020. In case of relevant products that contain or have been made using wood, that the wood has been harvested from the forest without inducing forest degradation after 31 December 2020.

- **Degraded land:** A land that has lost some degree of its natural productivity due to human caused processes.

- **Ecological zone:** A zone or area with broad yet relatively homogeneous natural vegetation formations, similar (not necessarily identical) in physiognomy.

- **Ecosystem Services:** Ecological processes or functions that have monetary or non-monetary value to individuals or society at large resulting from their practice of agroforestry and/or other conservation practices.

- **Ecosystem:** A dynamic complex of plant, animal micro-organism communities and their non-living environment interacting as a functional unit.

- **Enhancement of forest carbon stocks:** Refers to efforts that increase forest carbon stocks through afforestation, enrichment planting or conservation of forests.

- **Farm Forestry:** The practice of managing trees on farms whether singly, in rows, lines, boundaries or in woodlots or private forests;

- **Financing mechanism:** The way in which a business, organization, or program receives the funding necessary for it to remain operational such as revenue collection, grants or donations, loans, fund-raising among others.

- **Food and nutrition security:** A state that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

- **Forest community:** A group of persons who have a traditional association with a forest for the purposes of livelihood, culture or religion;

- **Forest produce:** Includes bark, bat droppings, beeswax, canes, charcoal, creepers, earth, fibrewood, frankincense, fruit galls, grass, gum, honey, leaves, flower, limestone, moss, murram, myrrh, peat, plants, reeds, resin, rushes, rubber, sap, seeds, spices, stones, timber, trees, water, waxwithies and such other things as may be declared by the Ministry of Environment and Forests to be forest produce.

- **Forest:** Land spanning more than 0,5 hectares with trees higher than 5 metres and a canopy cover of more than 10%, or trees able to reach those thresholds in situ, excluding land that is predominantly under agricultural or urban land use.

- **Forest degradation:** Structural changes to forest cover, taking the form of the conversion of primary forests or naturally regenerating forests into plantation forests or into other wooded land and the conversion of primary forests into planted forests.

- **Forestland:** A tract of land, including its flora and fauna that is devoted to growing trees for the production of timber, wood and other forest products.

- **Forestry:** The science of establishing, tending and protecting forest and tree resources, and includes the processing and use of forests and tree products.

- **Greenhouse gases (GHGs):** The atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Less prevalent but very powerful greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6).

- **Gross Domestic Product:** The sum of gross value added by all resident producers in the economy plus any product taxes minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

- **Incentives:** With respect to agroforestry, incentives are policy instruments that increase the comparative advantage of agroforestry practices and thus stimulate investments in agroforestry.

- **Indigenous forest:** A forest which has come about by natural regeneration of trees primarily native to Kenya, and includes mangrove and bamboo forests.

- **Innovation:** In the context of agroforestry development, an idea, practice, or object that is perceived as new by an individual or other unit of adoption.

- **Land degradation:** An alteration to all aspects of the natural (or biophysical) environment by human actions, to the detriment of vegetation, soils, landforms and water (surface and subsurface, terrestrial land marine) and ecosystem.

- **Land Tenure:** The possession or holding of the many rights associated with each parcel of land.

- **Landscape:** A social-ecological system that consists of a mosaic of natural and/or human modified ecosystems, often with a characteristic configuration of topography, vegetation, land use, and settlements that is influenced by the ecological, historical, economic and cultural processes and activities of the area.

- **Livelihood:** The methods and means of making a living in the world. The concept revolves around resources such as land/property, crops, food, knowledge, finances, social relationships, and their interrelated connection with the political, economic, and socio-cultural characteristics

ix

- of an individual community. A livelihood consists of capabilities, assets, and activities that are required for living.

- **Monitoring and Evaluation:** The set of actions that provide information and evidence on where an initiative is at any given time (and over time) relative to planned activities, inputs, outputs, targets and outcomes.

- **Payment for Environmental Services:** An economic instrument designed to provide positive incentives to users of agricultural land and those involved in coastal or marine management purposely to encourage continued or improved provision of ecosystem services, which in turn, will benefit the whole society.

- **REDD+:** An international framework whose name stands for 'reducing emissions from deforestation and forest degradation, the conservation of forest carbon stocks, sustainable management of forests, and enhancement of forest carbon stocks.

- **Resilience:** The ability of a system and its component parts to anticipate, absorb, accommodate and/or recover from the effects of a hazardous event in a timely and efficient manner.

- **Social inclusion:** The process of improving the terms of participation in society, particularly for people who are disadvantaged, through enhancing opportunities, access to resources, voice and respect for rights.

- **Soil health:** Also referred to as soil quality, is the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals and humans.

- **Subsidy:** The direct or indirect payment to individuals or firms, usually in the form of a cash payment from the government or a targeted tax cut typically given to remove some type of burden on the public.

- **Tree tenure:** The right of owning and using trees. Components of tree tenure include the right to own and inherit trees, the right to plant trees, the right to use trees and the right to cut down and sell trees.

- **Value chain development:** Focuses on deliberate efforts to create and strengthen win-win relationships between two or more chain actors aiming to result in win-win outcomes that can sustain the relationships over time.

- **Vulnerability:** The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.

ACKNOWLEDGEMENTS

xi

XI   *Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production*

EXECUTIVE SUMMARY

Climate change is a real occurrence which has turned out to be a major impediment to sustainable agricultural production globally. The phenomenon have a range of positive and negative impacts in particularly in coffee production especially the Arabica coffee species which prefers cooler, high altitude areas with adequate rainfall. In Kenya, the rising temperatures are pushing coffee production into higher altitude areas, a scenario which may cause ecological conflict between coffee production and forestry. In this realization, the European Union which consumes 55% of Kenyan coffee have introduced new regulations dubbed the "EU regulations on deforestation-free products". These regulations seeks to ensure zero-deforestation during the supply chain of various agricultural products that are exported into the EU market including coffee. Failure to comply with these regulations may lead to loss of that market share which may have dire economic consequences to the coffee sector.

It is clearly understood that climate change is majorly caused by increased emissions of greenhouse gases (GHGs) in to the atmosphere and agricultural production and deforestation are among the major emitters of these gases. On the other hand, research has shown that the trees act as the major sinks of carbon which is the major component of GHGs. Therefore, any attempt to expand agricultural production should be supported by adequate tree and forest cover, which unfortunately is not the case in many agricultural countries including Kenya. In preparation to comply with the new EU regulations, there is need for the Kenyan Coffee Sector to ensure that there are adequate mechanisms in place to prevent deforestation and forest degradation in the coffee growing areas. In addition, it is important to promote other climate change mitigation measures including agroforestry and climate-smart agricultural practices in coffee production. The overall objective of this analysis study was to analyse the legislation and practices of forest protection in coffee areas with coffee expansion as well as analysis of existing national policies and practices on agroforestry in coffee production in Kenya.

Chapter one of this report contains the introductory statements of the key aspects covered in this report. It sets the stage with some background information on the role of agriculture in the global and Kenyan economy. It also highlights the economic importance of coffee as the second most traded commodity in the world (after oil) and one of the most important agricultural products in the world with an estimated global value of 19 billion US dollars. The chapter narrows down to the status of coffee production in Kenya highlighting the production dynamics, some of the production challenges and the effects of climate change on coffee production. The chapter takes a glance of the coffee producing areas in Kenya and briefly analyses the increasing risk of the shrinking of coffee growing areas due to climate change.

Chapter two undertakes the valuation of forests in Kenya highlighting the status of current tree and forest cover in the country and the economic importance of forests. The chapter also highlights the drivers of deforestation and forest degradation and illustrates the link between farming, climate change and deforestation. Forests are ranked among the high value national assets of significant economic, environmental, social and cultural importance. They provide foundational support to other economic sectors such as agriculture, energy, water, infrastructure, livestock, wildlife, and tourism. Kenya is reported as one of the least forested countries in Sub-Saharan Africa with a

current tree cover of 12.13% and forest cover of 8.83%. Most of these trees are found within the traditional, emerging and potential coffee growing counties and therefore are at the highest risk of deforestation through encroachment. Considering that deforestation and expansion of agricultural land are among the major drivers of climate change, afforestation and reforestation programs must continue in all areas including the ASAL areas. Such interventions will reduce the vulnerability of climate change and assist in reclaiming the degraded areas and restoring the production capacity of our farmlands.

Chapter three covers the analysis of forest protection policies, strategies and practices in Kenya. This chapter sought to identify the policy gaps, forest protection challenges and necessary areas of intervention in order to prevent deforestation and forest degradation in Kenya, particularly in the coffee growing areas with coffee expansion. The chapter provides in-depth analysis of climate change mitigation measures related to forest protection at global, regional and local context. A SWOT analysis of the regional and local legal and policy framework guiding climate change mitigation measures including forest protection was conducted. The chapter also provides a brief review of the new EU regulations on deforestation-free products. This analysis showed that deforestation drivers in Kenya are largely associated with poor governance, inefficient policy implementation, and poor livelihoods of the forest-dependent communities.

Chapter four evaluates the existing policies and projects on agroforestry in Kenyan coffee production. It was guided by the realization that although tree-based interventions in agricultural landscapes are recognized as viable and attractive options in addressing deforestation and land degradation, adoption of planned agroforestry systems in Kenyan farming systems is still low. This analysis sought to identify the policy gaps, agroforestry adoption challenges and necessary areas of intervention in order to promote agroforestry systems in Kenya. The analysis showed that weak polices, legislations, and enforcement, coupled with overlap of mandates, poor coordination and lack of collaboration between relevant institutions and stakeholders have contributed to low and ineffective adoption of agroforestry practices. The chapter proposes some strategic requirements for agroforestry adoption in Kenyan farming systems and goes ahead to specify the necessary intervention to promote coffee agroforestry. In addition, the key institutions and stakeholders that would effectively lead these interventions have been identified.

Chapter five evaluates the potential of agroforestry in the kenyan coffee sector. It analyses the suitability and the benefits of agroforestry in coffee production and identifies some tree species that are recommended in coffee agroforestry systems. Although coffee agroforestry may cause a significant decrease in coffee yields, due to shading and competition for some growth resources, the system has many benefits on production sustainability and coffee quality improvement. In addition, adoption of coffee agro-forestry systems results in extra benefits that are more important for the local livelihood needs, such as income generation from both the coffee and agroforestry trees. Of utmost importance is to understand the most appropriate and mutually beneficial agroforestry trees and to observe the appropriate ratio of agroforestry trees to coffee trees.

Chapter six presents the findings of a study that was conducted to assess the status of agroforestry, deforestation and adoption of CSA in selected Kenyan highlands with coffee expansion. The respondents were purposively sampled from the coffee farming highlands and based on their proximity to forests. A total of 213 farmers were interviewed. This study found that climate change remains a major constraint in coffee production and the most limiting effects include reduced rainfall, changes in production seasons, rising temperatures and changes in pest dynamics. Although the study found minimal or no deforestation activities in the coffee growing areas or in areas with coffee expansion, the risk was imminent as the search for suitable lands for coffee production continues. Mitigation actions should therefore be put in place to prevent deforestation and forest degradation in the coffee growing areas. The results further showed that majority of Kenyan coffee farmers have not effectively adopted agroforestry and other CSA practices, despite their good awareness of the same. Therefore, there is need to improve the technical efficiency in the adoption of these practices especially the adoption of agroforestry.

The last chapter is evidently not the least as it provides at a glance the take home message from the entire study proposes some strategic requirements for forest protection (reducing deforestation and forest degradation) and promotion of agroforestry adoption in the coffee growing areas. The take home message is that the climate change phenomenon is expected to worsen. This is because the growing world population continues to increase the worldwide demand for coffee and other agricultural commodities whose production pressure will result in increased emission of GHGs. This necessitates enhanced protection of deforestation and forest degradation in the coffee growing areas. In addition, there is need to urgently roll-out feasible strategies to enhance reforestation, afforestation and increased tree cover in the farm lands through agroforestry systems.

Karugu Macharia

Chairman, Kenya Coffee Platform

xiv

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

1

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND INFORMATION

Agricultural sector plays a crucial role in development, especially in low income countries both in terms of aggregate income and total labour force (KNBS, 2021). The sector which accounts for about 30 percent of the Gross Domestic Product (GDP) in most-low income countries is a main source of livelihood for about 70 percent of the world's rural poor and is critical in sustaining food systems especially food security (Takama et al., 2022). In Kenya, the agriculture sector remains the biggest contributor to Kenya's GDP, directly contributing about 33% and another 27% indirectly through linkages to agro-based industries and the service sector (GOK, 2018a). The sector employs more than 40% of the total population and about 70% of the rural population (GOK, 2018b). The sector contributes about 60% of the country's income through production of crops and animals. It accounts for over 65% of total exports and provides 60% of the total employment, 18% of which is formal (UNEP, 2015). The agriculture sector is mainly dominated by small-holder farmers who produce over 75% of the total agricultural products on small portions of land averaging 0.2–3 hectares (GOK, 2018a). The agricultural sector therefore contributes significantly to Kenya's food security, income generation, employment creation and poverty reduction.

1.2 ECONOMIC IMPORTANCE OF COFFEE

Coffee is one of the most important agricultural products in the world with an estimated global value of 19 billion US dollars with up to 25 million farming households globally accounting for 80 percent of world output (FAO, 2023). It is ranked as the second most traded commodity in the world after oil. Production is concentrated in developing countries, where coffee accounts for a sizeable share of export earnings and provides a key source of livelihood for households. In Kenya, coffee is the fourth leading foreign exchange earner after tourism, tea, and horticulture and contributes about 8% of the total agricultural output in the country (Wambua et al., 2021). Coffee can contribute to the achievement of the Sustainable Development Goals (SDGs) by generating income, creating rural employment and alleviating poverty (FAO, 2023). There are two cultivated species of economic importance, Arabica and Robusta coffee (Figure 1.1). Arabica coffee accounts for about 75% of the total world coffee production and the rest is mainly Robusta coffee. Arabica coffee is renowned for high quality beans but Robusta coffee produces relatively small beans of lower quality thus attracting approximately 30% the price of Arabica. However, it yields about 30% more than Arabica. The small-scale farmers, who constitute 99.63% of the total coffee farmers (Table 1.1), dominate the coffee farming community in Kenya, producing over 70% of the Kenyan coffee. Coffee farming therefore plays a major role in improving the economic livelihood of over 800,000 farmers and directly or indirectly supports over 6 million people in Kenya (Gichimu, 2020).

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

1

Figure 1.1: Arabica coffee tree (a) and Robusta coffee tree (b)

Table 1.1: Distribution of coffee holdings in Kenya

Farmer Category	Farm Size (Acres)	Number of Farmers	Share of Total Farmers
Small holders	< 5	800,000	99.63%
Small estates	5 - 20	2,400	0.30%
Medium estates	20 - 50	500	0.06%
Large estates	> 50	100	0.01%
Total number of coffee farmers	**≈120,000**	**803,000**	**100%**

Source: ICO (2019)

1.3 COFFEE PRODUCTION IN KENYA

Close to 100% (over 99%) of Kenyan coffee is of Arabica type with very little (less than 1%) Robusta coffee in the Western region in Siaya and near Mt. Elgon. Arabica coffee varieties are associated with high cup quality but are susceptible to the major coffee diseases in Kenya namely the Coffee Berry Disease (CBD) and Coffee Leaf Rust (CLR). The Kenyan coffee varieties comprise of three traditional varieties (SL28, SL34 and K7) and two improved varieties (Ruiru 11 and Batian). The traditional varieties were developed by the colonial government in the 1930s. They are high yielding cultivars with good cup quality but highly susceptible to CBD and CLR except the K7 which has a partial tolerance to the two diseases. They are also tall statured and relatively tolerant to moisture stress. On the other hand, the improved cultivars (Ruiru 11 and Batian) combines good quality with high yields and resistance to CBD and CLR hence can be grown in all coffee growing areas in Kenya but performs best in the Kenyan highlands with adequate rainfall. Although the Kenyan coffee production was almost at par with the neighbouring

Uganda and Ethiopia in the 1980s, it took a nosedive trajectory as the neighbouring competitors continued to improve (Figure 1.2). Arabica coffee is usually more affected by climate change than Robusta coffee because the former prefers cooler, high altitude areas with adequate rainfall while Robusta performs better in warmer areas at lower altitudes. With climate change effects becoming more severe in the current years, the Kenyan coffee sector appears to be less resilient in combating the climate change menace hence more affected than its competitors.
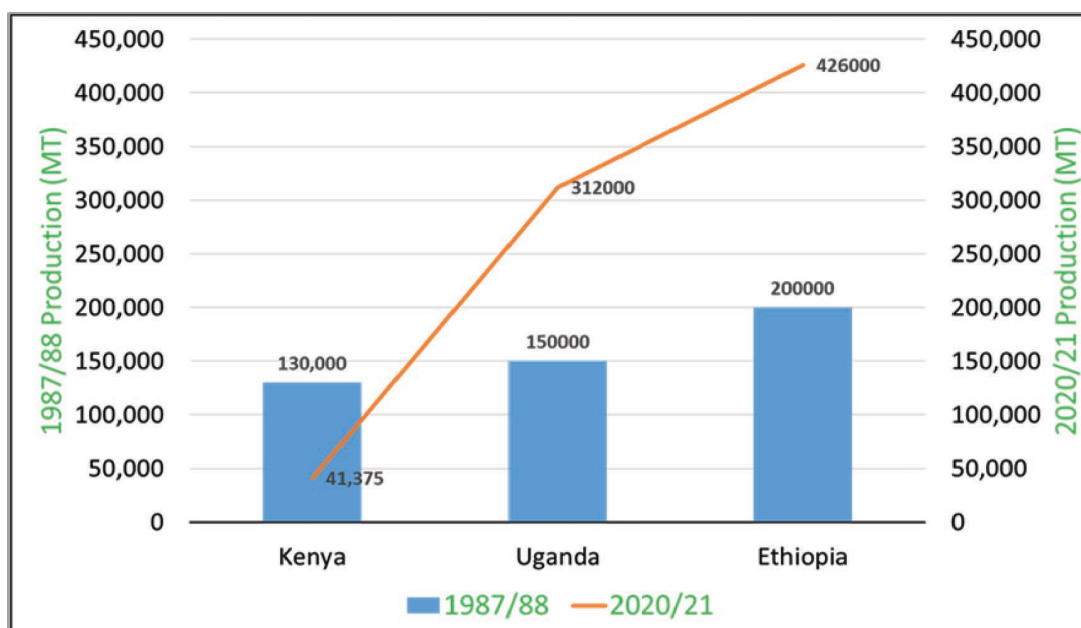
Figure 1.2: Coffee production in Kenya, Uganda & Ethiopia (1987/88 vs 2020/21).
NB: Kenya produces 99% Arabica; Uganda 82% Robusta; Ethiopia 80% Arabica.

1.4 EFFECTS OF CLIMATE CHANGE ON COFFEE PRODUCTION

In recent years, agricultural productivity in Kenya has been faced by a myriad of production challenges mainly associated to climate change. The term climate change is defined as change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer (ITC, 2010). The most important challenges regarding climate change on coffee production include the outbreak of coffee pests and diseases, reduction of coffee quality and loss of suitable land for coffee production (Kimemia, 2014). The reduction in coffee yield and quality have had direct impacts on the livelihoods of thousands of households whose economic wellbeing depends directly or indirectly on coffee production. Yield decline in Arabica coffee are virtually certain in a warming world because it is a montane species, not adapted to high temperatures (CCAFS, 2016). Recent evidence shows that climate change is having substantial impact on the areas suitable for cultivation of Arabica coffee in the major growing regions, including the East African Highlands (Haggar and Schepp, 2012). Reduction of suitable areas for coffee farming may lead to establishment of coffee plantations in new areas, which may have potential conflicts with other land covers including natural forest, with consequent implications to biodiversity and ecosystem services (Mcrae, 2016). The climate change related limitations are expected to become increasingly important in several coffee growing regions due to the increasing emission of major greenhouse gases such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).

Coffee plants are quite sensitive to changes in microclimate. The Kenyan Arabica coffee is grown on rich volcanic soils found in the highlands between 1400 to 2000 meters above sea level. The optimal temperature range for Arabica coffee is between 18°C and 21°C. High temperatures are known to disturb plant metabolism. Above 23°C, fruit development and ripening are accelerated, leading to loss of quality and below 18°C, growth is depressed (Mofatto et al, 2016). Temperatures of above 24°C decreases the net photosynthesis of coffee markedly, and at 34°C the photosynthesis is completely halted. This hinders the growth and development, ripening of cherries, and could result in yellowing and loss of leaves (ICC, 2009; Magrach and Ghazoul, 2015). Open-sun cultivated coffee provokes leaf exposure to high irradiance and absorption of much more energy than that usable by photosynthesis which result in energy overcharge and overheating of leaves (GACSA, 2015). High soil temperatures increase the rate of evaporation and organic matter breakdown leading to poor soil structure and increased susceptibility to erosion (Lin et al., 2008).

The optimum rainfall requirements for Arabica coffee are between 1500mm and 2000mm per annum (Mofatto et al, 2016) thus persistent drought is another major climatic limitation for coffee production. Increased drought and sunshine can induce the premature ripening of the beans, with sufficient yield and quality loss (Mofatto et al, 2016). Drought also affect the physiological activity of the coffee causing a reduction in photosynthesis processes (ICC, 2009). Water availability has been found to affect the maintenance of maximum photosynthetic rates, high fruit set levels, and fruit size. Heavy rains and hailstorms may interrupt coffee flowering, flooding and destroy the branches. The changes in rain seasons will cause major problems to coffee flowering, ripening and processing thus affecting both the coffee yields and quality. Sporadic rainfall results in random flowering with flowers and berries at different stages of growth being on the same branch (Figure 1.3). This complicates crop management and increases the cost of production as small quantities of coffee are harvested continuously throughout the year. Occurrence of frosts, even if sporadic, may strongly limit the economic success of the coffee (CIAT, 2013).

Figure 1.3: Coffee branches with flowers and berries at different stages and some with CBD infection

The other major climate change impact on coffee production is the outbreak of disease and insect pests and the aggressiveness of the existing pests. Incidences of pests and diseases result in decrease of coffee quality and viability of the product. The most significant coffee pests that are becoming more voracious and prevalent with climate change include the coffee berry borer (*Hypothenemus hampei*), Coffee Leaf Rust (*Hemileia vastatrix*) and some minor pests such as thrips and leaf miner are turning to be major pests. The minimum night temperature have risen by 1°C over the last 50 years leading to increased cloudiness in atmosphere and thereby increases in pest pressure. With rising temperatures, the area affected by the coffee berry borer has gradually increased to the plantations above 1,500m where it never used to occur (Lin et al., 2008). Coffee Leaf Rust (Figure 1.4a) which is favoured by high temperatures is becoming more rampant, even affecting coffee in high altitude areas (Lin et al., 2008). High rainfall coupled with very low temperatures are favouring the incidences of CBD (Figure 1.4b).
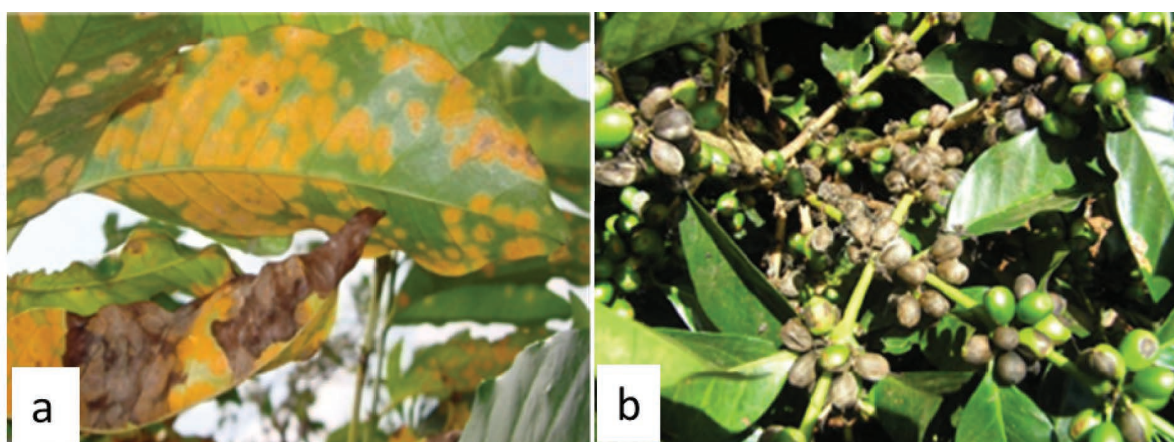
Figure 1.4: High manifestation of the CLR (a) and CBD (b) on coffee

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

5

Climate change is also causing the loss of suitable land for *Coffea arabica* cultivation. The rising of temperature is rendering certain production areas less suitable or even completely unsuitable for coffee growing. Therefore, coffee production may have to shift to higher altitudes and alternative crops will have to be identified to replace coffee (Jaramillo et al., 2011). Arabica coffee could lose 56% (± 7%) of the areas currently suitable for its cultivation in East Africa by 2050, with only a small gain of 9% (± 1%) of new suitable areas (Mcrae, 2016). A 3°C rise of temperature in this century, translates to the lower limit of coffee growing rising by 10 to 20 ft per year, (CCAFS, 2016). Climate change will therefore cause a major shift of coffee growing zones towards the higher altitudes (Lin et al., 2008) which may cause forest encroachment by the farmers. The phenomenon will also cause major changes in production patterns due to higher temperature and changing precipitation patterns.

