REPUBLIC OF RWANDA

MINISTRY OF ENVIRONMENT

NATIONAL AGROFORESTRY STRATEGY (2018-2027)

August 2018

Foreword

The Ministry of Environment (MoE) developed this "Agroforestry Strategy and Action Plan (2018-2027)" to support the development of agroforestry in Rwanda. The strategy creates a roadmap for promoting leadership and synergies in agroforestry and engaging coordinated actions to increase the adoption of agroforestry technologies at Rwanda's agricultural landscapes and watersheds.

The Government of Rwanda has put a lot of efforts to balance agricultural production with natural resources management. Agroforestry practices are on the forefront to increase agricultural production, reduce soil erosion and nutrient depletion, and provide suitable wood fuel while preserving natural forests and enhanced protection of watersheds on several hectares of slopping lands. These practices are key components of landscape management. Agroforestry presents an opportunity to address agricultural and natural resources conservation challenges and improve livelihoods of smallholder farmers. It addresses several of the priorities identified in several government policies and strategies including the National Strategy for Transformation (NST1), Green Growth and Climate Resilience Strategy, Forest Policy and Forest Sector Strategic Plan (2018-2022) and Strategic Plan for the Transformation of Agriculture (PSTA IV).

At present, land degradation and natural disasters are prevailing as environmental issues that affect people's livelihoods and the economic development of the country. It arises as a very urgent and important subject to actively adopt agroforestry practices in accordance with the country's agro-ecologies and socio-economic contexts. Through its efforts to achieve national development goals such as food security, sustainable economic development and environmental protection, Rwanda has great experiences with the implementation of agroforestry. Based on the good experiences achieved in practice, the Government of Rwanda has taken measures to extend agroforestry to a nationwide scale. The Ministry of Environment, whose mandate includes agroforestry and forestry, has developed a "National Agroforestry Strategy and Action Plan (2018–2027)" to serve as guideline for agroforestry development in the country.

The Ministry of Environment will endeavour to create an enabling environment that spearheads the implementation of this Agroforestry Strategy and Action Plan. I call on Government institutions, development partners, private organizations, civil society and a diverse group of stakeholders to join the Ministry's commitment to expand the application of agroforestry and generate prosperity while helping to manage the country's agricultural landscape to increase food security, increase resilience to climate change, landscape restoration, livelihoods and agroforestry based enterprise development.

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Acknowledgement

The “Rwanda Agroforestry Strategy and Action Plan 2018-2027” was developed as a collaborative effort between the Government of Rwanda represented by the Ministry of Environment and the Food and Agriculture Organization of the United Nations (FAO) that provided financial support.

The development of this Strategy and Action Plan was led by the consultant Dr. Denis Depommier from Centre International de Recherche Agronomique pour le Développement (CIRAD) in collaboration with the national consultant, Mr. Modeste Bizimana (EMS). Three background studies to support the development of the strategy were conducted by Dr. Athanase Mukuralinda and Fergus Sinclair from the World Agroforestry Centre (ICRAF), Dr Jean Damascene Ndayambaje of Rwanda Agriculture and Animal Resources Development Board (RAB) and Bonaventure Nzeyimana.

Ministries; Ministry of Agriculture and Animal Resources (MINAGRI) and Ministry of Local Government (MINALOC) and agencies including Rwanda Water Forestry Authority (RFA), RAB, University of Rwanda, and international partners; FAO, Belgian Development Agency (Enabel), ICRAF, and the International Union for Conservation of Nature (IUCN), have contributed to the development of “Rwanda Agroforestry Strategy” through consultative meetings and workshops through which necessary information was provided.

Executive Summary

Agroforestry, the intentional integration of agricultural and forestry-based land use systems, provides multiple benefits that contribute to food security, energy, and resilience to climate change. It addresses the country's land stewardship needs by restoring degraded lands, controlling soil erosion and diversifying farm production systems through provision of increased yields of crops, wood and fodder. As part of an ecologically based land management system, agroforestry practices can maintain ecosystem diversity and processes that contribute to long-term sustainability and environmental quality.