The climate change related effects often lead to other economic challenges or losses including reduced quality and yields, failure to comply to volume requirements and standards, lack of quality contracts, high cost of production and disorganized marketing structures due to unpredictable seasonal variability (Sabari et al., 2020). The end-result is poor or ever fluctuating prices, which are a major disincentive to the farmers and a threat to economic sustainability of the coffee whose foundation is sustainable production. Consequently, the Kenyan coffee sector lacks vibrant supply chain that is anchored on environmental sustainability, social justice and economic prosperity of the farmer and other value chain actors. Being the majority, the small-scale and resource poor farmers are the most vulnerable to the effects of climate change. For example, most of the small-scale farming in Kenya is usually rain fed thus largely exposed to weather variability such as reduced rainfall, changes in rainfall patterns and rising temperatures. It is therefore important to promote climate change mitigation and adaption measures as well as environmental conservation strategies for enhanced agricultural productivity and sustainability in Kenya and the world at large. These strategies should be designed towards transforming the agricultural sector to be vibrant, productive, modern, low risk and lucrative in order to sustainably support the country's economic, social, and ecological development goals.

1.5 COFFEE PRODUCING AREAS IN KENYA

The main coffee growing areas in Kenya are found in three altitude zones: the low altitude (1200 M–1580 M above sea level); the medium altitude (between 1580 M and 1760 M above sea level); and the high altitude (over 1700 M above sea level) (Gichimu and Omondi, 2010). Coffee is grown in 32 Counties in Kenya (Figure 1.1). The main growing regions include; Kiambu, Kirinyaga, Nyeri, Muranga, Kericho, Bungoma, Embu, Meru, Nandi, Machakos, Kisii, Tharaka Nithi, Nyamira, Trans Nzoia and Nakuru. Others include Baringo, Uasin Gishu, Elgeyo Marakwet, Makueni, Narok, Migori, Kisumu, Bomet, West Pokot, Kakamega, Nairobi, Homa Bay, Laikipia, Kajiado, Busia, Vihiga and Siaya.
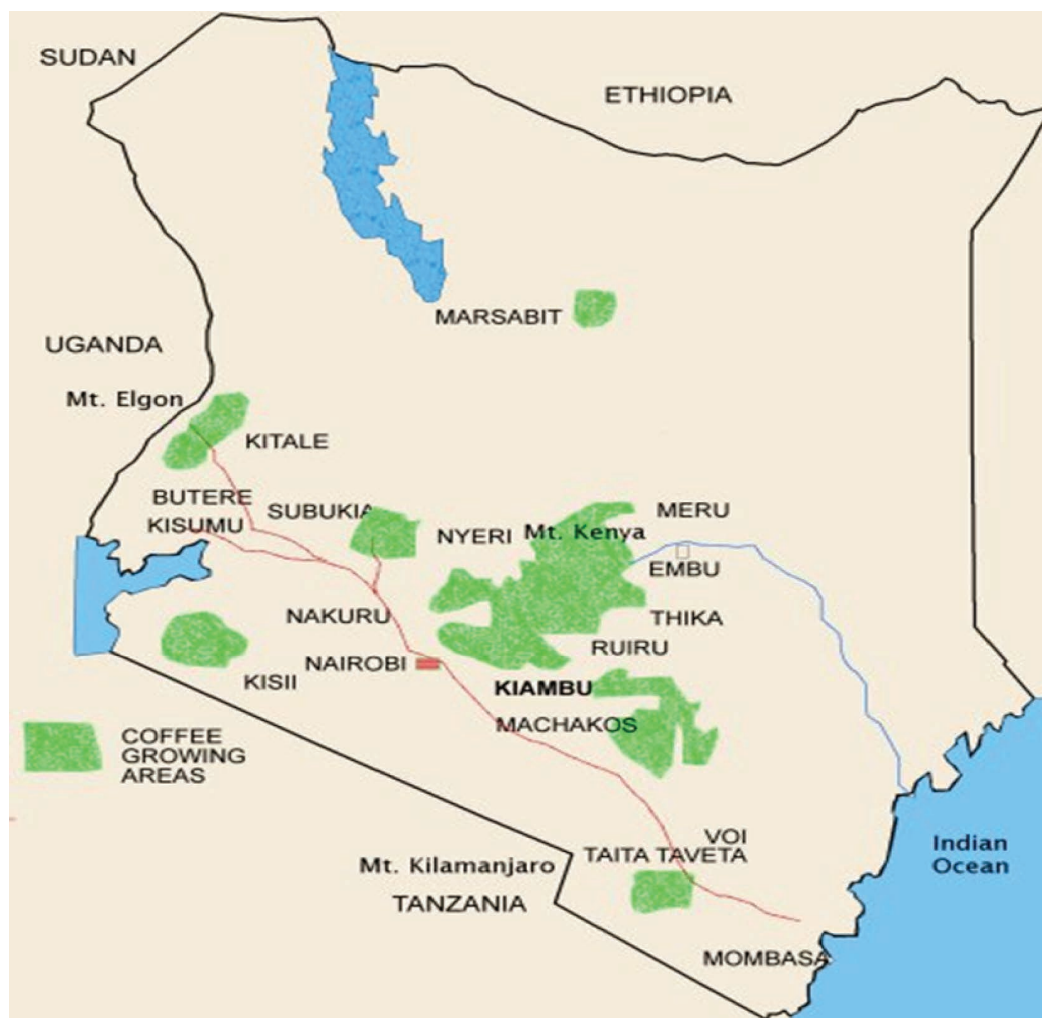
Figure 1.5: The coffee growing counties in Kenya

The total clean coffee production in the 2021/22 production season from all the above mentioned coffee growing counties amounted to 51,853 MT which was higher by 50.24% from the 2020/21 production season of 34,512 MT. This production is the highest ever in the past two decades comparable only to the period prior to liberalization when production soured above 50,000 MT. The co-operatives recorded a 59% (13,459 MT) increase while the estates sector recorded a 33% (3,882 MT) increase (Coffee Directorate, 2023). The proportionate contribution of coffee production by counties is presented in Figure 1.2.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

7
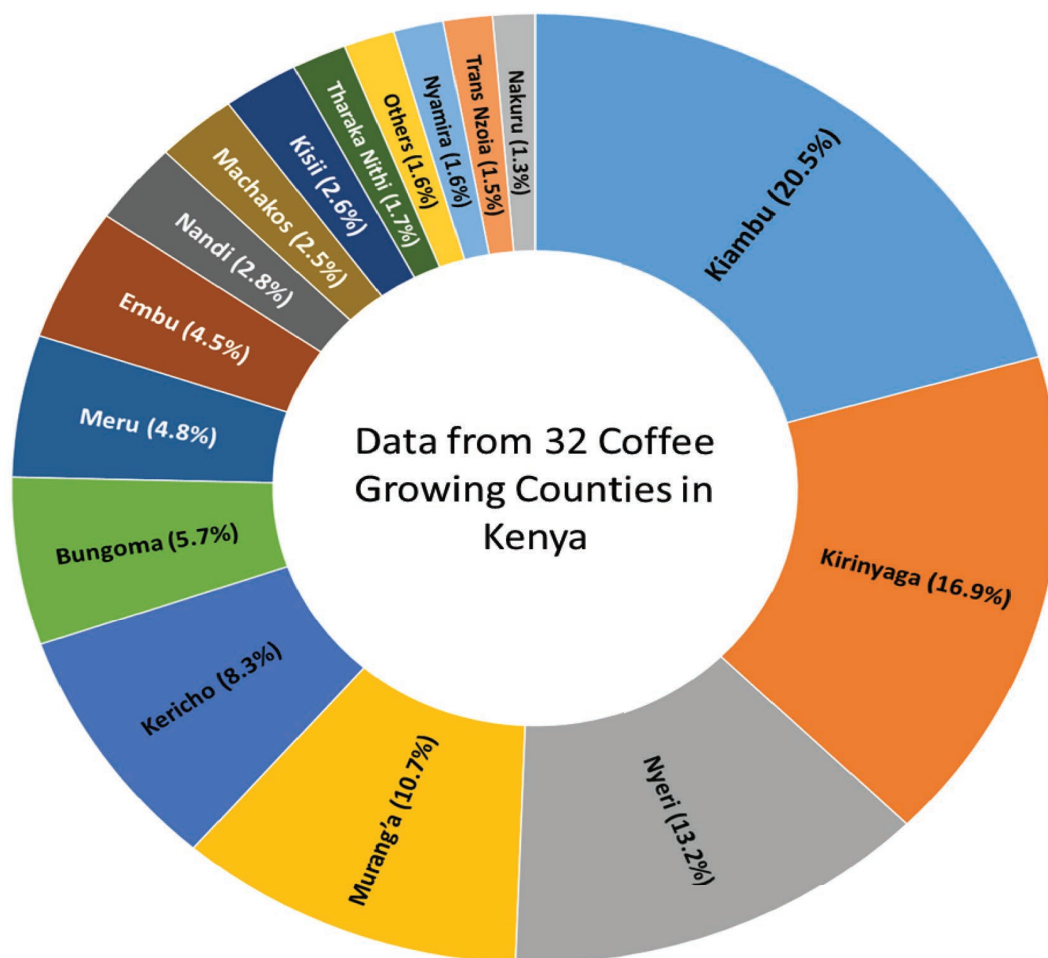
Figure 1.6: Proportion of coffee production per County (Coffee Directorate, 2023)

1.6 SHRINKING OF COFFEE GROWING AREAS DUE TO CLIMATE CHANGE

In recent years, agricultural productivity in Kenya has been faced by a myriad of production challenges mainly associated to climate change. Recent evidence shows that climate change is having substantial impact on the areas suitable for cultivation of Arabica coffee in the major growing regions, including the East African Highlands (Haggar and Schepp, 2012). The minimum night temperature have risen by 1°C over the last 50 years. With rising temperatures, the suitability of many coffee growing areas is decreasing due to increasing production challenges associated with high temperatures including outbreaks of pests and diseases. For example, the gradual rise in temperature has gradually increased the preference of coffee berry borer to areas above 1,500m where it never used to occur (Lin et al., 2008). Coffee Leaf Rust disease which is favoured by high temperatures is also becoming more rampant, even affecting coffee in high altitude areas (Lin et al., 2008). Therefore, the rising of temperature is rendering certain production areas less suitable or even completely unsuitable for coffee growing. Consequently, coffee production may have to shift to higher altitudes and alternative crops will have to be identified to replace coffee (Jaramillo et al., 2011). This may have potential conflicts with other land covers including natural

forest, with consequent implications to biodiversity and ecosystem services (Mcrae, 2016).

Arabica coffee is usually more affected by climate change than Robusta coffee because the former prefers cooler, high altitude areas with adequate rainfall while Robusta performs better in warmer areas at lower altitudes. A 3°C rise of temperature in this century, translates to the lower limit of coffee growing rising by 10 to 20 ft per year, (CCAFS, 2016). It is estimated that Arabica coffee could lose 56% (± 7%) of the areas currently suitable for its cultivation in East Africa by 2050, with only a small gain of 9% (± 1%) of new suitable areas (Mcrae, 2016). Climate change will therefore cause a major shift of coffee growing zones towards the higher altitudes (Lin et al., 2008) which may cause forest encroachment by the farmers. The phenomenon will also cause major changes in production patterns due to higher temperature and changing precipitation patterns. The average production areas of coffee Arabica

1.7 ECONOMIC TRANSFORMATION OF KENYAN COFFEE

There is need for the economic transformation of the Kenyan coffee sub-sector to regain the lost glory and to reclaim its rightful position in the country's economic development. Climate change related effects have already been identified as the major constraints towards agricultural productivity. Therefore, the key ingredients in driving agricultural transformation agenda would be the adoption of the necessary mitigation measures, which have already been identified. Unfortunately, there has been a lot of laxity in the adoption of most of these technologies or practices among the farmers. This calls for establishment of a strong institutional and policy landscape to drive the promotion of adoption of the desired practices. The policy guidelines should integrate technical and social promotion of specific climate-smart agricultural technologies that are relevant to specific crops. This study focuses on the analysis of national policies and projects on agroforestry in coffee production in Kenya. Agroforestry is one of the climate-smart technologies that is easy to implement and has a multi-faceted mutual benefits to the coffee, the farmer, the eco-system and the general environment.

1.8 OBJECTIVES OF THE STUDY

1.8.1 Overall Objective

The overall objective of this study was to analyse the legislation and practices of forest protection in coffee areas with coffee expansion as well as analysis of existing national policies and practices on agroforestry in coffee production in Kenya.

1.8.2 Specific Objectives of the Study

The specific objectives of the assignment include:

1) To assess the importance and applicability of agroforestry practices in the Kenyan coffee production;

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

9

1) To analyse the policy framework guiding agroforestry systems in the Kenyan coffee production and forest protection in coffee areas with coffee expansion.

2) To identify the policy gaps in the implementation of agroforestry systems in the Kenyan coffee production and forest protection policies in coffee areas with coffee expansion;

3) To identify the strategic requirements for adoption of agroforestry in coffee production and for forest protection in coffee areas with coffee expansion;

4) To identify the roles of various actors in policy advocacy or promotion of agro-forestry technologies and practices in coffee production.

5) To identify the roles of various actors in policy advocacy or promotion of forest protection in coffee areas with coffee expansion.

VALUATION OF FORESTS

2.1 STATUS OF CURRENT AND TREE COVER IN KENYA

Kenya is one of the least forested countries in Sub-Saharan Africa. Natural forests occupy 2% of total land area (about 1,165,292ha) while a considerable area (2.13 million ha) consists of woodlands, bushland and mangroves. According to the National Forest Resources Assessment (NFRA) Report 2021, Kenya's tree cover now stands at 12.13% while the forest cover is at 8.83% up from 5.9% in 2018. The report further states that 37 counties out of the 47 (79% of the counties) have a tree cover greater than 10% with only 10 counties having a tree cover which is less than the Constitutional target of 10%. This translates to 7,180,000.66 Ha of tree cover nationally. The country has a tree cover per capita index of 1,507.48 m2 per person. Within the total national tree coverage, were 88,123,836 tree seedlings which were planted between 2017 and 2021 by the Kenya Forest Service (KFS), to meet its natural forest restoration, rehabilitation and restocking of commercial forest plantation needs. On the other hand, the report indicates that 21 counties have forest cover above the national forest cover (8.83%), while 26 counties have forest cover below the national forest cover. This translates to 5,226,191.79 Ha of forest cover nationally. The counties in the top ten tier of tree coverage and those with the least tree cover are presented in table 2.1 while those in the top ten tier of forest coverage and those with the least forest cover are presented in table 2.2.

Table 2.1: Counties with the highest and the lowest tree cover

S/No.	County	Tree Cover (%)	Coffee Growing Status
Counties with the highest tree cover			
1	Nyeri	45	Traditional coffee growing county
2	Lamu	44	Non-coffee growing county
3	Kirinyaga	30.3	Traditional coffee growing county
4	Elgeyo Marakwet	29.9	Emerging coffee growing county
5	Meru	29.6	Traditional coffee growing county
6	Embu	29	Traditional coffee growing county
7	Murang'a	27.8	Traditional coffee growing county
8	Kilifi	27.75	Potential coffee growing county
9	Nyandarua	27.5	Potential coffee growing county
Counties with the least tree cover			
S/No.	County	Tree Cover (%)	Coffee Growing Status
10	Marsabit	2	ASAL
11	Mandera	3.6	ASAL
12	Wajir	4.4	ASAL
13	Siaya	5.2	Emerging coffee growing county
14	Machakos	6	Traditional coffee growing county
15	Isiolo	6.7	ASAL
16	Taita Taveta	6.8	Traditional coffee growing county
17	Uasin Gishu	8	Emerging coffee growing county
18	Busia	8.4	Emerging coffee growing county
19	Kisumu	8.8	Potential coffee growing county

Table 2.2: Counties with the highest and the lowest forest cover

S/No.	County	Forest Cover (%)	Coffee Growing Status
	Counties with the Highest Forest Cover		
	Nyeri	40.8	Traditional coffee growing county
	Lamu	32	Non-coffee growing county
	Kilifi	26.3	Potential coffee growing county
	Nyandarua	26.2	Potential coffee growing county
	Bomet	24	Traditional coffee growing county
	Kirinyaga	23.6	Traditional coffee growing county
	Samburu	23	ASAL
	Kericho	20.6	Traditional coffee growing county
	Elgeyo Marakwet	20.5	Emerging coffee growing county
	Mombasa	19.6	Non-coffee growing county
	Counties with the Least Forest Cover		
S/No.	**County**	**Forest Cover (%)**	**Coffee Growing Status**
	Siaya	0.2	Emerging coffee growing county
	Migori	0.3	Emerging coffee growing county
	Busia	0.56	Emerging coffee growing county
	Wajir	0.98	ASAL
	Marsabit	1.11	ASAL
	Mandera	1.46	ASAL
	Kisumu	1.55	Potential coffee growing county
	Machakos	2.59	Traditional coffee growing county
	Homabay	3.0	Emerging coffee growing county
	Taita Taveta	3.4	Traditional coffee growing county

From the data presented in Tables 2.1 and 2.2, it is evident that most of the counties with the highest tree and forest cover are the traditional, emerging and potential coffee growing counties and therefore are at the highest risk of deforestation through encroachment. In addition, some of the traditional coffee growing areas like Machakos as well as many emerging coffee growing counties are ranked among those with the lowest tree and forest covers. Such counties they are at risk of losing their suitability of coffee production if forest degradation is not stopped and restoration programs initiated. In addition, it is worth noting that although Kenya has made commendable strides in increasing the tree and forest cover, emission of GHGs keeps on increasing with technology advancement hence no chance for relenting. Afforestation and reforestation programs must continue in all areas including the ASAL areas in order to reclaim the degraded areas and restore the production capacity of our farmlands.

2.2 ECONOMIC IMPORTANCE OF FORESTS IN KENYA

Forests are ranked among the high value national assets of significant economic, environmental, social and cultural importance. They provide foundational support to other economic sectors such as agriculture, energy, water, infrastructure, livestock, wildlife, and tourism. About 140,000 ha of the forests are industrial forest plantations that provide the economy with 90% of its wood requirement. Among the identified roles that are played by the forests include:

a) Protection of water catchments that act as major sources of water for domestic use, agriculture, generation of hydro-electricity and other industries. There are five major water towers in Kenya namely Mt Kenya, Aberdare, Mau, Cherangani and Mt Elgon forests. These water towers produce approximately more than 15.8 billion cubic meters per year which is more than 75% of the renewable surface water resources of Kenya (UNEP 2015).

b) Forests support provision of environmental services including resilience to climate change impacts through the ability of the trees to absorb carbon from the atmosphere thus playing a major role in mitigating adverse effects of climate change.

c) Forests are also important as repository of biodiversity and are habitats of about 6000 species of plants including 1700 trees, 360 species of mammals, 1079 species of birds and thousands of insects (Wass, 1995).

d) Forests are sources of non-wood products such as herbal medicines, gums and resins that are of significant economic importance both locally and internationally.

e) Forests play a central role in national development through provision of various products such as sawn wood, firewood, charcoal, construction materials, transmission poles, pulp paper and other wood products. The economic value of the charcoal industry alone is estimated to be Kshs 135 billion (NFP, 2016) while the furniture market has as estimated economic value of above Kshs 38 billion. On the overall, forests directly contribute 3.6% to the national GDP excluding vital environmental services.

One of the greatest importance of forests is their ability to mitigate climate change through reduction of GHGs in the atmosphere. Mitigation actions in the six economic sectors set out in the United Nations Framework Convention on Climate Change (UNFCCC) namely agriculture, energy, forestry, industry, transport, and waste will lead to lower emissions than in the projected baseline and help to meet Kenya's Nationally Determined Contribution (NDC). However, the forestry sector has the largest potential to reduce GHG emissions in Kenya (GoK, 2015) because forests act as "sinks" through carbon sequestration (see the green wedge in Figure 2.1).
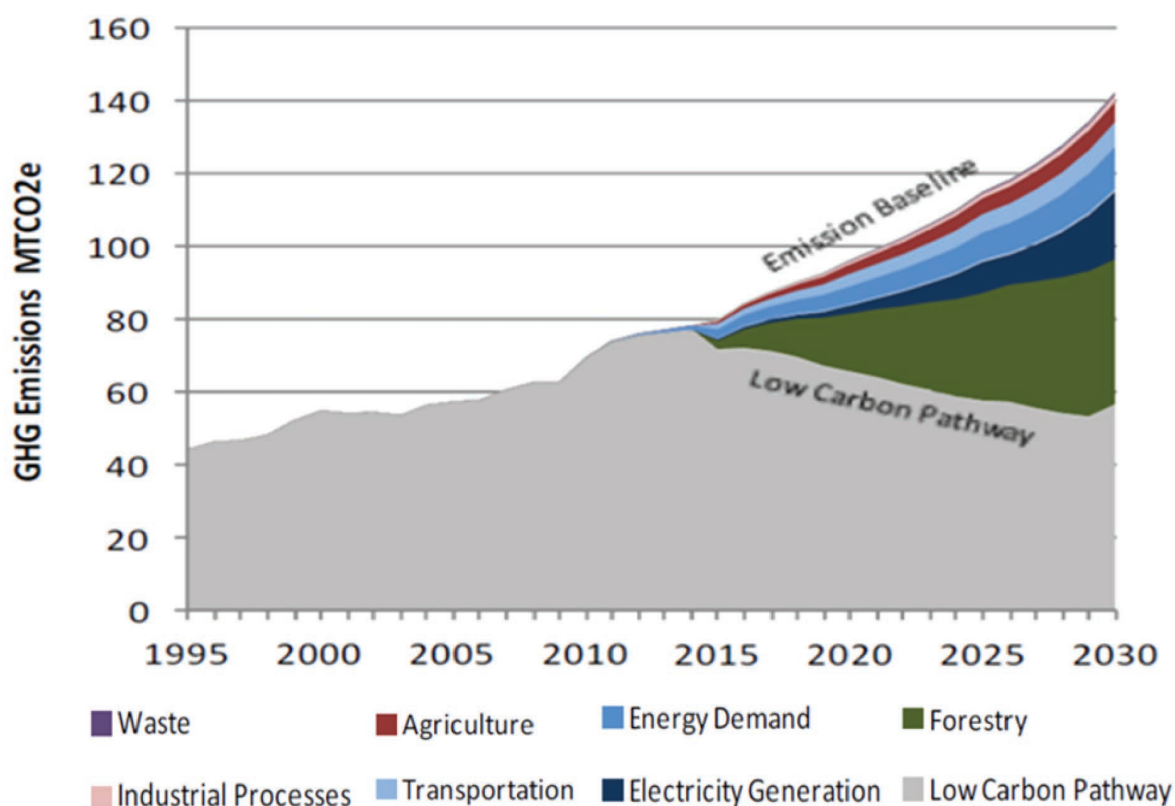
Figure 2.1: Composite reduction potential of GHG emissions (MtCO$_2$e) for all sectors in Kenya. Source: GoK (2015)

Despite the economic significance of forest resources in Kenya, the country's forest reserves, lands and landscapes have in the past two decades undergone significant degradation, causing a myriad of challenges to habitats (wildlife) and the people. Some of the challenges resulting from forest degradation include:

- Decline in hydrological functions;

- Increase in carbon emission into the atmosphere;

- Loss of biological diversity;

- Decline in soils productivity; and

- Climate change variability (extreme temperatures, drought, floods, hailstorms).