Although there is strong interest and potential for agroforestry to contribute to the economy and help to achieve sustainable development goals, agroforestry development and implementation is impeded because of lack of investment (research, training, infrastructure etc), inadequate knowledge, poor dissemination and coordination. Getting agroforestry adopted and applied at scale requires leadership, coordinated action for technology development and integration, application and decision support tools, technology transfer to agriculture and natural resource managers and technical assistance to farmers. The immediate need is to get agroforestry on the ground through a concerted effort to get into practice what is already known and to coordinate and strengthen the development of new knowledge.

The "Rwanda Agroforestry Strategy (2018-2027)" has been developed to promote leadership and synergies in agroforestry and engage coordinated action and implementation. It identifies needs and priority actions to develop and implement agroforestry in all the agro-ecological zones and land use systems of the country. Priority actions are formulated in six interconnected thematic areas that will be approached through meeting a set of relevant strategic objectives set out from the strengths, weaknesses, opportunities and threats (SWOT) analysis of agroforestry development in Rwanda. These themes are formulated as follow:

1. Creating Policy and Institutional Framework for Agroforestry,
2. Innovative Research and Knowledge for Agroforestry Development,
3. Strengthening Communication and Extension for Agroforestry Adoption and Scaling-Up,
4. Promotion of priority Agroforestry Practices,
5. Marketing of Agroforestry Products and Development of their Value Chains, and
6. Empowering Women and Youth through Agroforestry Development

The strategy has its action plan with clear targets, timeline and most importantly, it clarifies a coordinating institution for each priority action which has an estimated budget. The agroforestry strategy budget required for the 10 years period is estimated at RWF 11,217,420,000. Monitoring and evaluation will be timely conducted to insure that all activities are implemented as planned and are meeting the targeted objectives. The lead institution responsible for monitoring and evaluating implementation of the strategy will ensure that the M&E system is applied correctly and all involved entities and stakeholders provide necessary information and data in a timely and proper manner.

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Acronyms

AEZ	Agro-ecological zone
AfDB	African Development Bank
AF/AFS&T	Agroforestry/Agroforestry Systems and Technologies
AfSAP	Agroforestry Strategy and Action Plan
CAVM	College of Agriculture, Animal Sciences and Veterinary Medicine
CBOs	Community Based Organizations
CIRAD	Centre International de Recherche Agronomique pour le Développement
DFMP	District Forest Management Plan
EDPRS	Economic Development and Poverty Reduction Strategy
EMS	Entreprise Multi Services
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer Field School
FIP	Forest Investment Plan
FLR-SFA	Forest and Landscape Restoration - Sustainable Food and Agriculture
FONERWA	National Fund for Climate and Environment in Rwanda
GDP	Gross Domestic Product
GEF	Global Environment Facility
GGCRS	Green Growth and Climate Resilience Strategy
GoR	Government of Rwanda
GIS/RS	Geographic Information System/Remote sensing
HFCs	Hydrofluorocarbons
ICRAF	The World Agroforestry Centre
IITA	International Institute of Tropical Agriculture
IPRC	Integrated Polytechnic Regional College
ISAR	Institut des Sciences Agronomiques du Rwanda
INDC	(Rwanda's) Intended Nationally Determined Contribution
IUCN	International Union for Conservation of Nature
KCCEM	Kitabi College of Conservation and Environmental Management
LUS	Land Use System
M&E	Monitoring and Evaluation
MINAGRI	Ministry of Agriculture and Animal Resources
MINALOC	Ministry of Local Government
MINECOFIN	Ministry of Finance and Economic planning
MINEDUC	Ministry of Education
MoE	Ministry of Environment
MINICOM	Ministry of Trade and Industry
MIGEPROF	Ministry of Gender and Family Promotion
MoU	Memorandum of Understanding
MPTs	Multipurpose Trees and shrubs
NGO	Non-Governmental Organization

NFP	National Forest Policy
NST	National Strategy for Transformation
NISR	National Institute of Statistics of Rwanda
NAEB	National Agricultural Export Development Board
NWFP	Non wood forestry products
PAREF-BE	Programme d'Appui à la Reforestation (au Rwanda)-Belgique
PES	Payment for Ecosystem Services
PPCR	Pilot Program for Climate Resilience
PPP	Public Private Partnership
PSF	Private Sector Federation
PSTA	Plan Stratégique pour la Transformation de l'Agriculture
RAB	Rwanda Agriculture and Animal Resources Development Board
RCA	Rwanda Cooperative Agency
REMA	Rwanda Environment Management Authority
RSB	Rwanda Standards Board
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RNRA	Rwanda Natural Resources Authority
RFA	Rwanda Water and Forest Authority
R4D	Research for Development
RWF	Rwandan Franc
SAFBE	Sustainable Forestry, Agroforestry and Biomass Energy
SDG(s)	Sustainable Development Goal (s)
SWC	Soil and Water Conservation
TSC	Tree Seed Centre
T4FS	Trees for Food Security
TIF/TOF	Trees Inside Forests/Trees Outside Forests
UR	University of Rwanda
USD	United State Dollar
WRI	World Resources Institute