Therefore, all the effects of forest degradation have a direct or indirect impact on agricultural sustainability. Ironically, agricultural expansion and unsustainable practices are among the key drivers of deforestation and land degradation. It is in this recognition that the EU has found it imperative to come up with a regulation to promote agricultural sustainability through promotion of deforestation free supply chains for key agricultural products such as coffee.

2.3 DRIVERS OF DEFORESTATION AND FOREST DEGRADATION

Forests provide significant carbon benefits by mitigating the harmful effects of GHG emissions by acting as "sinks" through carbon sequestration (GoK, 2015). Kenya is a low forest cover country and this forest cover has been decreasing over time. Deforestation and forest degradation are driven mainly by clearance of land for agriculture that is linked to rural poverty and rapid population growth, unsustainable utilization of forest products (including timber harvesting, charcoal production, and grazing in forests), and past governance and institutional failures in the forest sector. The negative impacts that result from deforestation (such as soil erosion and increased flooding) are exacerbated by climate change (GoK, 2010a). This section analyses the drivers of deforestation and forest degradation and their impact on forest cover change. The section demonstrates the main agents (direct or proximate) or drivers and underlying causes of deforestation and forest degradation and their motivations in Kenya. Figure 4.2 summarizes the links between the proximate causes of deforestation and degradation and the underlying causes described in the sections below.
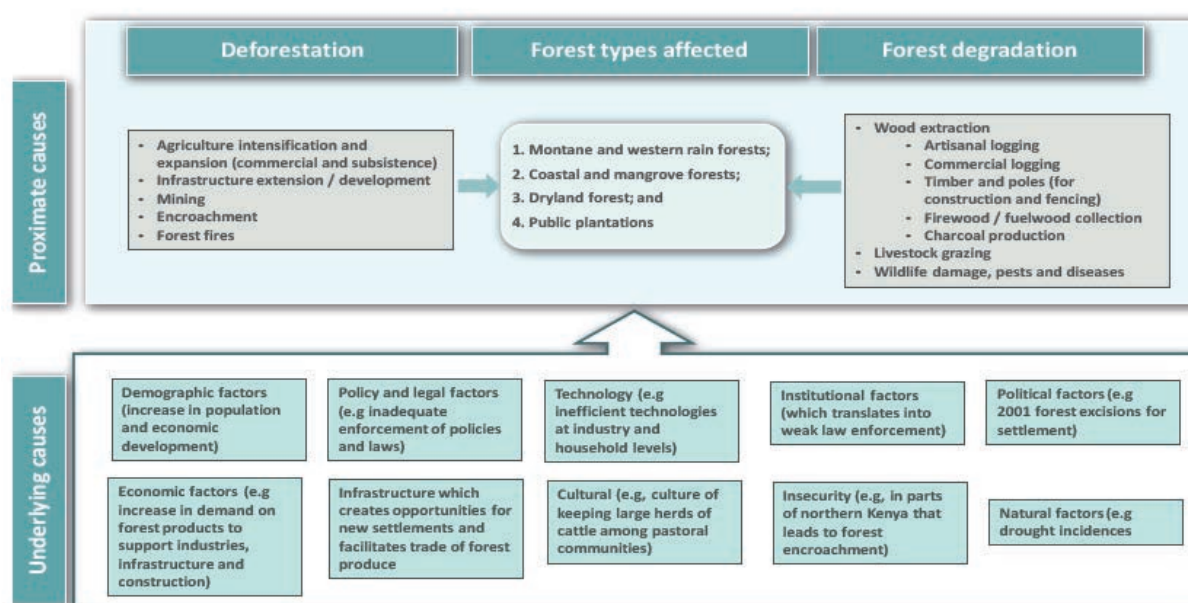
Figure 2.2: Links between the proximate causes of deforestation and degradation and the underlying causes

From the above analysis (Figure 2.2), agricultural expansion is classified among the key drivers of deforestation. In Kenya, agricultural expansion is motivated by subsistence and the market economy. It can be further subdivided into:

a) Shifting cultivation which occurs in the communal lands where communities clear forests and plant for short rotations before abandoning the sites;

b) Subsistence agriculture which results to total conversion of forestlands to croplands and is best illustrated in encroached forest areas;

c) Commercial farming which results to conversion of forests into perennial croplands including coffee farming.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

15

2.4 LINK BETWEEN FARMING, CLIMATE CHANGE AND DEFORESTATION

Forestry and agriculture are closely linked, since agriculture is the major driver of deforestation leading to forest loss. Kenya has developed and submitted its Forest Reference Level (FRL) to the United Nations Framework Convention on Climate Change (UNFCCC) as a requirement for REDD+ implementation. In the FRL, deforestation is identified as the largest single cause of GHG emissions in Kenya resulting to an annual emission of 48,166,940 tons CO_2/year. Closely associated with deforestation is the process of forest degradation which eventually leads to deforestation and historically contributed to an annual emission rate of 10,885,950 tons of CO_2 (MoEF, 2021). Consequently, the forestry sector is the second largest contributor to Kenya's GHG emissions after agriculture, accounting for about 32% of emissions, largely due to deforestation and forest degradation (GoK, 2015). However, the sector offers the greatest potential of all mitigation sectors to reduce emissions. Therefore, halting deforestation and forest degradation is key in reducing GHG emissions and thus mitigating climate change.

Agricultural activities also contribute greatly to emission of greenhouse gases (GHGs) in the atmosphere including carbon dioxide, methane, nitrous oxide among others (IPCC, 2001). The increasing concentrations of these GHGs in the atmosphere generally result in climate change. On the other hand, the effects of climate change including extreme temperatures, extended periods of drought, increased incidences of hailstorms and floods and emergence of invasive pests have negatively impacted on the livelihoods of the farming communities in Kenya. In particular, drought has become a major climatic hazard in Kenya causing over 72.2% of total livestock losses and over 12.5% of crop losses (GOK, 2018a). Intensified climate change challenges leads to undesirable coping strategies like deforestation and land degradation, causing further damage to the environment thus exacerbating the situation (GOK, 2018b). Most Kenyan farmers live in the medium to high potential agro-ecological zones that are suitable for both crop production and tree growing including forestry development (GOK, 2016). Projected increase in population and urbanization is expected to put more pressure on land and natural resources to keep pace with growing demand for agri-food products. For example, it is projected that by 2050 there will be 54 million rural residents expected to produce agricultural outputs for their own consumption, for export and for feeding another 43 million urban residents (GOK, 2016).

Coffee production is takes place in the medium to upper highland agro-ecological zones where most forests are also found. As temperatures continue to rise due to climate change, some areas that used to be suitable for coffee production are tending to become less suitable. Therefore, coffee farming is moving slowly from medium to higher altitudes in search of more suitable production areas. This makes coffee to be one of the candidate crops whose expansion may lead to clearing of forests to open more farmland. This would result into less absorption of the greenhouse gases while the coffee production activities increases the emission of the same gases. The net effect would be increased concentrations of the GHGs in the atmosphere, a situation that would further worsen the effects of climate change. This calls for adoption of innovative sustainable agricultural practices that would allow expansion of coffee farms devoid of deforestation and forest degradation.

3

CHAPTER 3

ANALYSIS OF FOREST PROTECTION POLICIES AND PRACTICES

Currently, forest governance is executed under the Forest Conservation and Management Act 2016 and the Forests Act, 2005. However, there are other legislative policies and regulations that contribute to forest protection either directly or indirectly. In addition, there are several forestry strategies that have been developed to guide the forestry practices but with different, though related objectives. Lack of proper coordination between various stakeholders result in overlap of activities or create some gaps in the implementation of the policies thereby encouraging deforestation practices and forest degradation. Therefore, there is need for analysis of the existing forest protection policies, strategies and practices in the country to identify the policy gaps, forest protection challenges and necessary areas of intervention in order to prevent deforestation and forest degradation in Kenya. This analysis is focussed on the coffee growing areas with coffee expansion that may prompt encroachment of the forest by the coffee farms in search for more favourable climatic conditions.

3.1 METHODOLOGY ADOPTED IN THE POLICY ANALYSIS

The study adopted the following step-wise methodology to analyse the existing forest protection policies and practices in Kenya:

1. Analysis of climate change mitigation measures related to forest protection at the global context;

2. Analysis of the regional legal and policy framework guiding climate change mitigation measures including forest protection;

3. SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of the forest protection policies in the country;

4. Analysis of the provisions of the existing forestry and related policies in Kenya and their implementation gaps. Some of the policies analysed include:

    a) Constitution of Kenya 2010

    b) Agriculture Act Cap 318

    c) Environmental Management and Coordination Act

    d) Forest Conservation and Management Act 2016

    e) Forest Conservation and Management (Amendment) Bill, 2021

    f) The Forests Act, 2005

5. Analysis of existing forestry protection strategies in Kenya and their implementation gaps

    a) National Forest Programme 2016–2030

    b) Nationally Determined Contribution

c) National Adaptation Plan (2015-2030)

d) National Strategy for achieving and maintaining over 10% tree cover by 2022

e) Kenya National Climate Change Action Plan (NCCAP) 2018-2022

f) National REDD+ Strategy, 2022

g) The Green Economy Strategy and Implementation Plan (GESIP, 2016 – 2030)

h) KENAFF Farm Forestry and Afforestation Programme, 2021 – 2030

6. Analysing the lessons learnt and using them to identify the strategic requirements and responsible actors in forest protection in coffee areas as presented in chapter seven.

3.2 CLIMATE CHANGE MITIGATION AT THE GLOBAL CONTEXT

Climate change is a global problem which demands a global solution, and Kenya is an active player in international efforts. The international response to climate change is founded upon the **United Nations Framework Convention on Climate Change (UNFCCC)** that entered into force in 1994. Kenya signed the UNFCCC on 12th June 1992 and ratified the Convention on 30th August 1994. Kenya is a key player in the global climate change governance system and participates in the meetings of the Conference of the Parties (COP) to the UNFCCC, articulating the national interest and the country's position during international negotiations.

The objective of the UNFCCC is set out in Article 2, which states:

> *The ultimate objective of this Convention is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate systems. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.*

Kyoto Protocol

The Kyoto Protocol is greenhouse gas emissions reduction treaty linked to the UNFCCC, and was adopted by the COP in 1997 and entered into force in 2005. The Kyoto Protocol is an international agreement that commits developed countries and countries in transition to market economics to reduce their overall GHG emissions. The Kyoto Protocol created the Clean Development Mechanism (CDM) under which projects in the developing countries that reduced emissions and contributed to sustainable development earned credits that could be sold to countries or companies with a commitment to reduce emissions. More that 1.5 billion tonnes of carbon dioxide were avoided through the CDM, and US$ 9.5-13.5 billion in direct benefits went to host counties from the sale of credits as of 2012. The first commitment period started in 2008 and ended in 2012. Parties to the Kyoto Protocol adopted an amendment in 2012, which has yet to enter into force. Kenya ratified the Kyoto Protocol on 25th February 2005.

18

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

Paris Agreement

The Paris Agreement aims to strengthen the global response to the threat of climate change by keeping global temperature rise this century to well below 2°C. It entered into force internationally on 4th November 2016 and was ratified by Kenya on 26th December 2016 under section 9(1) of the Treaty Making and Ratification Act, and entered into force for Kenya on 27th January 2017. Kenya's NDC sets out the country's actions to contribute to achieving the global goal set out in the Paris Agreement. As set out in Article 2(6), and read with Article 94(5) of the Constitution of Kenya (2010), the Paris Agreement now forms part of the law of Kenya.

Green Climate Fund

The Green Climate Fund (GCF) is an operating entity of the Financial Mechanism of the UNFCCC that serves the Paris Agreement and supports projects, programmes and other activities in developing countries. The Fund aims for a 50:50 balance between mitigation and adaptation investments, and engages directly with the private sector through its Private Sector Facility. As of May 2018, 43 governments had made pledges to the GCF totalling US$ 10.3 billion. The **Global Environment Facility** manages contributions from donors through trust funds to help developing countries meet the objectives of international environment conventions, including the UNFCCC. The trust funds include the Adaptation Fund, Special Climate Change Fund, and Capacity Building Initiative for Transparency (CBIT).

United Nations Conventions (Rio Conventions)

Kenya is signatory to the **United Nations Convention on Biological Diversity (1992)** (CBD) and the **United Nations Convention to Combat Desertification (1994)** (UNCCD). Kenya became Party to the CBD on 24th October 1994 and ratified the UNCCD on 25th June 1997. These two conventions plus the UNFCCC are known as the Rio Conventions and are intrinsically linked because they address interdependent issues such as sustainable land management and land degradation neutrality.

Sendai Framework for Disaster Risk Reduction 2015-2030

This is a voluntary agreement that recognizes that the State has the primary role to reduce disaster risk, but that responsibility should be shared with other stakeholders including local governments, the private sector and other stakeholders. It aims for the following outcome: "The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries."67 Kenya adopted the Sendai Framework in 2015.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

19

Sustainable Development Goals

Kenya is committed to the **2030 Agenda for Sustainable Development** that was adopted by world leaders, including the President of the Republic of Kenya, in September 2015 at the United Nations (UN) Sustainable Development Summit. On 1st January 2016, the **17 Sustainable Development Goals** (SDGs) officially came into force. The SDGs that are most relevant to the context of this report include:

- **Goal 2**: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

- **Goal 13**: Take urgent action to combat climate change and its impacts

- **Goal 15**: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

3.3 THE REGIONAL LEGAL AND POLICY FRAMEWORK

At the regional level, the **African Union's Agenda 2063** commits to climate change action that prioritizes adaptation and calls on member countries to implement the Programme on Climate Action in Africa, including a climate resilient agricultural development programme. Agenda 2063 commits to building climate resilient economies and communities, and notes that participation in global efforts for climate change mitigation will support and broaden the policy space for sustainable development.

The **East African Community (EAC)** Secretariat developed a Climate Change Policy and Strategy (2010) to guide partner states and other stakeholders on the preparation and implementation of collective measures to address climate change in the region. The Policy prescribes statements and actions to guide adaptation and mitigation to reduce the vulnerability of the region, enhance adaptive capacity, and build socioeconomic resilience of vulnerable populations and ecosystems.

The **Lake Victoria Basin Commission** developed a Climate Change Adaptation Strategy and Action Plan (2018-2023) that presents a roadmap for addressing and adapting to climate change impacts.

The **African Forest Landscape Restoration Initiative (AFR100)** aims to bring 100 million hectares of land in Africa into restoration by 2030. The commitments announced under AFR100 also support the Bonn Challenge adopted in 2011, whose overall objective is to restore 150 million hectares by 2020; the New York Declaration on Forests that stretches the goal to 350 million hectares by 2030; and the African Resilient Landscapes Initiative to promote integrated landscape management to promote adaptation to and mitigation of climate change. In 2016, Kenya committed to restore 5.1 million hectares of land.

3.4 FOREST PROTECTION POLICIES IN KENYA

Article 42 of the Kenyan Constitution (2010) provides the ground for the enactment of policies, legislation and strategies that guarantee the rights of citizens to a clean and healthy environment (GoK, 2010b). This facilitates achievement of the 10% tree cover national threshold as provided by Article 69 (1) (b) of the constitution. Consequently, Article 72 requires parliament to enact the requisite legislation to operationalize these provisions. Secondly, Vision 2030 and accompanying Medium Term Development Plans (MTPs) commit to transforming Kenya into a middle-income country with high quality of life in a clean and safe environment. Thirdly, sustainable development is an underlying principle under the Vision 2030's economic pillar and commits to an enabling environment for sustainable exploitation of the productive sectors of the Kenyan economy, especially those linked to land use such as agriculture and forestry. Fourthly, environmental quality is among the eight social sectors identified under the social pillar in the Vision 2030 blueprint. The vision for the environment is 'A people living in a clean, secure and sustainable environment'.

3.4.1 Proposed EU Regulation on Deforestation-Free Products

The European Commission is about to implement the "EU regulation on deforestation-free products". The proposed regulations seeks to ensure zero-deforestation during the supply chain of various agricultural products including coffee wood, palm oil, soy, cocoa and cattle. The implementation of these regulations will put across additional necessary stringent measures for to ensure "deforestation-free supply chains" of the earmarked products. The enforcement of these regulations is propelled by the realization:

i) Deforestation and forest degradation are occurring at an alarming rate, aggravating climate change and the loss of biodiversity;

ii) Deforestation will worsen the climate change as felled trees will release carbon to the atmosphere and reduce the carbon sinks;

iii) Changing climate patterns necessitates a shift to a sustainable production;

iv) The expansion of agricultural land for production of the earmarked commodities may be among the main drivers of deforestation and forest degradation;

v) The growing world population and increasing demand for these agricultural products is expected to increase the demand for agricultural land and put additional pressure on forests;

vi) The EU is a relevant consumer of most of the earmarked commodities thus would be contributing indirectly to deforestation and forest degradation if the status quo continues;

vii) The EU currently lacks specific and effective rules to reduce its contribution to deforestation or forest degradation, hence the new regulation.

The changing climate patterns necessitates a shift to a sustainable production that is not leading to further deforestation and forest degradation. The objective of this initiative is therefore to curb deforestation and forest degradation that is provoked by EU consumption and production. This, in turn, is expected to reduce GHG emissions and global biodiversity loss. The initiative aims to minimise consumption of products coming from supply chains associated with deforestation or forest degradation – and increase EU demand for and trade in legal and 'deforestation free' commodities and products.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

21

The new regulation proposes a benchmarking system, introduces the requirement of geolocation and traceability for each plot of land where the products are produced and determines a cut-off date for mandatory due diligence rules to be implemented. The cut-off date is December 31, 2020 - commodities and products (including coffee) produced on land subject to deforestation or forest degradation after that date cannot be exported into the EU. The concrete guidelines on the country or parts of country benchmarking system and due diligence rules have not been released, and there is a lot of uncertainty about how to proceed. However, from the cut-off date, the due diligence requires operators to:

i)   Have the geographic coordinates (or geolocation via latitude and longitude) of all the plot(s) of land where the relevant commodities and products are produced;

ii) Provide the name, email and address of any business or person from whom and to whom the relevant commodities or products have been sourced an supplied.

Coffee is incorporated into the regulation due to the term 'embodied deforestation' meaning - an association between deforestation and coffee production. Non-compliance to the EU market requirement that takes about 55% of Kenyan coffee would lead to loss of that important market segment and this would adversely affect the already volatile farmers' income. Such a suicidal move would jeopardize the coffee production in Kenya thus increasing the negative velocity of the declining production. It is therefore important for Kenya to re-evaluate its preparedness to comply with this regulation, hence the need to analyse the legislation and practices of forest protection in coffee areas with coffee expansion. Of importance to note is that conversion from forest to agroforestry is also considered as deforestation in the EU regulation.

3.4.2 SWOT Analysis of the Kenyan Forestry Policies and Strategies

Although adequate institutional mechanisms to support forest protection in the country exist, deforestation and land degradation cases in Kenya has been in the rise in the last decades. This is an indication that there could be gaps in the provisions of forest protection policies or in their implementation. Cognizant that agricultural expansion is among the major drivers of deforestation and forest degradation, there is need to analyse the legislation and practices of forest protection in Kenya particularly in areas with agricultural expansion. Such areas include the coffee growing areas considering that climate change is pushing coffee production from medium to upper highlands where most forests are found. The basis of such analysis is to conduct a general SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis on the forest protection policies and practices in the country. The SWOT analysis presented in Tables 3.1 & 3.2 was based on the following four sub-pillars:

1. Legal and regulatory framework

2. Institutional framework

3. Financing mechanisms

4. Research & capacity development

Forest protection policy provisions and practices were then critically analysed to identify their weaknesses and implementation gaps (Table 3.3 & 3.4) that were then used to identify the necessary areas for interventions and the intervention strategies.

Table 3.1: Strengths and Weaknesses of the Forest Protection Policies and Strategies

Sub-Pillar	Strengths	Weaknesses

Legal and Regulatory Framework	• The existence of different policies and strategies that supports forest protection either directly or indirectly including the following:
	   a. Constitution of Kenya 2010 and Vision 2030 requires that at least 10% tree cover be achieved and maintained on all the land area of Kenya.
	   b. Agriculture Act Cap 318 – mainly the farm forestry rules, 2009
	   c. Environmental Management and Coordination Act
	   d. Forest Conservation and Management Act 2016
	   e. Forest Conservation and Management (Amendment) Bill, 2021
	   f. The Forests Act, 2005
	   g. National Strategy for achieving and maintaining over 10% tree cover by 2022
	   h. Kenya National Climate Change Action Plan (NCCAP) 2018-2022
	   i. National REDD+ Strategy, 2022
	   j. The Green Economy Strategy and Implementation Plan (GESIP, 2016 – 2030)
	• Constitutional requirements for multi-stakeholder participation in formulating policies and legal instruments.
	• Enabling social and political environment for promoting reforestation and afforestation in a multi sectoral setting.
	• The legal framework supports stakeholder participation in forest management
		• Very few innovative national strategies on forest protection.
		• Limited alignment of the existing forest protection policies and practices
		• Weak enforcement and compliance of existing laws and regulations.
		• Low public awareness on the link between forest protection and climate change
		• Low farmer awareness on the link between forestry and agricultural sustainability
		• Failure to adequately involve the farmers and the general public when formulating the policies.
		• Lack of innovative incentives and reward mechanisms to communities supporting forest protection.
		• Political interference with laid out deforestation measures.
		• Lack of organized fora to facilitate discussion of forestry issues by various stakeholders.

Institutional Framework	• Presence of various national and international governmental, non-governmental and private institutions supporting and / or enforcing forest protection in the country including the following:
	  a. National Government Institutions - KEFRI, KFS, NEMA, Universities, County Departments of Forestry.
	  b. Non-Governmental Institutions - ICRAF, Vi Agroforestry, CARE, World Vision, Rainforest Alliance others;
	  c. Development Partners that support forestry systems e.g. P4F
	• Emerging farmers' organizations focusing on the promotion of afforestation and reforestation including Community Based Organizations (CBOs), Kenya National Farmers Federation (KENAFF), Farm Forestry Smallholder Producers' Association of Kenya (FFSPAK) and regional affiliates e.g. Western Tree Planters Association (WETPA), South Coast Forest Owners Association (SCOFOA), Kisii Tree Planters Association (KTPA).
		• Lack of government support of pro-forest organizations and recognition of their activities.
		• Inadequate coordination among the various actors and stakeholders supporting forest protection.
		• Inadequate skills/capacity and advisory services.
		• Weak enforcement of the existing laws and regulations against deforestation and forest degradation.
		• Limited financial resources, technical capacity, knowledge and policy support to institutions.

Financing Mechanisms	• Availability of financial support through grants, loans, subsidies and other forms of incentives towards afforestation and reforestation programs by government and non-governmental agencies, private companies and development partners. • Emerging private investments towards afforestation and reforestation programs mainly propelled by good returns realized from agroforestry e.g. through carbon credits or international recognition. • Availability of monetary and in-kind support from diverse institutions through their Corporate Social Responsibility (CSR) programmes.	• Lack of necessary skills to develop grant winning proposals • Poor coordination between the funding organizations to align their objectives for greater impact. • Insufficient resources (personnel & capital) for implementation of robust forestry programmes. • Poor monitoring and evaluation systems. • Poor accountability for unbudgeted or unsolicited support.

Research & Capacity Development	• The existence of universities, colleges and training institutions that train professionals on forestry programmes. • Existence of local research institutions (KEFRI, KIRDI, Universities) that are strong and well established in terms of human and physical capacity to effectively implement research nationally and even take regional leadership in some of the R&D themes in forestry. • Availability of seed grants to equip the research institutions. • Existence of international research organizations to broker access of innovations across international borders.	• Lack of robust extension wing to connect agroforestry research with agriculture and climate change. • Limited research on sustainable utilization of forest resources. • Inadequate knowledge of the role of forests in climate change mitigation • Inadequate data to demonstrate or determine the socio-economic benefits of forest conservation. • Lack of incentives to attract the youth in forestry training e.g. government-sponsored internships.

Table 3.2: Analysis of the Opportunities and Threats in the Forest Protection

Sub-Pillar	Opportunity	Threats
Legal and Regulatory Framework	• Existence of international conventions, treaties and agreements, which have been signed and ratified by Kenya e.g. Convention on Biological Diversity. • Devolvement of some key forestry functions from the National Government to County Governments hence taking the services close to the consumers of forestry resources. • Transition to Devolved Government Act, 2012 provides for a smooth transfer of devolved functions from National to County Governments. These include forestry functions being devolved from the Kenya Forestry Service (KFS) to County Governments. • Harmonization of policy frameworks at national and county levels.	• Low awareness of the existence of the international conventions, agreements and treaties • Poor understanding of the objects of the international conventions, agreements and treaties hence poor compliance. • Conflicting interests among actors • Lack of clarity of devolved/shared functions. • Lack of political good will from the political leadership.

Institutional Framework	• Avenues for collaboration in the related forestry programs with different like-minded institutions rather than different institutions carrying out forestry activities in isolation. • Opportunities for collaboration between the National and County governments in the implementation of forestry programs. • Support of forest protection by NGOs and international organizations through development of forestry programmes, projects and user friendly information packages. • Availability of some cultural groups and traditional communities who protect forest degradation e.g. the Kaya communities in the Coast.	• Conflicting interests among different institutions and actors • Lack of clarity of the devolved and shared functions. • Lack of adequate resources to promote forestry programmes and projects e.g. tree nurseries • A number of cultural beliefs and traditional practices hinder effective utilization of forest resources.
Financing Mechanisms	• Existence of global funding instruments such as UNFCCC's Special Climate Change Fund, Green Climate Fund (GCF) and the Adaptation Fund under the Kyoto Protocol, Global Environment Facility (GEF), Least Developed Countries Fund, REDD+ and other facilities linked to the UNCCD. • Private-public partnerships providing blended finance and performance-based financing opportunities.	• Bureaucratic process and procedures in accessing donor funding. • Emerging global crises such as conflicts and pandemics could shift funding priorities.
Research & Capacity Development	• Availability of national and international research (KEFRI, ICRAF, KIRDI and Universities) institutions that can develop appropriate mechanisms for sustainable utilization of forest products. • The existence of various institutions including NGOs that assist in development of extension packages and public participation programmes on forestry e.g. PELIS • Existence of traditional knowledge on biodiversity conservation and utilization of various forest resources.	• Lack of self-drive and other necessary incentives to propel forestry research. • Weak research-extension-farmer linkages to sensitize the farmers on the importance of forests to agricultural sustainability. • A number of cultural beliefs and traditional practices hinder effective utilization of forest resources.

Table 3.3: Forest Protection Policy Provisions and their Implementation Gaps

S/No.	Policy / Project	Forestry Provisions	Weaknesses / Implementation Gaps
1.	**Constitution of Kenya, 2010**	Article 42 of the Constitution (2010) provides the ground for the enactment of policies, legislation and strategies that guarantee the rights of citizens to a clean and healthy environment	Although the constitution have enough provisions to support forestry under article 69 (1), the provisions have major implementation gaps since the parliament has not enacted adequate requisite legislations to operationalize these provisions.
		Article 69 (1) (b) of the constitution – The state commits to work to achieve and maintain a tree cover of at least 10% of the land area of Kenya.	
		Article 69 (1) (c) – The state commits to protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities.	
		Article 69 (1) (d) – The state commits encourage public participation in the management, protection and conservation of the environment.	
		Article 69 (1) (e) – The state commits to protect genetic resources and biological diversity	
		Article 72 requires the parliament to enact the requisite legislation to operationalize the above provisions.	

2.	Environmental Management and Co-ordination Act, 1999	The policy No. 46 (2) of EMCA 1999 on "Re-forestation and afforestation of hill tops, hill slopes and mountainous areas" provides for every County Environment Committee to encourage voluntary self-help activities in their respective local community, to plant trees or other vegetation in any area specified as *hilly and mountainous areas.*	The provision does not support planting of trees on other terrains that are not identified as "hilly and mountainous" thus discouraging tree planting in flat areas.
		The policy No. 56A of EMCA 1999 on "Guidelines on climate change" gives the Cabinet Secretary, in consultation with relevant lead agencies, authority to issue guidelines and prescribe measures on climate change.	No policy guidelines have been issued on best agro-forestry practices even for major crops like coffee and tea.
3.	Forests Conservation and Management Policy 2015	The policy identifies the positive environmental effects of farm forestry including watershed protection, enhancement of the microclimate, carbon sequestration and its role in achieving the 10% national forest cover on land area. Forests under private ownership play a significant role in the provision of forest goods and services to supplement supply from state forests.	The policy does not include deforestation and forest degradation among the key issues and challenges in forestry development. In addition, it has not identified forest encroachment by farmlands as a challenge in forestry development.
4.	Forest Conservation and Management Act 2016	Section 5 (1) requires the Cabinet Secretary, in consultation with the county government and relevant stakeholders, to develop a **national forest policy for the sustainable use of forests and forest resources.** Section 5 (1) requires the Cabinet Secretary in consultation with the county government to ensure that the national forest policy is reviewed at least once in every five years.	The National Forest Policy, 2015 is yet to be reviewed.\n\nThere is no National Public Forest Strategy that has been developed so far except the strategy for achievement and maintenance of at least 10% tree cover of the land area.\n\nThese documents would guide the conservation and sustainable management of forest areas.

		Section 6 requires the Cabinet Secretary to formulate a public forest strategy. Sub-section (3) specifies the content of the **public forest strategy**, which include among others, "programmes for achievement and maintenance of at least 10% tree cover of the land area of Kenya".	The information on protected trees is not well disseminated to the public.
		Section 40 Sub-section (1) The Cabinet Secretary, on the advice of the Kenya Forestry Research Institute, by order published in the Gazette, declare any tree species or family of tree species to be protected in the whole country or in specific areas thereof, and shall cause this information to be disseminated to the public. (2) No person shall fell, cut, damage or remove, trade in or export or attempt to export any protected tree species or family of trees or regeneration thereof or abet in the commission of any such act.	Enforcement of this provision is affected by corruption and some political interests.

		Section 64 Sub-section (1): Except under a license or permit or a management agreement issued or entered into under this Act, no person shall, in a state, local authority or provisional forest –
		    i) Clause a) fell, cut, take, burn, injure or remove any forest produce;
		    ii) Clause f) clear, cultivate or break up land for cultivation or for any other purpose;
		    iii) Clause l) damage, alter, shift, remove or interfere in any way whatsoever with any beacon, boundary mark, fence notice or notice board.
		Sub-section (2): Any person who contravenes the provisions of subsection (1) of this section commits an offence and is liable on conviction to a fine not exceeding fifty thousand shillings or to imprisonment for a term not exceeding six months, or to both such fine and imprisonment.
			This provision is protective enough but its effectiveness is jeopardized by corruption at different administrative levels.
			
			Enforcement of this provision is also affected by some political interests.
			
			This Act is silent on how forest encroachment by farmlands should be protected.

5.	Agriculture and Food Authority Act, 2013	Part IV Section 22 (b) enables the Cabinet Secretary to make general rules to prescribe the manner in which farming shall be done in accordance with the rules of good husbandry Part IV Section 23 enables the Cabinet Secretary to prescribe national guidelines requiring, regulating or controlling the afforestation or re-afforestation of land [sub-section b (i)]	Under these provisions, the Cabinet Secretary may issue policy guidelines to prevent deforestation and forest degradation during agricultural expansion but this avenue has not been exploited. Similarly, there are no guidelines in place regulating or controlling the afforestation or re-afforestation of land

6.	Climate Change Act, 2016	The Climate Change Act (2016) is national legislation that provides for an enhanced response to climate change, and provides mechanisms and measures to achieve low carbon climate resilient development. The Act adopts a mainstreaming approach that includes integration of climate change considerations into all sectors and in County Integrated Development Plans. The Act establishes the National Climate Change Council, chaired by His Excellency the President. The Council is responsible for overall coordination and advisory functions. The Act also establishes the Climate Change Fund – a financing mechanism for priority climate change actions and interventions.
		Part III Section 13 enables the Cabinet Secretary (in accordance with Article 10 of the Constitution) to formulate a National Climate Change Action Plan which shall prescribe measures and mechanisms:
		  a. towards the achievement of low carbon climate resilient sustainable development;
		  b. for adaptation to climate change;
		  c. for mitigation against climate change;
			The act has laid down mechanisms and measures to achieve low carbon climate resilient development but the implementation, monitoring and enforcement strategies are weak.
			
			The National Climate Change Action Plan was developed but has major implementation gaps including financing, monitoring and evaluation mechanisms.
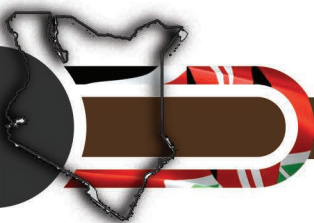
7.	**National Climate Change Framework Policy (2018)**	The National Climate Change Framework Policy aims to ensure the integration of climate change considerations into planning, budgeting, implementation and decision-making at the National and County levels and across all sectors.	There is poor coordination between the national and county governments on forestry matters.
8.	**National Climate Finance Policy (2018)**	The National Climate Finance Policy promotes the establishment of legal, institutional and reporting frameworks to access and manage climate finance. The goal of the policy is to further Kenya's national development goals through enhanced mobilisation of climate finance that contributes to low carbon climate resilient development goals.	Lack of quality finance seeking proposals and poor management of the attracted funds. Poor monitoring and evaluation of funded climate projects.

Table 3.4: Forestry Related Strategies and their Implementation Gaps

S/No.	Strategy	Strengths and Objectives of the Strategy	Weaknesses / Implementation Gaps
1.	National Forest Programme 2016–2030	The National Forest Programme (NFP) is a strategic framework for forest policy, planning and implementation to coordinate the sector's development. The NFP is designed to sustain and restore the resilience of forests in the country by ensuring that forests are able to withstand and recover from climate-related stresses and disturbances such as droughts, wildfires, and epidemics of insects and diseases while adhering to the principles of sustainable forest management.	NFP has identified that forest encroachment and deforestation have been accelerated by weak compliance and enforcement regimes and general non-compliance with regulatory requirements. However, it failed to identify ways of preventing encroachment and enforcing compliance.
2.	Nationally Determined Contribution	Box 5: Kenya's Nationally Determined Contribution • Adaptation contribution - ensure enhanced resilience to climate change towards the attainment of Vision 2030 by mainstreaming climate change into the Medium Term Plans (MTPs) and implementing adaptation actions. • Mitigation contribution - seek to abate GHG emissions by 30% by 2030 relative to the business as usual scenario of 143 MtCO2eq.	Achievement of the NDC is subject to international support in the form of finance, investment, technology development and transfer, and capacity development.
3.	National Adaptation Plan (2015-2030)	Kenya's National Adaptation Plan 2015-2030 was submitted to the UNFCCC in 2017. The NAP provides a climate hazard and vulnerability assessment and sets out priority adaptation actions in the 21 planning sectors in MTP II.	The plan has weak strategies to implement the prioritized adaptation actions.

4.	National Strategy for achieving and maintaining over 10% tree cover by 2022	The strategy aimed to deliver, among others, the following objectives by 2022: i. Enhance conservation and protection of natural forests on public, community and private lands and rehabilitation of degraded areas; ii. Implement innovative restoration programs, including the Greening Kenya Initiative; Greening of infrastructure and Institutions, the "Adopt a forest" concept and the Environmental Soldier Programme (ESP) of the Kenya Defence Forces to support seedlings production and rehabilitation of degraded forest areas; iii. Strengthen Forest resources assessment, monitoring and reporting capabilities of forest sector institutions and iv. Establish commercial forest plantations on public, private and community lands to provide adequate and sustainable timber, poles and fuelwood for industrial and domestic consumption.	Although the strategy achieved 8.83% forest cover and surpassed the 10% tree cover by 2022, there was no provision put in place to monitor the impact of the achievement in terms of reduction of GHG emissions since there was no baseline and end-line studies focussing on GHGs emission levels.
5.	National REDD++ Strategy, 2022	The strategy seeks to support Kenya's goal to achieve low-emission development through REDD+ for multiple benefits. This is towards the realization of one of the aspirations under Kenya's Vision 2030 to achieve 10% of national tree cover and become a carbon neutral middle-income country providing a high quality of life to all its citizens in a clean and secure environment. The strategy seeks to achieve the following specific objectives: i) Increased forest and tree cover ii) Enhanced productivity of the forest iii) Increased investments in forest development iv) Protecting existing forest cover v) Integrated good governance in forestry sector	Although the strategy identifies agricultural expansion as a major driver of deforestation and degradation through both subsistence and commercial farming, it has not identified the agricultural crops that are the major culprits neither has it identified the forest areas that are at high risk e.g. forests in the coffee growing areas with coffee expansion.

		vi) Enhanced forest based economic, social and environmental benefits vii) Enhanced livelihoods of the Indigenous Peoples and Local Communities Strategic Option 2 - Enhance governance and policy implementation to prevent the conversion of forests to other land uses aligned to the REDD+ activities. It seeks to harmonize Policy, Legislations and Regulations (PLRs) that have historically resulted in deforestation and support institutional arrangements that can sustain existing forests.	
6.	The Green Economy Strategy and Implementation Plan (GESIP, 2016 – 2030)	GESIP is a national cross-sectoral strategy and implementation plan designed to support a globally competitive low carbon development path. Under thematic Area 3 (Sustainable Natural Resource Management), the Strategy recognizes that the transition to green economy entails addressing the drivers of natural resources and pursuing strategies that create conditions that encourage the community to participate in the conservation and management of land based natural resources.	The strategy fails to recognize deforestation and forest degradation among the barriers of green economy and consequently fails to include reduction or prevention of deforestation and degradation in the objectives and strategies for realizing the green economy under thematic area 3 on Sustainable Natural Resource Management
7.	The National Climate Change Action Plan (NCCAP, 2018-2022)	The aim of NCCAP (2018-2022) was "to further Kenya's sustainable development by providing mechanisms and measures to achieve low carbon climate resilient development in a manner that prioritises adaptation" One of the thematic areas is Forestry, Wildlife and Tourism under which the NCCAP seeks to "increase forest cover to 10% of total land area and rehabilitate degraded lands, including rangelands". It seeks to achieve this through the following activities:	The deliverables of the Action Plan have clear timelines but have no financing, monitoring and evaluation mechanisms. There is no coordination between the County and National Governments on afforestation and reforestation of degraded and deforested areas in the Counties.

		• Afforest and reforest degraded and deforested areas in Counties • Implement initiatives to reduce deforestation and forest degradation The Action Plan targets to achieve GHG emission reductions of 10.4 MtCO2e by 2023, through forest restoration, afforestation and reforestation, and reducing deforestation.	There was need for an audit (baseline study) to show the current status of deforestation and forest degradation in order to quantify the achievements.
8.	**Kenya Climate Smart Agriculture Strategy (2017-2026)**	The objectives of the Kenya Climate Smart Agriculture Strategy (KCSAS) are to adapt to climate change and build resilience of agricultural systems while minimising greenhouse gas emissions. The actions will lead to enhanced food and nutritional security and improved livelihoods.	
9.	**Climate Risk Management Framework (2017)**	The Climate Risk Management Framework for Kenya integrates disaster risk reduction, climate change adaptation, and sustainable development so that they are pursued as mutually supportive rather than stand-alone goals. It promotes an integrated climate risk management approach as a central part of policy and planning at National and County levels.	
10.	**KENAFF Farm Forestry and Afforestation Programme, 2021 – 2030**	The KENAFF Farm Forestry and Afforestation Programme, 2021 - 2030 is a strategy through which Kenyan farmers contribute to climate action as envisaged under the Paris Agreement, specifically to; contribute to mitigation and conserve and enhance sinks and reservoirs for greenhouse gas emissions. It is meant to support: a. The Kenyan government's initiative on regreening Kenya; b. The target to achieve 10% forest cover by December 2022; and c. The achievement of the Sustainable Development Goals (SDGs), specifically Goal 13 on Climate Action.	The programme lacks a strategy to ensure effective participation of all the farming fraternity including coffee farmers and other relevant stakeholders thus it may not be as impactful as desired. There is need for proper coordination to bring on board all the farming communities especially the coffee and the tea farmers who are mainly based in the highlands where the forests are also found.

3.5 LESSONS LEARNT FROM THE ANALYSIS

3.5.1 Summary of Findings

This analysis has shown that deforestation drivers in Kenya are largely associated with poor governance, inefficient policy implementation, and poor livelihoods of the forest-dependent communities. Poor governance has resulted to encroachment beyond forest boundaries, and allocation of forest areas to non-deserving entities. Inefficient policy implementation, including community policing, has caused gradual encroachment and removal of the forest resources, resulting in forest degradation and eventual deforestation. Lack of alternative livelihoods for forest dependent communities was identified as an underlying driver of forest degradation since the population growth is increasing rapidly. Therefore, providing alternatives to wood products and developing environmental-friendly livelihoods is ideal for reducing deforestation and forest degradation.

3.5.2 General Weaknesses of the Policies and Strategies

1) None of the forest protection policies has stipulated measures to prevent forest encroachment by farmlands.

2) Most of the existing policies, strategies and legislations are not properly aligned to the Kenyan Constitution, 2010 and lacks proper implementation and enforcement mechanisms.

3) Most of the strategies have been developed through policy directives and are meant to enforce some of the policies and legislations. However, they lack a clear direction and proper and innovative mechanisms to do so.

4) Most of the strategies recognize the roles played by different institutions in climate change mitigation and the importance of proper coordination between different institutions but do not provide a clear strategy to achieve this coordination. Lack of adequate mechanisms for linkages and coordination between stakeholders results in overlaps and inefficiency in implementation of the programs.

5) Some programs and strategies have limited innovative interventions on climate change adaptation and mitigation. They emphasize on short term measures overlooking the long-term measures such as afforestation and reforestation. A few of them which have embraced the long-term measures lacks innovative implementation mechanisms and hence they end up not making great impact.

6) Most of the existing policies and legislations are weak in enforcement mechanisms and hence they may not be quite impactful. They also lack adequate mechanisms to instil punitive measures against the perpetrators.

7) Most of the policies and strategies lacked proper community participation during their formative stages. They are focused towards environmental conservation and climate change mitigation without considering their social and economic impacts to the community hence the community does not relate with them.

ANALYSIS OF EXISTING POLICIES AND PROJECTS ON AGROFORESTRY IN KENYAN COFFEE PRODUCTION

Overall, Kenya's overarching development policy frameworks are supportive of agroforestry or planting of trees in farmland as a tool for achieving national sustainable development aspirations including food and nutrition security, incomes and related livelihood outcomes, and climate change, environmental and social resilience. An increasing number of government policy and strategy documents recognize tree-based interventions in agricultural landscapes as viable and attractive options in addressing deforestation and land degradation. However, adoption of planned agroforestry systems is still low in Kenyan farming systems including coffee farming. Therefore, there is need analysis of the existing national policies/ projects on agroforestry in the country, best practices and their impact on farmer prosperity. This analysis will identify the policy gaps, agroforestry adoption challenges and necessary areas of intervention in order to promote agroforestry systems in Kenya. This analysis of the agroforestry policy framework used the Kenyan coffee sector as a case study.

4.1 STUDY METHODOLOGY

The study adopted the following step-wise methodology to accomplish the assignment:

1. Review of the existing and emerging agro-forestry practices, technologies and/or innovations in coffee growing areas. This was achieved through a thorough review of the existing relevant secondary information, technical materials, reports and publications about agroforestry practices applicable in the coffee growing areas.

2. SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of the national policies/ projects on agroforestry in the country;

3. Analysis of agroforestry related policy provisions in Kenya and their implementation gaps. Some of the policies analysed include:

    a) Constitution of Kenya 2010

    b) Agriculture and Food Authority Act, 2013

    c) Environmental Management and Coordination Act

    d) Forest Conservation and Management Act 2016

    e) Kenya Agriculture sector growth and transformation strategy (2017-2027)

    f) Kenya National Agroforestry Strategy (2021 – 2030)

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

37

g) Kenya climate smart Agriculture strategy (2017-2027)

h) National Strategy for achieving and maintaining over 10% tree cover by 2022

i) Kenya National Climate Change Action Plan (NCCAP) 2018-2022

j) National REDD+ Strategy, 2022

k) The Green Economy Strategy and Implementation Plan (GESIP, 2016 – 2030)

4. Analysing the lessons learnt and using them to identify the strategic requirements for agroforestry adoption in coffee production and responsible actors presented in chapter seven.

4.2 AGROFORESTRY POLICY AND INSTITUTIONAL FRAMEWORK

Article 42 of the Kenyan Constitution (2010) provides the ground for the enactment of policies, legislation and strategies that guarantee the rights of citizens to a clean and healthy environment (GoK, 2010). This facilitates achievement of the 10% tree cover national threshold as provided by Article 69 (1) (b) of the constitution. Consequently, Article 72 requires parliament to enact the requisite legislation to operationalize these provisions. Secondly, Vision 2030 and accompanying Medium Term Development Plans (MTPs) commit to transforming Kenya into a middle-income country with high quality of life in a clean and safe environment. Thirdly, sustainable development is an underlying principle under the Vision 2030's economic pillar and commits to an enabling environment for sustainable exploitation of the productive sectors of the Kenyan economy, especially those linked to land use such as agriculture and forestry. Fourthly, environmental quality is among the eight social sectors identified under the social pillar in the Vision 2030 blueprint. The vision for the environment is 'A people living in a clean, secure and sustainable environment'.

Farmland and dryland tree planting are identified as flagship projects under the social pillar. This is a recognition of the latent potential offered by farmlands and drylands in improving tree cover in Kenya. Two other major dynamics shaping the unfolding policy and institutional landscape are the devolved system of governance and the ongoing shift from fragmented to an integrative approach to policy and institutional reforms for enhanced coordination and harmonization. The fourth schedule of the Constitution details the distribution of functions between the national and county governments, under the devolved governance system, with some functions relevant to promotion of agroforestry being devolved to county governments. They include the task of implementing national policies related to the agricultural sector (crops, fisheries and livestock) and some specific policies related to natural resources and environmental conservation such as farm forestry and forestry extension.

Although adequate institutional mechanisms to promote agroforestry exist, there is low coordination and interactions among the various actors and stakeholders that promote agroforestry in Kenya. Most importantly, the function of promoting agroforestry has been traditionally domiciled within the Ministry of Environment and Forestry (MoEF) due to the ministry's rich forestry repository. However, farmlands where most of agroforestry is practiced are the domain of the ministry responsible for Agriculture and Livestock (MoAL).

In addition, the contribution of private and non-governmental farmer's organizations (FOs) on agroforestry and environmental conservation cannot go unnoticed. There is need to conduct a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis on the national policies/ projects on agroforestry in the country based on four sub-pillars (Table 4.1 & 4.2):

1. Policy, legal and regulatory framework

2. Institutional framework

3. Financing mechanisms

4. Research & Capacity development

Agroforestry related policy provisions as well as agroforestry related strategies were then critically analysed and their weaknesses and implementation gaps were identified (Table 4.3 & 4.4).

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

39

Table 4.1: Strengths and Weaknesses of the National Agroforestry Policies/ Projects

Sub-Pillar	Strengths	Weaknesses
Policy, Legal and Regulatory Framework	• The existence of different policies and strategies that promotes agro-forestry either directly or indirectly including the following: a) Kenya's Constitution (2010) and Vision 2030 requires that at least 10% tree cover be achieved and maintained on all the land area of Kenya. b) National Strategy for achieving and maintaining over 10% tree cover by 2022. c) Forest Conservation and Management Act 2016. d) Environmental Management and Coordination Act e) Kenya Agriculture Sector Growth and Transformation Strategy (2017-2027) f) Kenya National Agroforestry Strategy (2021 – 2030) g) Kenya Climate Smart Agriculture Strategy (2017-2027) h) Kenya National Climate Change Action Plan (NCCAP) 2018-2022 was promoting agroforestry. i) National REDD+ Strategy, 2022 j) The Green Economy Strategy and Implementation Plan (GESIP, 2016 – 2030) • Constitutional requirements for multi-stakeholder participation in formulating policies and legal instruments. • Enabling social and political environment for promoting agroforestry in a multi sectoral setting.	• Lack of specific policy, regulations and strategy for agroforestry development. • Limited alignment of the existing agroforestry related Policies and Acts • Lack of recognition of agroforestry in the national accounting and auditing system. • Weak enforcement and compliance of existing laws and regulations. • Failure to adequately acknowledge the role of agro-forestry in climate change mitigation. • Lack of subsidy systems and incentives favoring agro-forestry approaches. • Low farmer awareness on the role and importance of agro-forestry in enhancing agricultural sustainability • Failure to adequately involve the farmers and the general public when formulating the policies. • Failure to recognize the major crops that can support agro-forestry in their production systems e.g. coffee

Institutional Framework	• Presence of various national and international governmental, non-governmental and private institutions contributing to promotion of agroforestry systems including the following:
	
	  a) National Government Institutions - KEFRI, KALRO, KFS, NEMA, Universities
	
	  b) Non-Governmental Institutions - ICRAF, Vi Agroforestry, CARE, World Vision, Solidaridad, Rainforest Alliance others;
	
	  c) Development Partners that support agroforestry systems e.g. P4F
	
	• Emerging farmers organizations focusing on the promotion of trees-on-farms including national apex organizations such as Kenya National Farmers Federation (KENAFF), Farm Forestry Smallholder Producers' Association of Kenya (FFSPAK) and regional affiliates e.g. Western Tree Planters Association (WETPA), South Coast Forest Owners Association (SCOFOA), Kisii Tree Planters Association (KTPA).
		• Inadequate coordination among the various actors and stakeholders that develop and promote agroforestry.
		
		• Inadequate skills/capacity and advisory services.
		
		• Lack of a joint platform for sharing agroforestry knowledge and information and coordinating agroforestry practices.
		
		• Weak coordination and institutional framework in enforcement of the existing laws and regulations related to matters agroforestry.
		
		• Limited financial resources, capacity, knowledge and policy support to institutions.
		
		• Lack of or weak horizontal coordination among farmers around tree-based commodities.

Financing Mechanisms	• Availability of financial support through grants, loans, subsidies and other forms of incentives towards agroforestry programs and projects by government agencies, non-governmental agencies, private companies and development partners. • Emerging private investments towards agroforestry mainly propelled by good returns realized from agroforestry e.g. through carbon credits or international recognition.	• Lack of necessary skills to develop grant winning proposals • Poor coordination between the funding organizations to align their agroforestry objectives for greater impact. • Inadequate access to sustainable credit facilities for agroforestry investment by farmers. • Insufficient resources (personnel & capital) for implementation of robust programmes in agroforestry • Poor monitoring and evaluation systems.

Research & Capacity Development	• The existence of universities, colleges and training institutions that train professionals in agroforestry. • Existence of local research institutions (KEFRI, KALRO, KIRDI, Universities) that are strong and well established in terms of human and physical capacity to effectively implement research nationally and even take regional leadership in some of the R&D themes in agroforestry. • Existence of international research organizations to broker access of innovations across international borders. • Existence of African Network for Agroforestry Education (ANAFE) that promotes the institutionalization of Agroforestry in education programs in universities and technical colleges.	• Lack of standardization of curricula in agroforestry education nationally and regionally. • Lack of innovative approaches to integrate the science and practice of agroforestry. • Limited documentation of formal support to education and training in agroforestry. • Inadequate centers for training farmers on agroforestry techniques. • Inadequate knowledge on agroforestry value chains for training package formulation. • Inadequate quantitative data to demonstrate/determine agroforestry's socio-economic and conservation benefits, etc. • Little emphasis on knowledge and information needs assessment. • Lack of sufficient infrastructure/ incentives e.g. government-sponsored internships to interest youth in agroforestry training.

Table 4.2: Opportunities and Threats in the National Agroforestry Policies/ Projects

Sub-Pillar	Opportunities	Threats
Policy, Legal and Regulatory Framework	• Existence of international conventions, treaties and agreements, which have been signed and ratified by Kenya e.g. Convention on Biological Diversity. • Devolvement of some key forestry and agricultural functions from the National Government to County Governments hence taking the services close to the farmers and the general public who are consumers of agro-forestry products. • Transition to Devolved Government Act, 2012 provides for a smooth transfer of devolved functions from National to County Governments. These include forestry functions being devolved from the Kenya Forestry Service (KFS) to County Governments.	• Lack of awareness of the existing international conventions, treaties and agreements and their importance hence poor compliance. • Conflicting interests among actors • Lack of clarity of devolved/shared functions. • Lack of political good will from the political leadership in the Counties.
Institutional Framework	• Avenues for collaboration in the related agroforestry programs with different like-minded institutions rather than different institutions carrying out agroforestry activities in isolation. • Opportunities for collaboration between the National and County governments in the implementation of agroforestry systems. • Availability of national and international research institutions that can be utilized to develop appropriate agro-forestry technologies including Research organizations that have a role in climate smart agriculture include: KALRO; KEFRI; ICRAF; CIFOR; ILRI; ICIPE; and Universities.	• Conflicting interests among different institutions and actors • Lack of clarity of the devolved and shared functions. • Lack of self-drive and other necessary incentives to propel research in agroforestry • Lack of adequate resources to promote agro-forestry practices.

Financing Mechanisms	• Existence of global funding instruments such as UNFCCC's Special Climate Change Fund, Green Climate Fund (GCF) and the Adaptation Fund under the Kyoto Protocol, Global Environment Facility (GEF), Least Developed Countries Fund, REDD+ and other facilities linked to the UNCCD. • Private-public partnerships providing blended finance and performance-based financing opportunities.	• Bureaucratic process and procedures in accessing donor funding. • Emerging global crises such as conflicts and pandemics could shift funding priorities.
Research & Capacity Development	• Support by NGOs and international organizations that promotes agroforestry through development of programmes, projects and information packages on agroforestry in agricultural production systems. • Existence of traditional knowledge on agroforestry that can be utilized in agricultural systems. • The existence of research institutions that can be used to develop agroforestry packages for specific crops (e.g. coffee, tea and food crops) for specific agricultural systems (e.g. for steep and flat farmlands, mechanized farming, PELIS) and agro-ecological zones (e.g. highlands, midlands and ASALs).	• A number of cultural beliefs and traditional practices hinder agroforestry development. • Institutional conflicts for example where some agroforestry centers tend to lean towards forestry. • Poor distinction of agroforestry from boundary disciplines, hence hindering targeted training. • Weak research-extension-farmer linkages and low adoption rate of technologies by farmers

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

44
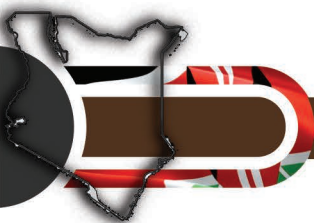
Table 4.3: Agroforestry Related Policy Provisions and their Implementation Gaps

S/No.	Policy / Project	Provisions relevant to Agro-forestry	Weaknesses / Implementation Gaps
9	Constitution of Kenya, 2010	Article 42 of the Constitution (2010) provides the ground for the enactment of policies, legislation and strategies that guarantee the rights of citizens to a clean and healthy environment	Although the constitution have enough provisions to support agro-forestry under article 69 (1), there are weak or no innovative strategies to implement these provisions.

Article 72 requires the parliament to enact the requisite legislation to operationalize these provisions. Unfortunately, the legislations have major implementation gaps and are fragmented (have no coordination). |
		Article 69 (1) (b) of the constitution – The state commits to work to achieve and maintain a tree cover of at least 10% of the land area of Kenya.	
		Article 69 (1) (c) – The state commits to protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities.	
		Article 69 (1) (d) – The state commits encourage public participation in the management, protection and conservation of the environment.	
		Article 69 (1) (e) – The state commits to protect genetic resources and biological diversity	

10	Agriculture Act Cap 318	PART I (Preliminary) of Agriculture (Farm Forestry) Rules, 2009 Section 4 (2) requires every person who owns or occupies agricultural land to establish and maintain a minimum of 10% of the land under farm forestry. This may include trees on soil conservation structures or rangeland and cropland in any suitable configurations, provided that the species of trees or varieties planted shall not have adverse effects on water sources, crops, livestock, soil fertility and the neighbourhood and should not be of invasive nature	Most farmers, land owners and occupiers are not aware of this farm forestry rule hence not implementing it.
		PART II (Farm Forestry Inspection and Enforcement) of Agriculture (Farm Forestry) Rules, 2009 Section 6 (1) states that "an inspector may at any reasonable time enter upon any agricultural land in an area of his/her jurisdiction for the purpose of ascertaining whether the farm owner or occupier has complied with 10% farm forestry requirement.	Although the enforcement mechanism is in place, the enforcement has not been taking place and no punitive measures in place.
11	Environmental Management and Co-ordination Act, 1999	The policy No. 46 (2) of EMCA 1999 on "Re-forestation and afforestation of hill tops, hill slopes and mountainous areas" provides for every County Environment Committee to encourage voluntary self-help activities in their respective local community, to plant trees or other vegetation in any area specified as **hilly and mountainous areas**.	The provision does not support planting of trees on other terrains that are not identified as "hilly and mountainous" thus discouraging tree planting in flat areas.
		The policy No. 56A of EMCA 1999 on "Guidelines on climate change" gives the Cabinet Secretary, in consultation with relevant lead agencies, authority to issue guidelines and prescribe measures on climate change.	No policy guidelines have been issued on best agro-forestry practices even for major crops like coffee and tea.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

46

12	Agriculture and Food Authority Act, 2013	Part IV Section 22 enables the Cabinet Secretary to make general rules for the preservation, utilization and development of agricultural land and such rules may: i) Prescribe the manner in which farming shall be done in accordance with the rules of good husbandry (sub-section b) ii) Advise on the kinds of crops which may be grown on land	Under these provisions, the Cabinet Secretary may issue policy guidelines on agro-forestry but this avenue has not been exploited.
		Part IV Section 23 enables the Cabinet Secretary to prescribe national guidelines for requiring, regulating or controlling the afforestation or re-afforestation of land [sub-section b (i)]	
13	Climate Change Act, 2016	Part III Section 13 enables the Cabinet Secretary (in accordance with Article 10 of the Constitution) to formulate a National Climate Change Action Plan which shall prescribe measures and mechanisms to: (a) towards the achievement of low carbon climate resilient sustainable development; (b) for adaptation to climate change; (d) for mitigation against climate change;	
14	Forest Conservation and Management Act 2016	Section 6 requires the Cabinet Secretary to formulate a **public forest strategy**. Sub-section (3) specifies the content of the public forest strategy which include among others, "programmes for achievement and maintenance of at least 10% tree cover of the land area of Kenya".	

Table 4.4: Agroforestry Related Strategies and their Implementation Gaps

S/No.	Strategy	Strengths and Objectives of the Strategy	Weaknesses / Implementation Gaps
11.	Kenya National Agroforestry Strategy (2021 – 2030)	Through a situational analysis, it identifies the strategic issues that will inform the strategic focus for investment in agroforestry practices in Kenya. Lack of coordination among the key actors in agro-forestry as well as lack of harmony in the policy framework is identified as one of challenges in the implementation of the strategy. However, the strategy has proposed an implementation plan and has identified the key actors to be involved in the Agroforestry Steering committee. The membership will include the ministries responsible for agriculture, environment and forestry, energy, education, public service, development partners and NGOs.	The proposed Agroforestry Steering Committee is yet to be formed and its performance may be jeopardized by the conflicting interests of the diverse membership. The agro-forestry practices may vary according to crops hence the strategies should be crops-specific e.g. coffee, tea, food crops etc.
12.	National Strategy for achieving and maintaining over 10% tree cover by 2022	The strategy aimed to deliver the following objectives by 2022: v. Produce 1.8 billion quality tree seedlings needed to increase tree cover to 10%; vi. Implement national policies, legislations and rules that require increased tree planting; vii. Strengthen institutional capacity of KFS to implement its mandate including fire management and enforcement of compliance; viii. Strengthen Coordination and collaboration in the governance of the forest sector;	The strategy failed to recognize the role of agro-forestry in achieving and maintaining over 10% tree cover. The strategy did not therefore enforce the Agriculture (Farm Forestry) Rules 2009 that seeks to promote and maintain farm forest cover of at least 10% of every agricultural land holding. The Presidential Directive on accelerated tree planting to achieve the 10% National tree cover by 2022 was partially implemented in government institutions but not to the general public and farming communities.

		ix. Enhance conservation and protection of natural forests on public, community and private lands and rehabilitation of degraded areas; x. Enhanced national tree planting campaigns through national and county tree planting events, public education, awareness, sensitization; xi. Adopt use of alternative energy sources and efficient wood conversion and utilization technologies by institutions, industry and households; xii. Implement innovative restoration programs, including the Greening Kenya Initiative; Greening of infrastructure and Institutions, the "Adopt a forest" concept and the Environmental Soldier Programme (ESP) of the Kenya Defence Forces to support seedlings production and rehabilitation of degraded forest areas; xiii. Strengthen Forest resources assessment, monitoring and reporting capabilities of forest sector institutions and xiv. Establish commercial forest plantations on public, private and community lands to provide adequate and sustainable timber, poles and fuelwood for industrial and domestic consumption.	Another Presidential Directive on "review of teaching curriculum to include sustainable forest management" was not implemented as a common course in the University curricula.
13.	Kenya Agriculture Sector Transformation and Growth Strategy (2019 – 2029)	The Strategy is based on the belief that food security requires a vibrant, commercial and modern agricultural sector that supports Kenya's economic development sustainably and its commitments to regional and global growth.	However, the Strategy puts emphasis to short-term climate change mitigation and resilience measures such as early warning and response systems for adverse environmental effects but overlooks long-term measures such as agro-forestry.

		The ASTGS has three anchors to drive Kenya's 10-year transformation: i) Increase small-scale farmer, pastoralist and fisherfolk incomes; ii) Increase agricultural output and value add; and iii) Boost household food resilience. ASTGS recognizes the importance of addressing the effects of climate change and other agricultural challenges in Kenya. It also recognizes the importance of climate-smart agriculture in increasing agricultural productivity and incomes; adapt and build resilience to climate change; and reduce and/or remove greenhouse gas emissions.	
14.	Kenya Climate Smart Agriculture Strategy 2017 – 2026.	The overall objective of this strategy is to build resilience and minimize emissions from agricultural farming systems for enhanced food and nutritional security and improved livelihoods. The specific objectives are: i. To enhance adaptive capacity and resilience of farmers, pastoralists and fisher-folk to the adverse impacts of climate change; ii. To develop mechanisms that minimize greenhouse gas emissions from agricultural production systems; iii. To improve coordination and collaboration among institutions and stakeholders in climate smart agriculture; and iv. To address cross-cutting issues that adversely impact or enhance CSA (GoK, 2017)	The Strategy recognizes the huge role of agroforestry in reducing greenhouse gas emissions since the trees are major carbon sinks and hence agro-forestry has a potential for forest carbon stock enhancement. However, there is lack of effective incentive mechanisms to motivate adoption of agroforestry and enhancement of carbon stocks (REDD+) in the farming systems.

| 15. | National REDD++ Strategy, 2022 | The strategy seeks to support Kenya's goal to achieve low-emission development through REDD+ for multiple benefits. This is towards the realization of one of the aspirations under Kenya's Vision 2030 to achieve 10% of national tree cover and become a carbon neutral middle-income country providing a high quality of life to all its citizens in a clean and secure environment. The strategy seeks to achieve the following specific objectives:
   vii) Increased forest and tree cover
   ix) Enhanced productivity of the forest
   x) Increased investments in forest development
   xi) Protecting existing forest cover
   xii) Integrated good governance in forestry sector
   xiii) Enhanced forest based economic, social and environmental benefits
   xiv) Enhanced livelihoods of the Indigenous Peoples and Local Communities | The strategy fails to recognize agroforestry as one of the approaches for "enhancement of forest carbon stocks" which refers to efforts that increase forest carbon stocks through afforestation, enrichment planting or conservation of forests.
This is largely interpreted to mean "the conversion of non-forests to forestlands and increase in canopy cover e.g. from open to dense forest". However, increase of tree cover in farmlands through agroforestry may also play a similar role. |
| 16. | The Green Economy Strategy and Implementation Plan (GESIP, 2016 – 2030) | GESIP is a national cross-sectoral strategy and implementation plan designed to support a globally competitive low carbon development path. Under Objective 2.2 (iii) of the thematic area 2 (Building resilience of economic, social and environmental systems to the adverse effects of external shocks), the strategy identifies the need to "Grow fast-maturing, high value trees that have multiple commercial uses. Again, under Objective 3.2 (i) of thematic Area 3 (Sustainable Natural Resource Management), the Strategy supports the move towards 10% tree cover. | The strategy fails to recognize the role of agroforestry in any of these objectives and even under Thematic Area 5 on Social Inclusion and sustainable livelihoods |

17.	The National Climate Change Action Plan (NCCAP, 2018-2022)	The NCCAP (2018-2022) was developed as required by the Climate change Act 2016. It seeks to further Kenya's sustainable development by providing mechanisms and measures to achieve low carbon climate resilient development in a manner that prioritises adaptation. Some of its objectives are: To increase food and nutrition security through enhanced productivity and resilience of the agricultural sector in as low-carbon manner as possible; To "increase forest cover to 10% of total land area and rehabilitate degraded lands, including rangelands" The action plan recognizes agroforestry as one of the climate smart actions with win-win benefits capable of transforming the country towards becoming climate change resilient. In fact, one of the deliverables of the action plan is to increase the total area under agroforestry at farm level by 200,000 acres by 30th June 2023.	The NCCAP has identified its financing requirements but have not put in place any financing mechanisms. In addition, the Action Plan has many deliverables which have clear timelines but have no monitoring and evaluation mechanisms.

4.3 LESSONS LEARNT FROM THE ANALYSIS

4.3.1 General Weaknesses of the Policies and Strategies

1) Most of the existing policies, strategies and legislations are not properly aligned to the Constitution and do not recognize the role of agroforestry as a CSA intervention. Most of the strategies have been developed through policy directives and are meant to enforce some of the policies and legislations. However, they lack a clear direction and proper and innovative mechanisms to do so.

2) Most of the strategies recognize the roles played by different institutions in climate change mitigation and the importance of proper coordination between different institutions but do not provide a clear strategy to achieve this coordination. In other words, there are inadequate mechanisms for linkages and coordination between CSA agencies and stakeholders which results in overlaps and inefficiency in implementation of programs.

3) Various CSA instruments provide limited innovative interventions on climate change adaptation and mitigation. They emphasize on short term measures overlooking the long-term measures such as agro-forestry, afforestation and reforestation. A few of them which have embraced the long-term measures lacks innovative implementation mechanisms and hence they end up not making great impact. For example, none of the reviewed strategies has suggested an innovative way of promoting agroforestry in high potential crops such as coffee and tea.

4) Most of the existing policies and legislations are weak in enforcement mechanisms and hence they may not be quite impactful. They also lack punitive measures to punish the perpetrators.

5) Most of the policies and strategies are not farmer centric. They are focused towards environmental conservation and climate change mitigation without considering the impact they would have on farmer prosperity in terms of the cost of adoption and related economic benefits.

4.3.2 Barriers of Agroforestry in Kenya's Agricultural Systems

1) Lack of awareness of the value of agroforestry among the Kenyan farming community due to weak extension programs;

2) Lack of tested and proven agroforestry packages that are specific to specific crops (e.g. coffee, tea, food crops), specific agricultural systems (e.g. farmlands, rangelands and PELIS) and agro-ecological zones (e.g. highlands, midlands and ASALs);

3) Inadequate incentives to develop agroforestry practices in farmlands and rangelands e.g. payment for environmental services to the farmers who are already practicing agroforestry purposely to encourage them to continue and improve.

4) Lack of adequate policy guidelines on agroforestry at national and county levels;

5) Lack of enforcement of some supportive policies e.g. the Agriculture (Farm Forestry) rules of 2009 requires every person who owns or occupies agricultural land to establish and maintain a minimum of 10% of the land under farm forestry. These may include trees on soil conservation structures, rangeland and cropland provided the tree species, or varieties have no adverse effects on water sources, crops, livestock, soil fertility and the neighbourhood and are not invasive in nature [Rule no. 4 (2)]. The rules further provides mechanisms for enforcement by

stating that "an inspector may at any reasonable time enter upon any agricultural land in an area of his/her jurisdiction for the purpose of ascertaining whether the farm owner or occupier has complied with 10% farm forestry requirement [Rule no. 6 (1)].

6) Lack of adequate programmes and projects on agroforestry in agricultural production systems supported by effective monitoring and evaluation mechanisms.

7) Land tenure systems that do not align with long-term land-use planning for long term investments such as agroforestry e.g. temporary occupancy on leased land or family land.

POTENTIAL OF AGROFORESTRY IN THE KENYAN COFFEE SECTOR

5.1 SUITABILITY OF AGROFORESTRY IN COFFEE PRODUCTION

The most used criteria for classifying agroforestry systems are the structure (in terms of composition and/or arrangement of components), function, ecological zones, and end-use orientation (Agroforestry Network, 2018). Based on composition of components, five main agroforestry systems have been identified:

a) Agro-silvicultural - where non-woody crops are integrated with trees;

b) Silvopastoral - for systems that integrate trees and livestock e.g. in the rangelands;

c) Agro-silvopastoral - for systems that integrate crops, livestock, and trees;

d) Entomo-silvicultural - for systems that integrate insects and trees (including specialized systems such as apiculture (trees and bees) and sericulture (silkworms and trees); and,

e) Aqua-silvicultural - for systems that integrate fish and trees.

The above systems can take different time (temporal) and space (spatial) configurations as may be designed by the farmer to leap maximum benefits. Agroforestry in coffee production can be made to innovatively fit in the 1st, 3rd, 4th system all of which offers additional benefits to the farmer and mutual benefits to the different agricultural products involved in that specific agroforestry system.

Based on the functional basis, there are two main categories of agroforestry:

a) Productive functions (e.g. production of food, fodder, and wood) and

b) Protective functions (e.g. ecosystem/intangible services).

With regenerative/conservation agriculture, agroforestry in coffee production contributes to both functions. Under the production functions, coffee will produce food while the agroforestry trees may produce wood (e.g. *Grevilea robusta*) or food (e.g. macadamia) or fodder (e.g. Calliandra). Under protective functions, both coffee and various agroforestry trees will contribute significantly to environmental protection and conservation by acting as carbon sinks, carbon sequestration and protecting the soil against erosion by water and wind.

Based on the ecological zones, agroforestry may be classified under **humid/sub humid, semi-arid/arid, and highlands** systems and coffee fits well under the latter which offers the best climate for coffee production. On end-use orientation, agroforestry systems may be classified as **commercial, intermediate, or subsistence** based on the market orientation. For other crops, this largely depends on the level of production in terms of acreage and quantity of the products

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

55

but coffee fits well under commercial since over 95% of Kenyan coffee is usually destined to export market. However, largescale coffee producers usually tend to adopt agroforestry practices to a higher extent as compared to intermediate and subsistence producers with relatively smaller portions of land.

The diverse agroforestry system criteria described above is relevant in appraising, designing, and evaluating agroforestry development interventions and it places coffee as a strong candidate for agroforestry with eminent multi-faceted mutual benefits.

5.2 BENEFITS OF AGROFORESTRY IN COFFEE PRODUCTION

It is often assumed that agroforestry in coffee farming is beneficial ecologically as well as economically (Perfecto and Armbrecht, 2003). Although coffee shading by agroforestry trees may cause a significant decrease in coffee yields, the shade regulates production thus preventing biennial bearing, overproduction and die back. Moderately shaded Arabica coffee plants have photosynthetic rates three times higher than coffee leaves under full sun (Davis et al., 2012). Coffee shading may be beneficial in reducing extreme temperature and excessive light, regulating rainfall patterns, increasing the relative humidity of the air, reducing soil temperature and providing mulch via their fallen leaves and inhibiting weed growth (Perfecto and Armbrecht, 2003; Lin et al., 2008). Shade trees reduces air temperature by about 4°C at midday. Therefore, coffee plants grown in the shade suffer less from environmental stresses and have higher biochemical and physiological potential for carbon fixation (CABI, 2009). Shade protects the coffee plants from drought stress and over exposure to sun, which causes yellowing and death of leaves, tree overbearing and/ or dieback in older trees. Shade also promotes a better balance between flowering and growth resulting in better berry production. Shaded coffee trees are associated with better cup profiles as they produce larger and heavier beans which ripen much slower resulting in better quality and taste. Therefore, high cup quality and large bean size are some of the characteristics of coffee grown under shade. However, optimal shade levels should be identified because heavy shade may result in significant yield reduction and high severity of Coffee Berry Disease (CBD). Optimal shade levels are likely to be below 50%, especially for coffee that receives fertilization or supplemental irrigation (Youkhana and Idol, 2010).

Coffee agroforests may be important for the conservation of biodiversity within forest fragments. Agroforestry trees act as a shelter for beneficial insects and vertebrates (Rahn et al., 2013). In degraded areas, planting agroforestry trees in coffee plantations would result in highest mitigation potential and adaptation to climate change (Sanchez and Sotomayor, 2008). Reforestation with coffee agro-forestry systems results in additional benefits that are more important for the local livelihood needs, such as income generation from both the coffee and agroforestry trees. Agroforestry trees may provide additional income through the sale of their wood or fruit, they act as additional carbon sinks as the absorb carbon dioxide from the air and store it within them, and they can fix nitrogen and other needed nutrients. Legumes used as shade trees contribute substantially to soil health by providing organic matter and nutrients from leaf fall and prunings, and fix nitrogen from the air to restore soil fertility and structure. Shade trees act as windbreakers to protect the coffee trees from excessive and destructive winds and some even repel dangerous pests found in the environment. Shade trees also reduce the incidence of frost.

The shade trees should be planted in between the coffee rows at a spacing that would not cause too heavy shade that may adversely affect coffee production by reducing the yields or causing high incidences of CBD. The lower branches of the young shade trees should be removed as they grow to ensure that the canopy of the trees forms above the coffee trees.

5.3 RECOMMEDED SHADE TREES IN COFFEE

Coffee agroforestry trees may be of three types:

a) Use of deep-rooted woody trees which are often native to the region. This type of system has a lot of benefits. It's a long-term investment because the wood from the trees may ultimately be harvested and sold. Even without wood harvesting, these trees improve the value of the land and could be leveraged to get a loan if needed. The trees maintains the soil structure, provides habitats for birds and other animals and increases carbon sequestration. Since the trees are deep rooted, they do not compete with the coffee for water and nutrients but instead they recover soil nutrients from deeper soil horizons and transport them to their leaves. When the leaves fall and rot, they provide organic matter or manure which is released to the coffee plantation. This organic matter improves the soil texture and water retention thus availing the much needed water to the coffee. Besides, it's a low-maintenance system that doesn't require additional input. However, since the main purpose is to maintain the coffee farming, the trees should be adequately spaced out provide a shade to sun ratio of 2:3, which is ideal for coffee growing. The best trees are those with umbrella shaped canopies of smaller leaves.

b) Intercropping with other high value trees that provide fruits or nuts. This system provides both shade for coffee and additional regular income every year from the sale of fruits or nuts. The additional revenue can help alleviate cash flow problems for the farmer. The trees also attract attracts a lot of biodiversity like birds and insects and also maintains soil structure, helping in the fight against erosion. However, some caution should be taken because fruit trees can compete with the coffee for water and nutrients leading to a decrease in the coffee quality. The tree should be chosen based on the farm environment and local market prices. Ideally, they should have a moderately high canopy in order to provide a light shade that's not too intense. Macadamia nut trees are very common in coffee agroforestry.

c) Leguminous shade trees are used, not to provide an additional income, but to add nutrients to the soil – particularly nitrogen. This system can provide real savings in fertilizer thus opening the door to organic certification. These trees tend tend to be fast growing, which makes them a better choice for creating shade in already established coffee plantations. Farmers should be aware that leguminous shade trees tend to need annual maintenance, particularly pruning. In addition, they can compete with coffee for other nutrients and water. Most leguminous shade trees are also a source of foliage for domestic animals and at the same time an important source of firewood in rural households when they are pruned to regulate shade, a process called pollarding. Unfortunately their wood is soft and therefore not marketable.

Numerous species can be used as shade trees – some of the most preferred or most commonly used are described in Table 5.1.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

57

Table 5.1: Some of the recommended coffee agroforestry trees

	Tree name and brief description	Image
1	*Albizia coriaria* - a deciduous tree with a heavily branched, spreading, dome-shaped crown. It usually grows up to 35 metres tall. It is sometimes grown as an ornamental shade tree valued especially for its bright green splashes of new foliage growth and showy flowers. It's a legume that is able to fix atmospheric nitrogen in the soil thus improving the soil fertility.	
2	*Cordia africana* - an evergreen shrub or tree with a heavily branched, spreading, umbrella-shaped or rounded crown. It usually grows 4 - 15 metres tall, but some specimens can be up to 30 metres. It is cultivated for the timber, its edible berries, as shade tree in coffee plantations, as a medicinal plant and also for ornamental purposes.	
3	*Ficus ovata* - an evergreen, much-branched shrub or a tree with a spreading crown; it usually grows to around 10 metres tall, but some specimens may grow up to 25 metres It often starts life as an epiphyte in the branch of a tree and can eventually send down aerial roots that, once they reach the ground, provide extra nutrients that help the plant grow more vigorously.	
4	*Grevillea robusta* – a deciduous tree with a dense, conical crown; it can grow 12 - 25 metres tall with exceptional specimens up to 40 metres. The tree is often cultivated in the tropics for timber and as a windbreak. It is often grown in gardens or farms as an agroforestry tree. The tree flowers freely in subtropical areas, but only poorly in the lowland tropics.	
5	Sesbania sesban - a short-lived shrub or small tree with a narrow crown; it can grow from 1 - 7 metres tall. Plants grown closer together tend to produce one main stem, but when growing in a more open position tend to produce many side branches from low down on the bole. It is often grown in agroforestry systems to provide shade, shelter, organic matter etc. Having a long history of cultivation in tropical Asia and Africa, the origin of this species is unclear, though it is likely to have been North Eastern Africa.	

6	*Markhamia lutea* - an evergreen shrub or small tree with a narrow, irregular crown; it can grow 10 - 15 metres tall, though it has been reported to reach heights of 40 metres. It is sometimes grown as an ornamental and also to provide shade and screening. It is a plant of the moist tropics, where it is found at elevations from 700 - 2,000 metres. It is found in areas where the mean maximum and minimum temperatures fall within the range of 18 - 28°C, though it can tolerate 14 - 32°C. It prefers a mean annual rainfall of 800 - 2,000 mm.	
7	*Erythrina subumbrans* - a deciduous tree with a spreading crown and branches. It is fast growing and easily propagated from cuttings. It can grow 5 - 35 metres tall. It is among the most preferred shade trees for cocoa, coffee and tea plantations in tropical countries. At one time this species was one of the most widely planted shade trees for coffee and other crops in Indonesia, until large numbers of trees were destroyed by a root disease in the late 19th Century	
8	*Gliricidia sepium* - a shrub or small tree with a medium-sized, open crown; it can grow 2 - 15 metres tall. A very valuable multipurpose tree and important component of various agroforestry systems, the tree is often cultivated in many tropical countries including Africa. It serves as a pioneer species to establish the site, as a shade and support tree, as a green manure and forage crop in plantations. It looses leaves and begins to flower in the dry season unless pruned in wet season to keep plant vegetative. It fixes nitrogen from the air thus improving soil fertility.	
9	*Cassia siamea* – a medium-size, evergreen tree that grows up to 18 metres tall with a crown that is usually dense and rounded when young, later becoming irregular and spreading with drooping branches. It is particularly valued for its high quality firewood, and it is widely cultivated in the tropics both for this and for its many uses in agroforestry systems. It is also grown as an ornamental and its use for reforestation activities is also growing. It's a good shade tree but does not fix nitrogen and can compete with coffee for nutrients and water.	

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

59

| 10 | *Melia azedarach* - a fast-growing, deciduous tree that can reach a height of around 45 metres in moist areas, though it is much smaller in the cooler and drier regions. It is planted for re-reforestation in its native areas, where it is a fast growing though short-lived species. It drops a lot of leaves thus adding organic matter in the soil. It's a good timber tree that may provide some insect control as the seed extracts are used as insecticide and repellent. It is often cultivated in many parts of the tropics. | |

When selecting the best shade trees for coffee, the tree species with the following traits need to be avoided:

i) Trees that are alternate hosts to coffee pests e.g. Avocado and *Albizia chinensis* are alternate hosts to the Black Coffee Twig Borer.

ii) Hardwood trees that attract wood sawyers e.g. *Maesopsis emimii*.

iii) Trees that take very long to grow e.g. *Milicia excelsa* (Muvule)

iv) Trees that have conical shaped canopies which would provide conical shaped shade e.g. jack fruit tree.

v) Trees that have leaves that take very long to decompose.

vi) Trees that produce thorns as these are very difficult to tame e.g. *Erythrina abyssinica*

vii) Poisonous trees

5.4 COFFEE AS A CANDIDATE FOR PELIS

Plantation Establishment and Livelihood Improvement Scheme (PELIS) a system whereby Kenya Forest Service (KFS) allows forest adjacent community, through community forest associations the right to cultivate agricultural crops during the early stages of forest plantation establishment. Cultivation is often allowed to continue for 3 to 4 years until tree canopy closes. The PELIS scheme is meant to improve economic gains of participating farmers while ensuring success of planted trees. It is a modified form of 'Shamba' System which for a long time has been used by the Government of Kenya to raise forest plantation at a low cost. Since coffee would continue to produce albeit at low yield levels inside the young trees, the system can be used with coffee farmers and the farmers can be allowed to continue harvesting coffee for a longer period until when the coffee would stop producing due to heavy shade. This would have economic benefits to both the Kenya Forest Service and the coffee farmers. The KFS would benefit from low plantation establishment costs and high tree seedling survival while the coffee farmers would enjoy the returns from organically produced coffee at very low cost.

60

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

ANALYSIS OF AGROFORESTRY AND DEFORESTATION STATUS IN COFFEE GROWING HIGHLANDS IN KENYA

6.1 SITUATION ANALYSIS

In Kenya, agricultural expansion is a major driver of deforestation and land degradation, and emitter of greenhouse gases. Ironically, the same agricultural sector is highly vulnerable to climatic changes and variability such as extreme weather events characterized by extreme temperatures, drought, floods, hailstorms among others. It is estimated that drought, a major climatic hazard in Kenya has become more and more frequent and between 2008 and 2011, caused losses of KSh. 699.3 billion (72.2% of total losses) and KSh. 121.1 billion (12.5% of total losses) in the livestock and crops sectors respectively (GOK, 2018a). With the deteriorating climatic conditions, the annual growth rate of agricultural "value added" products have been on the decline. Extended periods of drought, increase in incidences of flooding and invasive pests such as fall army worm and locusts have negatively impacted on livelihood opportunities and community resilience in these areas. This leads to undesirable coping strategies that damage the environment and impair household nutritional status, further undermining long-term food security (GOK, 2018b).

Most Kenyan people live in medium to high potential agro-ecological zones that are suitable for both crop production and tree growing including forestry development (GOK, 2016). Coffee production is undertaken in medium to upper midland agro-ecological zones where forests are found and agroforestry is also practiced. Projected increase in population and urbanization is expected to put more pressure on land and natural resources to keep pace with growing demand for agri-food products. For example, it is projected that by 2050 there will be 54 million rural residents expected to produce agricultural outputs for their own consumption, for export and for feeding another 43 million urban residents (GOK, 2016). As temperatures continue to rise due to climate change, some areas that used to be suitable for coffee production are tending to become less suitable. Coffee farming is moving slowly from medium to higher altitudes in search of more suitable production areas. Therefore, coffee is one of the candidate crops whose expansion is may lead to clearing of forests to open more farmland that in turn would result in increased emission of greenhouse gases.

6.2 SURVEY OF AGROFORESTRY AND DEFORESTATION STATUS

A study was conducted to assess the status of agroforestry, deforestation and adoption of CSA in selected Kenyan highlands with coffee expansion. The respondents were purposively sampled from the coffee farming highlands and based on their proximity to forests. A total of 213 farmers were interviewed (Table 5.1).

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

61

Table 6.1: Survey Sampling Frame

Region	County	Sub-County	Nearby Forest	Respondents	Distance (km) from the Forest
Central	Kirinyaga	Baricho	Mt. Kenya	3	18
		Ndia	Mt. Kenya	2	16
		Kagumo	Mt. Kenya	2	18.5
		Kirinyaga Central	Mt. Kenya	4	12
		Kirinyaga East	Mt. Kenya	9	8
		Kirinyaga West	Mt. Kenya	12	8
	Murang'a	Gatanga	Aberdare	14	28
		Kangema	Aberdare	13	29
	Nyeri	Mathira East	Tumutumu	16	7
		Mathira West	Tumutumu	14	3.5
Eastern	Embu	Embu East	Mt. Kenya (Irangi)	13	7
		Embu West	Njukiri	10	13
		Embu North (Manyatta)	Njukiri	3	10
		Embu North (Manyatta)	Mt. Kenya (Irangi)	12	11
	Meru	Imenti Central	Mt. Kenya (Gituune)	9	4.5
		Imenti North	Mt. Kenya	19	4.8
Rift Valley	Narok	Narok South	Mau North	11	6.5
Western	Bungoma	Bungoma Central	Mt. Elgon	2	37.5
		Bungoma West	Mt. Elgon	2	23
		Cheptais	Mt. Elgon	26	9.3
		Kabuchai	Mt. Elgon	3	17
		Mt. Elgon	Mt. Elgon	3	13
		Sirisia	Mt. Elgon	11	8
Total Number of Respondents				**213**	**Av. 13.6 km**

6.3 SURVEY RESULTS

6.3.1 Demographic Status of the Respondents

The study targeted only the household heads to be interviewed because they held first-hand information relating to areas of interest. Most of the respondents (73%) were male while the rest (27%) were female. Majority of the farmers were elderly with 65.2% of the respondents aging above 50 years and the rest 34.8% aged below 50 years. Only 1.9% were in the youthful age of 18 – 30 years (Figure 6.1). This indicates that most of the coffee farmers in Kenya are elderly. The study further revealed that there were more women in the older age of above 60 years than men but there were more men in the younger ages than women.
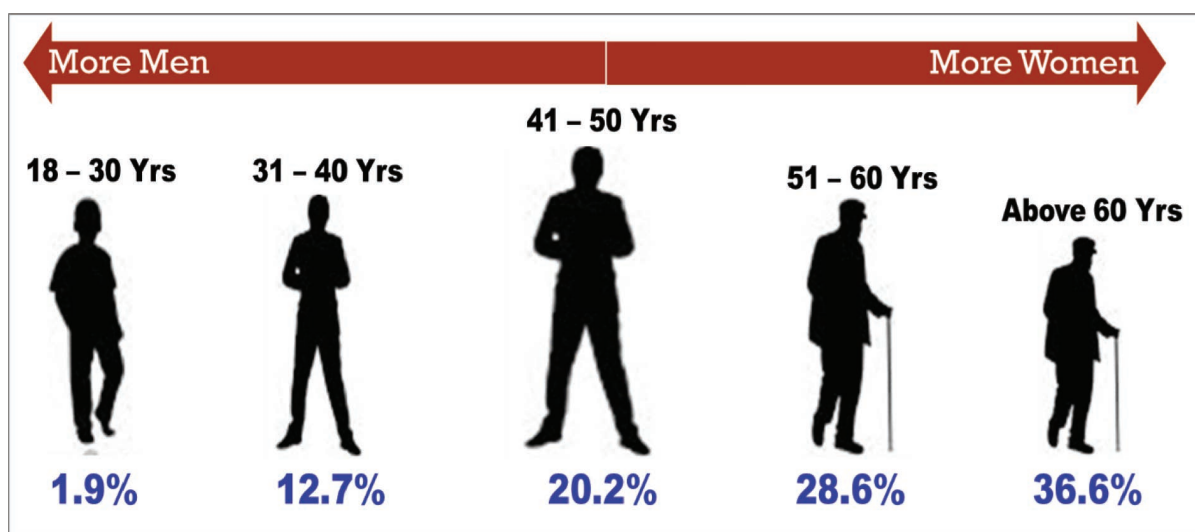
Figure 6.1: Age of the sampled respondents. This may be indicative of the age of the coffee farmers in Kenya

The demographic analysis of the study further showed that the most (70.4%) of the respondents had attained at least secondary education with only 3.8% having no formal education (Figure 6.2a). This indicated that the respondents were capable of making key decisions related to technology adoption in coffee farming. In addition, only 29.1% of the respondents had less than 10 years of the coffee farming experience. The rest (79.9%) had over 10 years of coffee farming experience with 15% having over 40 years experience (Figure 6.2b).

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

63
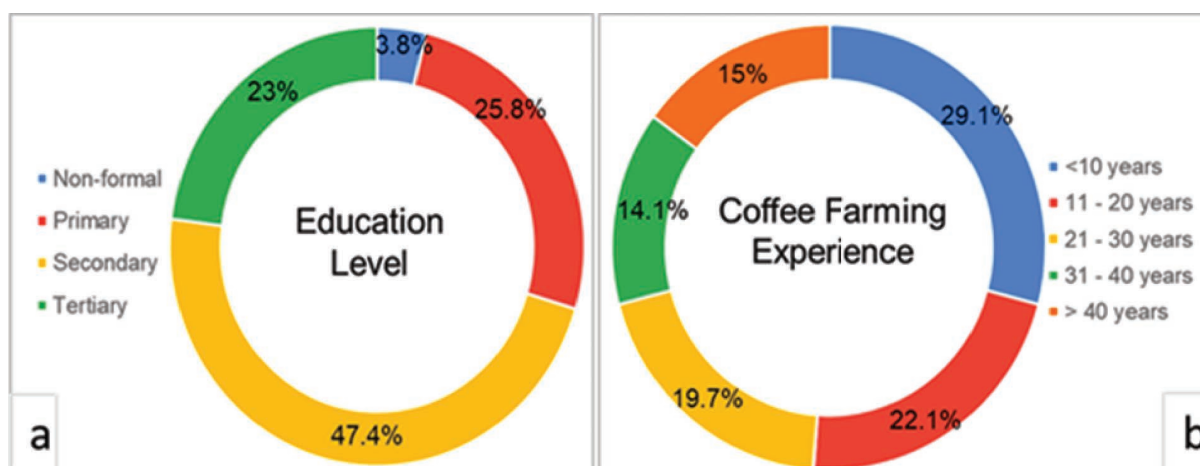
Figure 6.2: Education level and coffee farming experience of the respondents

Assessment of the land sizes owned by the farmers showed than most of them (83.1%) are smallholder farmers with less than or up to 5 acres of land. Consequently, most of the coffee farms that were covered in this study (95.7%) were less than or up to 5 acres with 56.3% of the respondents having less than 1 acre (Figure 6.3). However, there seemed to be no correlation between the land sizes and the coffee farm sizes although there was weak regression between the two parameters (Figure 6.4).
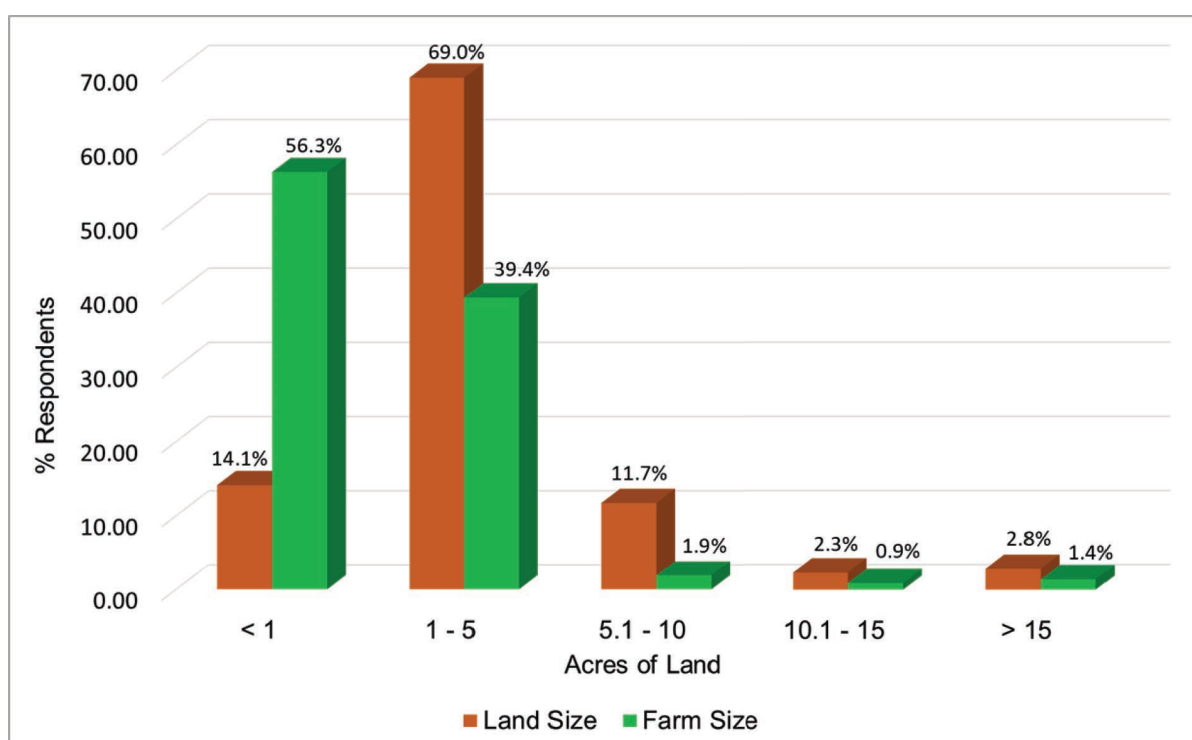
Figure 6.3: Total land size and coffee farm size in acres

64

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production
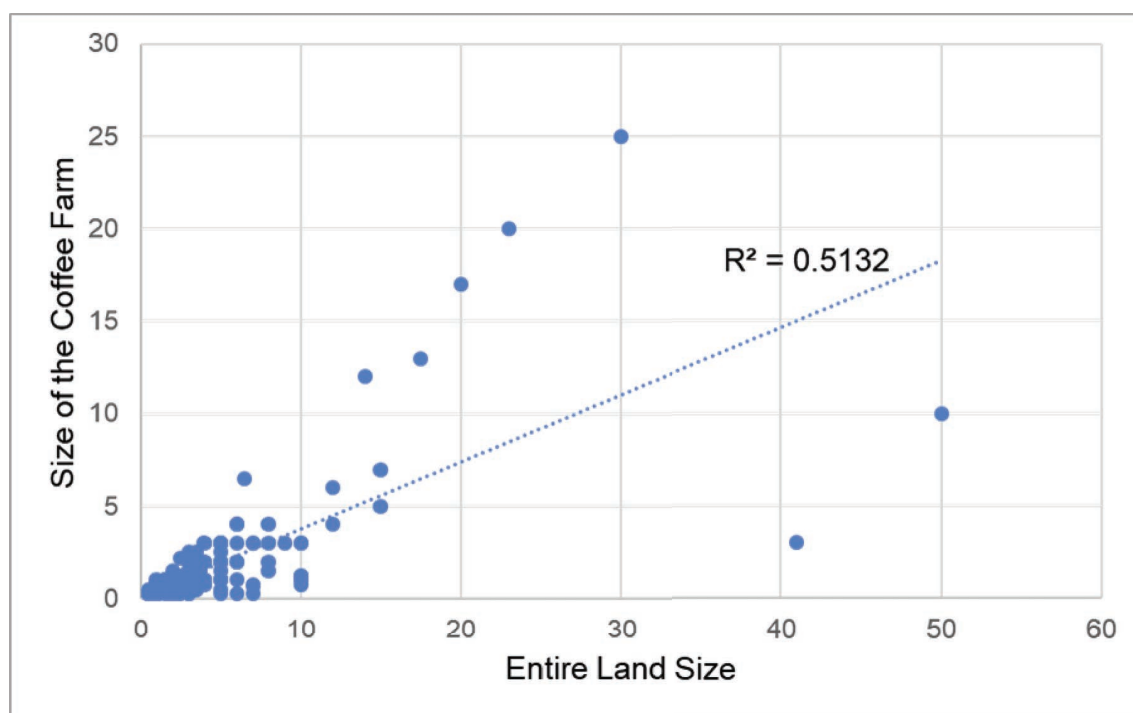
Figure 6.4: Regression analysis between the land sizes and coffee farm sizes

6.3.2 Coffee Varietal Popularity

The study further assessed the popularity of the five Kenyan coffee varieties among the sampled farms (Table 6.2). This was done in an attempt to ascertain whether there was any relationship between agroforestry adoption and variety adoption. In addition, this analysis was aimed at confirming whether coffee expansions with improved coffee varieties was promoting deforestation or forest encroachment. The study showed that the improved Ruiru 11 cultivar was the most popular among the sampled farmers with general popularity of 55.52%. This cultivar had the highest adoption in all the sampled counties except Nyeri and Narok. The traditional SL28 cultivar was the second most popular variety with 40.71% average popularity followed by the improved Batian cultivar with 39.11% average popularity. The SL28 was most popular in Central Kenya region led by Kirinyaga (71.88%), Nyeri (70.97%) and Murang'a (51.85%). The cultivar also had a considerable adoption in the Eastern region with average popularity of 44.74% and 37.04% in Embu and Meru respectively. For the Batian cultivar, the highest popularity of 100% was in Narok County because this is an emerging coffee growing area with relatively low rainfall hence their choice for Batian. The variety K7 was the most popular in Bungoma (80.85%) and slightly popular in Embu (13.16%). SL34 had the least average popularity of 8.19% with its highest adoption being recorded in Embu (31.58%) followed by Kirinyaga (15.63%) and slight adoptions in Nyeri (6.45%) and Meru (3.7%). Considering that all the six traditional coffee growing areas (Kirinyaga, Murang'a, Nyeri, Embu, Meru and Bungoma) showed significant levels of adoption of both traditional (SL28,SL34 and K7) and improved (Ruiru 11 and Batian) varieties, this was an indication that coffee expansion has been taking place in these areas.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

65

Table 6.2: Popularity of the Kenyan coffee varieties

County	Popularity (%)				
	SL28	SL34	K7	Ruiru 11	Batian
Kirinyaga (32)	71.88	15.63	0.00	65.63	37.50
Murang'a (27)	51.85	0.00	0.00	81.48	25.93
Nyeri (31)	70.97	6.45	0.00	41.94	9.68
Embu (38)	44.74	31.58	13.16	57.89	18.42
Meru (27)	37.04	3.70	0.00	66.67	33.33
Narok (11)	0.00	0.00	0.00	9.09	100.00
Bungoma (47)	8.51	0.00	80.85	65.96	48.94
Average Popularity	**40.71**	**8.19**	**13.43**	**55.52**	**39.11**

6.3.3 Climate Change Effects

The study sought to assess the magnitude of various climate change effects in the sampled coffee growing areas in the last 5 years. The sampled farmers reported various climate change effects that have increasingly constrained their coffee production in the last five years as shown in Figure 6.5. The results showed that rainfall reduction was the most constraining climate change related effect followed by high temperatures, unpredictable seasonal changes and pest prevalence. These effects were reported by 92%, 80%, 67% and 57% of the respondents, respectively. According to the sampled respondents, the less constraining climate change effects included floods, hailstorms, low temperatures and disease prevalence (Figure 6.5).
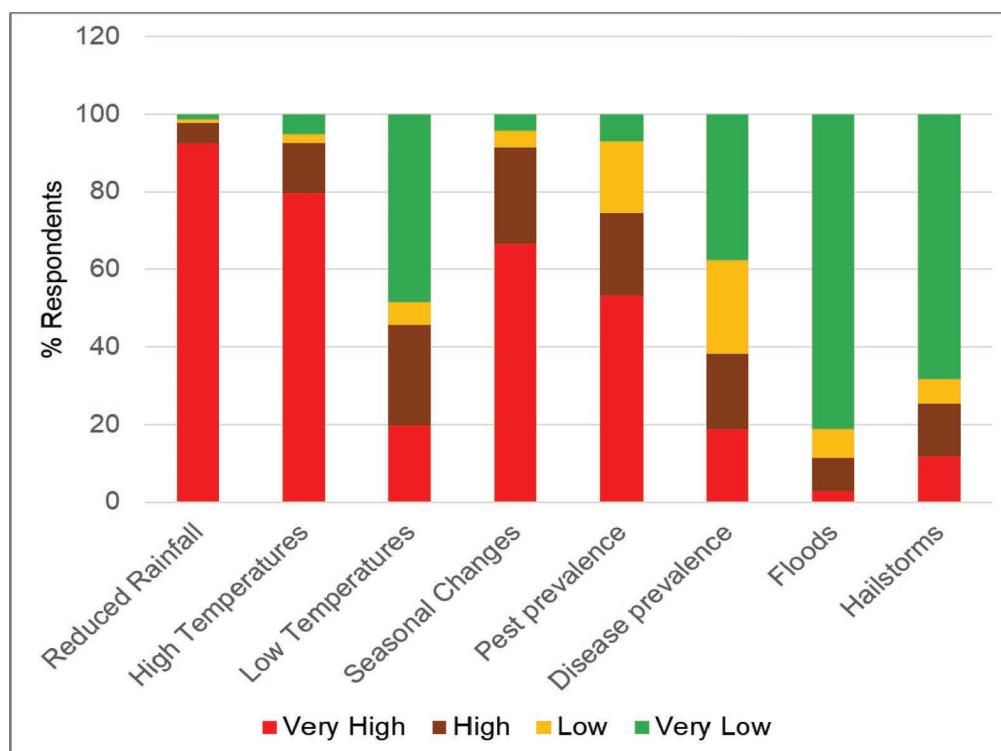
Figure 6.5: Magnitude of various climate change effects in the sampled areas

Despite the occurrence of the above climate change effects that are reportedly constraining coffee production in the sampled coffee growing areas, majority of the respondents held the opinion that

66

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

coffee productivity has increased in the last five years. The feedback was that coffee production, quality and resultant income have been increasing in the last five years as reported by 78.4%, 87.8% and 82.2% of the respondents, respectively (Figure 6.6). This was an indication that coffee productivity would have increased significantly in the last five years if there was no constraining effects resulting from climate change phenomenon.
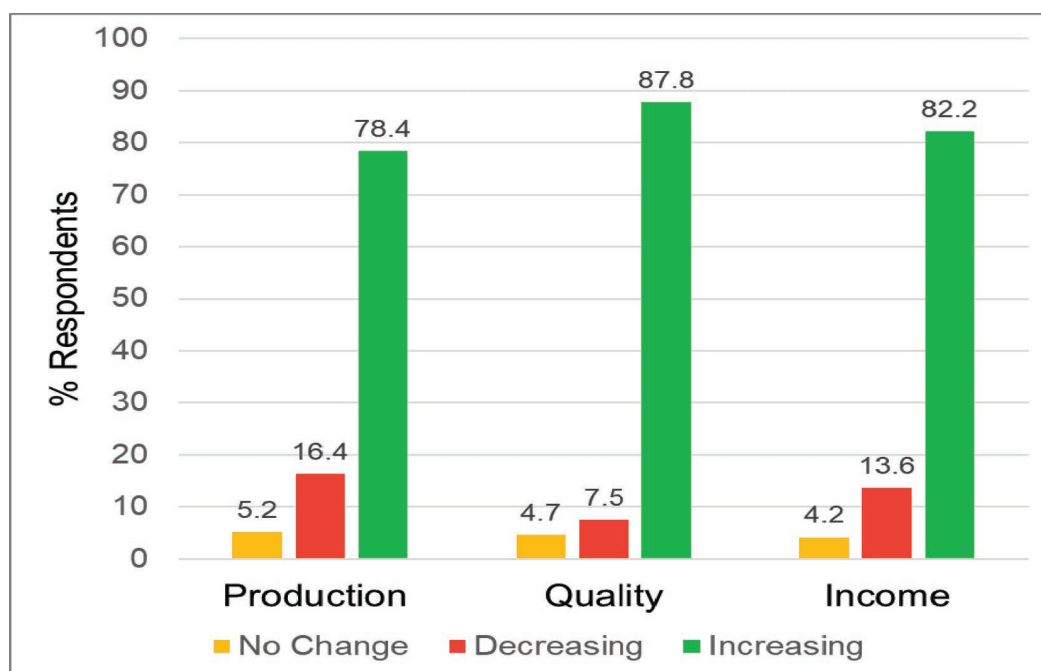
Figure 6.6: Changes in coffee productivity in the last 5 years

6.3.4 Deforestation for Coffee Expansion

According to the EU regulation on deforestation-free products, 'deforestation' means the conversion of forest to agricultural use, whether human-induced or not. The regulation further defines a 'forest' as land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10%, or trees able to reach those thresholds in situ, excluding land that is predominantly under agricultural or urban land use. Since climate change is causing a major shift of coffee growing zones towards the higher altitude areas where forests are mainly found, this study had hypothesized that this shift may have caused forest encroachment by the farmers through deforestation. Deforestation may occur directly whereby a forest cover is converted into another land use e.g. coffee farming. It may also occur indirectly whereby expansion of one activity e.g. coffee expansion increases the need for agricultural land leading to forest loss (Figure 6.7).

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

67
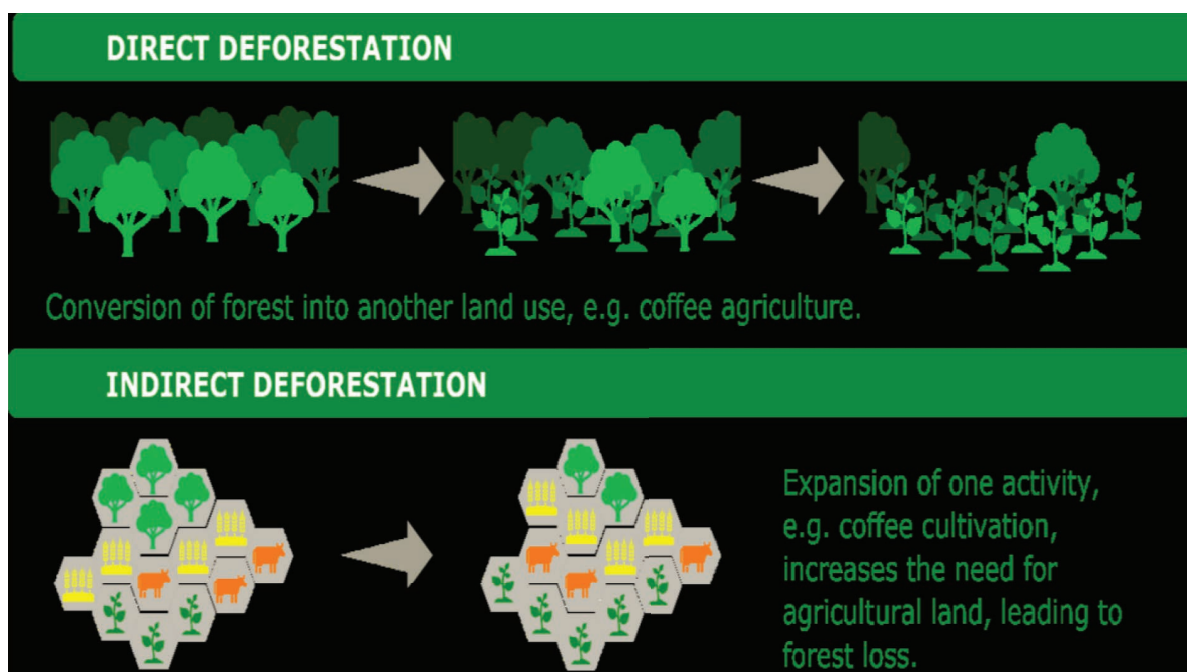
Figure 6.7: Potential deforestation types

Since it was not easy to assess indirect deforestation in the sampled coffee growing areas, the study attempted to assess direct deforestation since this is what the coffee farmers may be conscious of. The results showed that majority (69%) of the farmers had not practiced deforestation at all in an attempt to create land for coffee planting. About 23% of the respondents confessed to have cut down disintegrated trees to pave way for coffee expansion while 7% had cleared a "forest stand" that was less than 1 acre. Only 1% of the sampled farmers had cleared a forest stand of more than 1 acre to create land space for coffee farming (Figure 6.8). Based on the EU definition of deforestation, it was apparent that there is limited or no deforestation that has occurred in the coffee growing areas to create room for coffee expansion. However, with increasing climate change effects continuously rendering some hitherto coffee growing areas unsuitable for coffee production, the risk of deforestation in the coffee growing areas cannot be ignored. Therefore, there is eminent need to sensitize the farmers on the potential effects of deforestation and enhance forest protection efforts in the coffee growing areas.
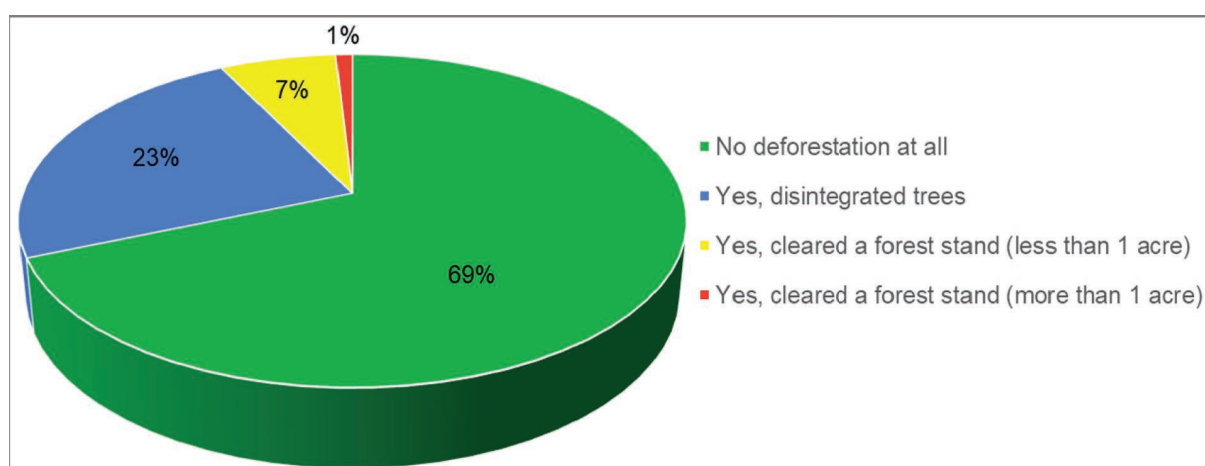
Figure 6.8: Analysis of possible deforestation status in the sampled areas

6.3.5 Other Indicators of Greenhouse Gas Emissions

Apart from deforestation which is usually ranked as the major source of greenhouse gas emissions, the study also attempted to identify other possible sources of GHG emissions among the sampled farmers. The results showed that majority 63.4% of the sampled farmers owned an automobile; 29.1 owned a motorbike, 18.3 owned a car, 9.4 had a pick-up, 6.6 owned a lorry and 0.5% owned a tractor. In addition, 20.2% was using a motorized sprayer when applying chemicals and foliar fertilizers to their coffee (Figure 6.9a). Unfortunately, majority of the farmers had not adopted any of the two major sources of regenerative energy namely biogas and solar as evident in Figure 6.9b. These results indicates a high possibility of high carbon foot prints among the coffee farmers thus underscoring the need for enhanced forest and tree cover through reduction of deforestation and promotion of afforestation, reforestation and agroforestry practices.
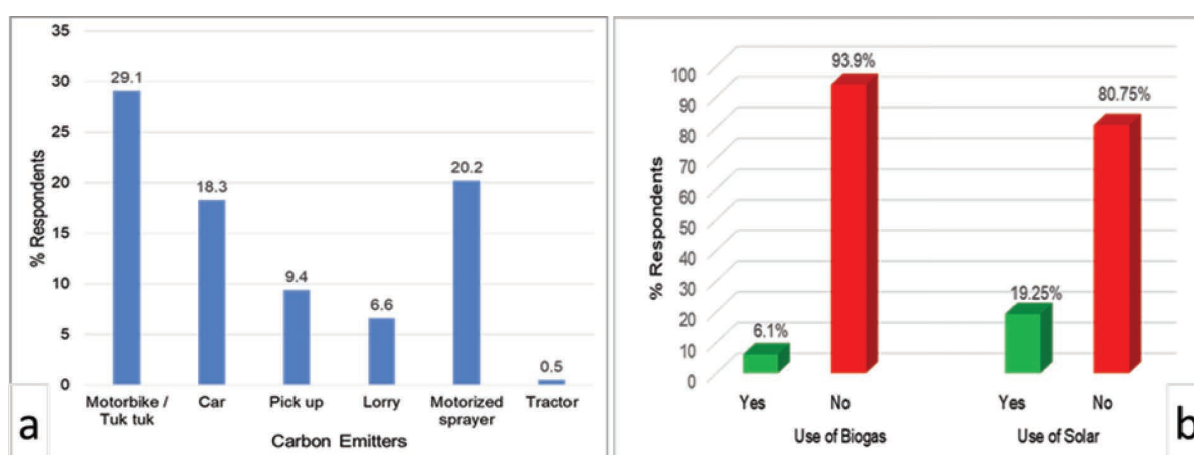
Figure 6.9: Indicators of greenhouse gas emissions by the coffee farmers

6.3.6 Adoption of Climate Smart Agriculture

The study evaluated the levels of awareness and adoption of climate smart agriculture (CSA) among the sampled farmers. It established that majority (92.5%) of the farmers were aware of CSA (Figure 6.10a) and 86.9% had already adopted some forms of CSA practices (Figure 6.10b). Among the few (13.1%) who had not adopted any form of CSA practices, 60.7 cited lack of awareness while the remaining 39.3% cited lack of technical capacity. There is therefore need for sensitization and capacity upgrading to enhance adoption of CSA activities among the coffee farmers for enhanced mitigation of climate change.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

69
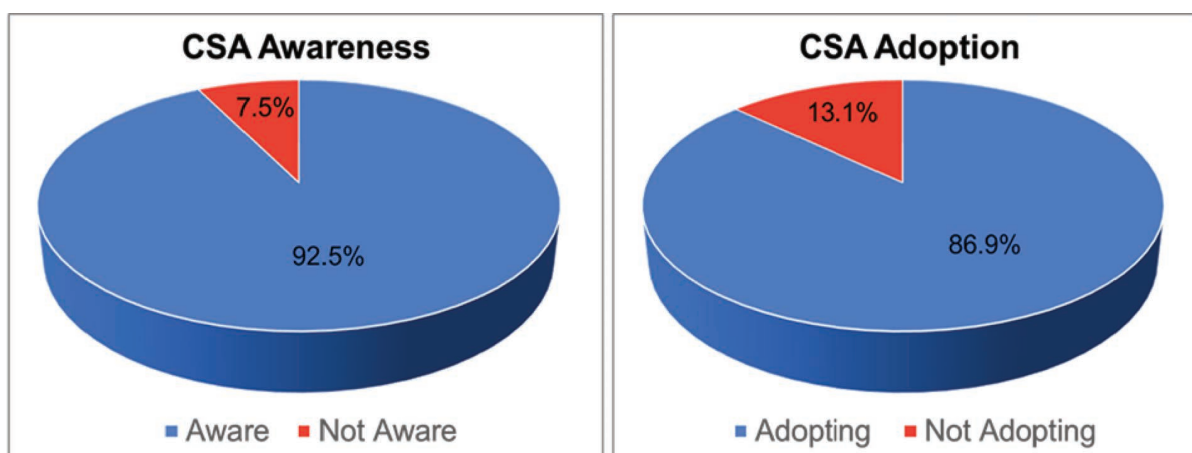
Figure 6.10: Adoption of Climate Smart Agriculture

The study further assessed the level of adoption of various CSA practices and the results were as presented in table 6.3. Soil and water conservation was the CSA practice with the highest level of adoption of 75.6% followed by integrated soil fertility management with 69% adoption level. Adoption of improved coffee varieties followed closely with 61.5%. The rest of the practices recorded very low adoption levels of between 1% and 23%. These results further underscores the need for sensitization and capacity building of the farmers to improve the adoption levels of CSA activities for enhanced mitigation of climate change.

Table 6.3: Adoption levels of selected CSA practices

Climate Smart Agriculture Practices	Adopters (%)
Integrated soil fertility management	69.0
Integrated pests management	18.8
Soil & water conservation measures	75.6
Adoption of improved coffee varieties	61.5
Adoption of organic fertilizers	11.7
Adoption of organic chemicals	10.8
Composting of organic wastes	6.6
Proper disposal of chemical containers	22.1
Use of drip irrigation	0.9

6.3.7 Adoption of Agroforestry

Considering the major role played by trees in the emission of greenhouse gases, the study sought to establish the level of adoption of agroforestry in coffee farming among the sampled farmers. The results showed that majority (84.5%) of the respondents had already adopted agroforestry in coffee farming (Figure 6.11). Among these adopters, 76.1% were practicing well organized (planned) system of agroforestry while the rest (23.9%) were practicing unplanned system of agroforestry. Out of the 15.5% who were not practicing agroforestry, 57.6% opined that agroforestry had no clear benefits to coffee production while 30.3% lacked the technical capacity to adopt

agroforestry. The rest defended their decision of not adopting agroforestry with diverse opinions. Some reported that agroforestry lowers coffee yields (18.2%) and quality (15.2%) while another 15.2% felt that they did not have adequate land to allow them practice agroforestry. Only 6.1% believed that agroforestry promoted coffee pests and diseases while 9.1% opined that agroforestry trees competes with coffee for nutrients (Figure 6.11). These results shows an untapped potential of increasing adoption of agroforestry among coffee farmers through sensitization and training programmes.

Reasons for Not Practicing	% Respondents
Lack of technical capacity	30.3
Inadequate Land	15.2
No clear benefits	57.6
Agro-forestry promotes pests and diseases	6.1
Agro-forestry lowers coffee yields	18.2
Agro-forestry lowers coffee quality	15.2
Trees competes with coffee for nutrients	9.1

Figure 6.11: Adoption levels of coffee agroforestry among the sampled farmers

On the other hand, among the 84.5% who were already practicing agroforestry, 67.1% and 63.8% reported that agroforestry improved coffee production and quality respectively. Those who reported improved soil moisture conservation, improved soil fertility and reduced soil erosion comprised 66.2%, 63.4% and 53.6% of the adopters, respectively. In addition, 43.2% of the adopters reported less pest infestation as another benefit of coffee agroforestry with 26.8% specifically citing that agroforestry contributed to reduction in coffee leaf rust infestation (Figure 6.12).

Perceived Adoption Benefits	% Respondents
Improved coffee quality	63.8
Improved coffee yields	67.1
Less pest infestation	43.2
Less CLR Infestation	26.8
Improved soil fertility	63.4
Soil moisture conservation	66.2
Reduced soil erosion	53.5
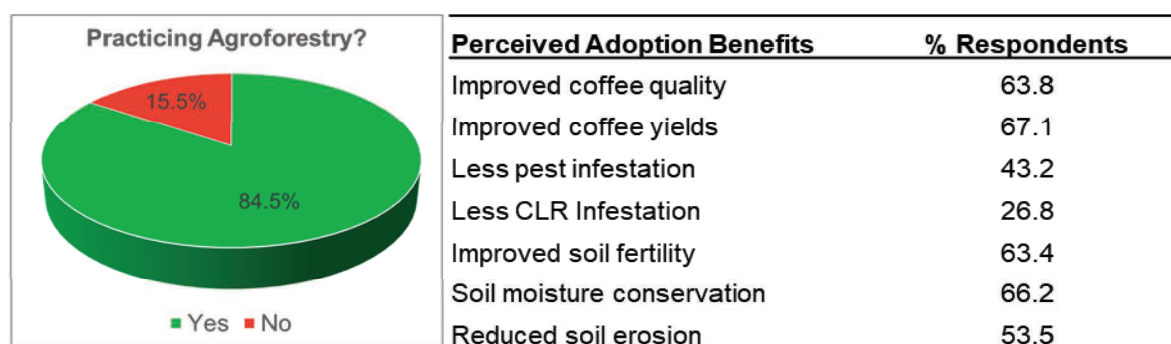
Figure 6.12: Perceived benefits of coffee agroforestry among the adopters

Comparative visual assessment of different coffee plots with and without agroforestry confirmed the farmers' reports that coffee agroforestry had significant positive effects on coffee production resulting to improved general coffee health as evident in Figure 6.13 below.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

71

Figure 6.13: Heathy coffee in an agroforestry system (a) vis-a-vis unhealthy coffee under open sun (b)

6.4 Summary of Findings, Conclusion and Recommendations

This study found that climate change is currently a major constraint in coffee production as it continues to complicate coffee production in Kenya and other regions. The most limiting climate change related effects on coffee production include reduced rainfall, changes in production seasons, rising temperatures and changes in pest dynamics. These climate change related constraints are causing significant reduction in coffee yields and quality as well as loss of suitable land for coffee production thus pushing coffee production towards the higher altitudes. Although the study found that there is minimal or no deforestation taking place in the coffee growing areas or in areas with coffee expansion, there is a potential risk of deforestation in the near future driven by search for suitable lands for coffee production. Mitigation actions should therefore be put in place to prevent deforestation and forest degradation in the coffee growing areas. The study further confirmed the bountiful benefits of adoption of agroforestry and other CSA practices in coffee production. However, majority of Kenyan coffee farmers have not effectively adopted the practices, despite their good awareness of the same. Therefore, there is need to improve the technical efficiency in the adoption of these practices especially the adoption of agroforestry. Appropriate adoption of agroforestry and other CSA practices in coffee production would go a long way in reducing the GHG emissions and carbon foot prints in coffee production. In addition, adoption of agroforestry systems may play a significant role in reclaiming the original suitability of some traditional coffee growing areas thus reducing the pressure of opening new production areas.

72

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

OVERALL SUMMARY OF THE STUDY AND NECESSARY POLICY INTERVENTIONS

The growing world population and increasing worldwide demand for coffee and other agricultural commodities in the wake of climate change is increasing the demand for suitable agricultural land thus putting additional pressure on forest areas. The situation is expected to worsen since the production pressure will result in increased land and forest degradation and increased emission of GHGs. This necessitates enhanced protection of deforestation and forest degradation in the coffee growing areas. In addition, there is need to urgently roll-out feasible strategies to enhance reforestation, afforestation and increased tree cover in the farm lands through agroforestry systems. This chapter proposes some strategic requirements for forest protection (reducing deforestation and forest degradation) and promotion of agroforestry adoption in the coffee growing areas.

7.1 STRATEGIC REQUIREMENTS FOR REDUCED DEFORESTATION

i) Carry out baseline studies on the following areas:

    a) To assess the current status of deforestation and forest degradation in Kenya.

    b) To identify the current drivers of deforestation and forest degradation and how to mitigate them.

    c) To assess the potential of afforestation and deforestation programs in restoring the degraded forest areas.

    d) To assess the feasibility of afforestation and deforestation programs in ASAL areas.

ii) Aligning forest legislation with the Constitution and providing for policy, legal and institutional reforms that address emerging forestry issues, including climate change, while taking into account good practices at global, regional and national levels

iii) The original boundaries of all the Kenyan forests should be re-assessed and their polygons geo-referenced and clearly mapped out.

iv) Development of effective implementation guidelines (strategies) for rapid increase of the forest cover and restoration of degraded forests through afforestation and reforestation programs. The guidelines should have effective monitoring and evaluation mechanisms. Enforcement mechanisms may include Presidential Directives.

v) The National and County Governments should implement measures and programmes to integrate expansion of forests and tree growing on public, private and community land in a sustainable manner.

vi) The National and County Governments should implement a programme for enhancing agriculture land use and prevention of land degradation through sustainable climate-smart strategies including adoption of agroforestry practices.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

73

vii) The National and County Governments should integrate sustainable forestry and tree growing into physical and land use planning and development processes to prevent cases of forest encroachment by other land uses.

viii) The National and County Governments should ensure that utilization of all forms of forest resources integrate effective measures to protect and conserve forests, trees and biodiversity.

ix) A total economic valuation of forestry resources should be undertaken in all the forests in Kenya in order to ascertain the economic worth of these forests and to ensure sustainable development in the county.

x) Initiate or scale up extension services on forestry practices targeting all agro-ecological zones including ASALs and with special consideration to community participation for their social and economic wellbeing.

xi) Appropriate data management to support future planning and information update to ensure provision of validated technical information in extension services.

xii) Formulate a joint coordinating mechanism between all the institutions responsible for forest and environmental protection under the Ministry of Environment and Forestry both at National and County Governments, other relevant State Corporations, NGOs, Farmers Organizations and other players with significant contribution to forestry programmes in the country.

Table 7.1: Strategic Requirements for Forest Protection in Coffee Areas

Investment area	Responsibilities	Responsible entities
Data Management and Planning	Provide a platform for coordination of afforestation and reforestation projects in the coffee growing areas.	KCP; GCP
	Formulate a mechanism to coordinate the afforestation, reforestation and agroforestry projects by different actors in the coffee growing areas.	
Research and Development	Carry out a baseline survey to assess the current status of deforestation and forest degradation in the coffee growing areas.	KCP; GCP; KALRO (CRI); County Departments of Agriculture; Relevant NGOs e.g. Solidaridad, Fairtrade Africa and Rainforest Alliance
	Evaluate the potential of afforestation and deforestation programs in restoring the degraded forests in the coffee growing areas.	
	Carry out an assessment of the carbon foot prints in the coffee supply chain and propose mitigation measures	
	Promote CSA activities (e.g. agroforestry and regenerative agriculture) in coffee farming to prevent further emissions of GHGs and to reclaim the coffee growing areas that have been rendered unsuitable by climate change.	

	Develop information packages on agroforestry and farm forestry practices in all the coffee agro ecological zones. These should include the most suitable tree species for different agro-ecological zones where coffee is growing.	KALRO (CRI); KEFRI
	Initiate or scale up extension services on agroforestry practices in coffee farming that are specific to different agro-ecological zones.	KALRO (CRI); Coffee Directorate
Implementation of afforestation, reforestation and agroforestry programs	Develop an afforestation and reforestation strategy to restore degraded forests in the coffee growing areas. The strategy should have a clear vision, objectives, timelines, monitoring and evaluation mechanisms, and implementation guidelines.	All actors including MoA; MoEF; KCP; GCP, KALRO (CRI); KEFRI; NGOs, Coffee Directorate and County Governments.
	Roll out agroforestry packages for coffee in different coffee growing areas to assist in reclaiming the suitability of coffee production in those areas as a long-term measure to prevent further forest encroachment.	KALRO (CRI); KEFRI
	Establish nurseries for propagation of different tree species for afforestation and deforestation programs.	KALRO (CRI); KEFRI
	Develop innovative incentives, programmes and projects to promote establishment of farm forests in the coffee growing areas	KALRO (CRI); KEFRI; NGOs; Certification Bodies e.g. Fairtrade, RA and Solidaridad; Other Development Partners
	Develop innovative incentives, programmes and projects to promote agroforestry in coffee farming in order to increase the tree cover.	
Enforcement	Develop mechanisms for monitoring the forest borders in the coffee growing areas against any acts of deforestation and forest degradation.	Coffee Directorate; National and County Governments; KWS
	Introduce community policing to report the perpetrators of forest destruction for them to face disciplinary measures	National and County Governments; KWS
Financing	Develop financing arrangements with the government, private sector equities, development partners and funding organisations	Kenya Coffee Platform
	Identify funding opportunities and develop grant proposals on forest restoration and protection in the coffee growing areas.	KCP; KALRO (CRI)
	Provide financial aid to support afforestation and reforestation in the coffee growing areas	Funding Agencies; Coffee Traders & Consumers

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

75

7.2 STRATEGIC REQUIREMENTS FOR ADOPTION OF AGROFORESTRY

i) Carry out a baseline studies to collect data on the status and potential of agroforestry systems in different agro-ecological zones in Kenya with special consideration of the agricultural systems practiced in those areas and the type of crops grown in the area.

ii) Development of effective implementation guidelines (strategy) for Agriculture (Farm Forestry) Rules, 2009 with special emphasis to agroforestry rules number 4 and 6. The guidelines should have effective monitoring and evaluation mechanisms. Enforcement mechanisms may include Presidential Directives on agroforestry.

iii) Development of programmes and projects on agroforestry in agricultural production systems. Such programmes/projects should have SMART objectives with clear milestones and supported by effective monitoring and evaluation mechanisms.

iv) Develop agroforestry packages for specific crops (e.g. coffee, tea and food crops) and for specific agricultural systems (e.g. for steep and flat farmlands, mechanized farming, rangelands, PELIS) and agro-ecological zones (e.g. highlands, midlands and ASALs). This should include the tree species that are suitable for each set-up.

v) Development of information packages on agroforestry that are specific to specific agro ecological zones, farming systems, and target crops. This information would be useful in formal and non-formal extension programs.

vi) Initiate or scale up extension services on agroforestry practices specific to different agro-ecological zones, agricultural systems, and target crops.

vii) Appropriate data management to support future planning and information update to ensure provision of validated technical information in extension services.

viii) Formulate a joint coordinating mechanism between the two ministries responsible for agroforestry (Ministry of Agriculture and Ministry of Environment and Forestry) as well as County Governments, relevant State Corporations, NGOs, Farmers Organizations and other players needed to steer implementation of an effective agroforestry programmes in the country.

Table 7.2: Strategic Requirements in Coffee Agroforestry

Investment area	Responsibilities	Responsible entities
Data Management and Planning	Provide a platform for coordination of agroforestry projects in coffee farming	KCP; GCP
	Formulate a mechanism to coordinate the agroforestry activities under different actors	KCP; GCP
	Carry out baseline studies to assess the status and potential of agroforestry systems in coffee farming	KCP; GCP
	Establish an updated repository for agroforestry data to support future planning and to ensure provision of validated technical information in extension services.	Coffee Directorate; County Governments; KALRO (CRI)
Research	Develop agroforestry packages for coffee in different agro-ecological zones (e.g. highlands, midlands) with special considerations to necessary soil conservation requirements (topography, & soil types), weather patterns (rainfall & temperature), agronomic requirements of coffee and specific agronomic traits of different coffee varieties. The packages should also consider other farm practices e.g. mechanization and should include the tree species that are suitable for each set-up.	KALRO (CRI); KEFRI; Universities
Implementation of Agroforestry Practices	Develop a Coffee Agroforestry Strategy in line with the requirements of the Kenya Constitution, 2010 (Article 69), Vision 2030, Medium Term Plans and Sustainable Development Goals (SDGs). The strategy should have a clear vision, objectives, timelines, monitoring and evaluation mechanisms, and implementation guidelines.	All actors including MoA; MoEF; KCP; GCP, KALRO (CRI); Coffee Directorate, KEFRI; Academia; County Governments; NGOs & Development Partners like Fairtrade, RA and Solidaridad
	Roll-out agroforestry packages for coffee in different coffee growing areas and set-up demonstration sites to show-case different agro-forestry practices applicable in different agro-ecological zones.	KALRO (CRI); KEFRI
	Establish nurseries for propagation of recommended agroforestry trees	KALRO (CRI); KEFRI

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

77

Enforcement	Develop mechanisms for enforcing adoption of Agroforestry Practices in coffee farming with social inclusion	Coffee Directorate; County Governments
	Develop innovative incentives to promote adoption of agroforestry practices in coffee farming	Coffee Directorate; Certification Bodies e.g. Fairtrade, Solidaridad and Rainforest Alliance
	Develop programmes and projects to promote agroforestry in coffee farming	NGOs; Certification Bodies e.g. Fairtrade, RA and Solidaridad; Other Development Partners
	Introduce punitive measures to punish the perpetrators e.g. those not observing Section 4 (2) of the Agriculture (Farm Forestry) Rules, 2009	National and County Governments, Legislators
Financing	Develop financing arrangements with the government, private sector equities, development partners and donor organisation	Kenya Coffee Platform
	Identify funding opportunities and develop grant proposals	KCP; KALRO (CRI)
	Provide financial aid to support agroforestry initiatives in coffee farming	Funding Organizations; International Coffee Traders & Consumers
Capacity Building	Develop information packages on agroforestry in coffee farming that are specific-to-specific agro ecological zones.	KALRO (CRI)
	Initiate or scale up extension services on agroforestry practices in coffee farming that are specific to different agro-ecological zones.	KALRO (CRI); Coffee Directorate

7.3 OTHER OVERALL RECOMMENDATIONS

From the analysis of agroforestry and forest protection policies, strategies and practices in the coffee growing areas and areas with coffee expansion, the following overall recommendations were deduced:

1. Effective implementation of the proposed strategic requirements as identified in tables 7.1 and 7.2 calls for government support channelled towards relevant institutions as identified

2. There is need to sensitize the farmers on the sources of GHG emissions (drivers of climate change);

3. There is need to promote CSA practices in coffee production especially those that contributes significantly to reduction of GHG emissions including agroforestry, use of organic based inputs and integrated pests management;

4. There is need to comply with the proposed EU regulation on deforestation free products – however, since conversion from forest to agroforestry is considered as deforestation in the EU regulation, there is need for a baseline survey to ascertain the current status;

78

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

5. There is need for clear demarcations of forests and geo-referencing of all the coffee farms;

6. Forest protection should take a multi-disciplinary approach – there is need for coordination and collaboration between all the stakeholders for all the products whose supply chain may cause deforestation and forest degradation.

Analysis of Existing National Policies, Strategies and Practices on Agroforestry and Forest Protection in Kenyan Coffee Production

79

REFERENCES

CABI (Centre for Agriculture and Biosciences International) (2009). Climate Change and Agricultural Commodities Masters G, Baker P, Flood J (Ed.) CABI Position Paper

CCAFS (Climate Change Agriculture and Food Security) (2016). Climate change adaptation in agriculture: practices and technologies Dinesh D, Vermeulen S (Ed.) Messages to the SBSTA 44 agriculture workshops.

CIAT (International Center for Tropical Agriculture) (2013). Mesoamerican Coffee: Building a Climate Change Adaptation Strategy, Läderach P, Haggar J, Lau C, Eitzinger A, Ovalle O, Baca M, Jarvis A, Lundy M (Ed.) Cali, Colombia.

Coffee Directorate (2023). Coffee Year Book, 2021/22.

Davis AP, Gole TW, Baena S, Moat J (2012). The Impact of Climate Change on Indigenous Arabica Coffee (*Coffea arabica*): Predicting Future Trends and Identifying Priorities. PLoS ONE 7 (11): 47981

GACSA (Global Alliance for Climate-Smart Agriculture) (2015). Coffee-Banana Intercropping; Climate Smart Agriculture: Implementation guidance for policymakers and investors, Asten PV, Ochola D, Wairegi L, Nibasumba A, Jassogne L, Mukasa D (Ed.).

Gichimu B.M. (2020). Coffee, the Crucified Savior of Kenyan Economy Presented During Leland International Hunger Fellows Mid-Field Retreat. Available Online   DOI: 10.13140/RG.2.2.26761.72807

Gichimu B.M. and Omondi C.O. (2010). Early Assessment of Growth and Yield Characters of Five Newly Developed Lines of Arabica Coffee in Two Environments and Spacings in Kenya. Afr. J. Hort. Sci. (2010) 3:98-111

GoK (2010a). *Kenya Forest Service Study Report 2010*. Nairobi: Kenya Forest Service;

GoK (2010b). *The Constitution of Kenya 2010.* Nairobi: National Council for Law Reporting.

GoK (2015). *Second National Communication to the UNFCCC*.

GoK (2016). *Forest Conservation and Management Act. of 2016.* National Council for Law Reporting, Nairobi.

GoK (2017). Kenya Climate Smart Agriculture Strategy 2017-2026

GoK (2018a). *Agricultural Sector Transformation and Growth Strategy (ASTGS): Towards sustainable agricultural transformation and food security in Kenya 2019-2029. Long Version.* Nairobi: Government of Kenya.

GoK (2018b). National Climate Change Action Plan 2018-2022. *Government Printer. Nairobi*.

Haggar J, Schepp K (2012). Coffee and Climate Change Impacts and options for adaption in Brazil, Guatemala, Tanzania and Vietnam, University of Greenwich, Brazil

ICC (International Coffee Council) (2009). Climate change and coffee, 103rd Session 23 – 25 September 2009 London, England

ICO (International Coffee Organization) (2019). Country Coffee Profile – Kenya. 124th Session of the International Coffee Council, 25 – 29 March 2019, Nairobi, Kenya

ITC (International Trade Centre) (2010). Climate Change and the Coffee Industry, Kasterine A., Scholer M, Hilten HJ (ed.), Geneva, Netherland.

Jaramillo J, Muchugu E, Vega FE, Davis A, Borgemeister C (2011). Some Like It Hot: The Influence and Implications of Climate Change on Coffee Berry Borer (*Hypothenemus hampei*) and Coffee Production in East Africa. PLoS ONE 6 (9): e24528. doi: 10.1371/journal.pone.0024528.

Kimemia J (2014). Climate change and its mitigation in sustainable coffee production, Coffee Research Institute

Lin BB, Perfecto I, Vandermeer J (2008). Synergies between Agricultural Intensification and Climate Change Could Create Surprising Vulnerabilities for Crops, J. American Ins. Bio. Sci., 58 (9): 847-854.

Magrach A, Ghazoul J (2015). Climate and Pest-Driven Geographic Shifts in Global Coffee Production: Implications for Forest Cover, Biodiversity and Carbon Storage. PLoS ONE 10 (7): 1371.

Magrach A, Ghazoul J (2015). Climate and Pest-Driven Geographic Shifts in Global Coffee Production: Implications for Forest Cover, Biodiversity and Carbon Storage. PLoS ONE 10 (7): 1371.

Mcrae RM (2016). State of the Art Review on Climate Change and Coffee, Climatico, Mexico.

Mofatto LS, Carneiro FA, Vieira NG, Duarte KE Vidal RO, Alekcevetch GC, Cotta MG, Verdeil JL, Montes FL, Lartaud M, Leroy T, Bellis FD, Pot D, Rodrigues GC, Carazzolle MF, Pereira GAG, Andrade AC, Marraccini (2016). Identification of candidate genes for drought tolerance in coffee by high-throughput sequencing in the shoot apex of different *Coffea arabica* cultivars, BMC Plant Biology, 16: 9.

Perfecto I, Armbrecht I (2003). The Coffee Agroecosystem in the Neotropics: Combining Ecological and Economic Goals, CRC. Press L. L. C. 12.

Rahn E, Läderach P, Baca M, Cressy C, Schroth G, Malin D, Rikxoort H, Shriver J (2013). Climate change adaptation, mitigation and livelihood benefits in coffee production: where are the synergies? J. Mitig Adapt Strateg Glob Change, 19: 1119–1137.

Sanchez JAM, Sotomayor SMH (2008). Biotechnology in Coffee Research, Americas J. Plant Sc. Biotechnology, 2 (2): 85-95.

UNEP (2015). Green Economy Sector Study on Agriculture in Kenya. United Nations Environment Programme. pp 34

Wambua, D.M., Gichimu, B.M. and Ndirangu S.N. (2021). Smallholder Coffee Productivity as Affected by Socioeconomic Factors and Technology Adoption. International Journal of Agronomy, Volume 2021, Article ID 8852371, 8 pages. https://doi.org/10.1155/2021/8852371

Youkhana AH, Idol T (2010). Growth, Yield and Value of Managed Coffee Agro-ecosystem in Hawaii. J. Pac. Agric. Nat. Resour. 2: 12-19.

KENYA
COFFEE
PLATFORM

SAUTI YA KAHAWA- KENYA COFFEE PLATFORM
P.O BOX 36439-00100
COFFEE PLAZA, 1ST FLOOR
EXCHANGE LANE,
OFF HAILE SELASSIE AVENUE
EMAIL: INFO@SAUTIYAKAHAWA.ORG
PHONE: +254 700 419 148