1. Introduction

Agroforestry practices are becoming important factors for sustainable land use in many parts of the world, especially in tropical developing countries. In these countries, agroforestry is considered as a means of food security and poverty alleviation, particularly for rural households. Many of its practices are ancient, but the scientific applications emerged at the end of the 1970s as a result of international research and efforts to solve the food, economic and environmental crises that the world faced from the middle of the last century. Today, modern agroforestry is being continuously developed and widely adopted throughout the world as a combined management system of agriculture and forestry. While the science and social science that underpin agroforestry are still being explored, there have been great gains in understanding in the last decade or so.

Recognizing the threats of climate change, deforestation, land degradation and loss of biodiversity, research and discussion have started focusing on prevention measures. Researchers, extension agents and policy makers are searching for land use practices that ensure sustainability of the production while meeting the demand for diversified products and environmental safeguards. Their attention focuses on land use systems integrating trees, crops and livestock in the same unit of land systems that were traditionally in use in the various countries of the world. Agroforestry is gaining recognition for its ability to contribute to food security, sustainable economic development and environmental protection, reason why it is being widely adopted in many countries of the world.

1.1 Understanding agroforestry

1.1.1 Definition of agroforestry

Agroforestry is not forestry and is more than "agriculture with trees'. Agroforestry may occur at a range of scales from the field and farm to the landscape and the planet. It may involve trees within or outside forests. The most important form of agroforestry is where trees are integrated in agricultural fields, farms and landscapes, where they provide some, but generally not all, of the ecosystem functions provided by forests. Agroforestry is important for sustaining smallholder agricultural production because trees can provide income, dietary diversity, energy and ecosystem services (nutrient cycling, water regulation, erosion control and the maintenance of soil health) as well as contribute to both climate change adaptation and mitigation.

From the agricultural perspective, agroforestry is about recognizing and promoting trees on farm; from the strict forestry perspective, it is about recognition and rights for the tree based systems and livelihoods that farmers establish and could expand with appropriate support. Whilst agroforestry is a combination of agriculture and forestry, rather than treating these as separate land uses, institutions, policy domains and fields of science, current practices integrate them in a landscape approach. Agroforestry is often an entry point to further social, economic, farmer welfare, market, environmental stewardship and political goals.

Based on these considerations, agroforestry is defined as a *"Dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels. In particular, agroforestry is crucial to smallholder farmers and other rural people because it can enhance their food supply, income and health. Agroforestry systems are multifunctional systems that can provide a wide range of economic, sociocultural, and environmental benefits"*. In short,

"Agroforestry is the practice and science of the interface and interactions between agriculture and forestry, involving farmers, livestock, trees and forests at multiple scales" (FAO[1] and ICRAF, 2017).

1.1.2 Classification of agroforestry systems

Several criteria can be used to classify and group agroforestry systems. The most commonly used are based on the system's structure (composition and arrangement of components) and its function. Structurally, the system can be grouped as agri-silviculture which is a combination of crops and tree species; silvopastoral (a combination of trees, pastures and animals), and agrosilvopastoral (a combination of crops, trees, pasture and animals). However, there are many other types of specialized agroforestry systems such as apiculture with trees, woodlots, fodder banks, fruit orchards which are frequent in most farming systems depending on soils and climatic condition. Arrangement of components can be in time (temporal) or space (spatial) and several terms are used to denote various arrangements. Functional basis refers to the main output and role of components, especially the woody ones. These can be productive functions (production of 'basic needs' such as food, fodder, and fuelwood, other products, etc.) and protective roles (soil conservation, soil fertility improvement, protection offered by windbreaks and shelterbelts, boundary planting, live fences, and trees and shrubs for soil conservation).

1.1.3 Benefits of agroforestry

Agroforestry contributes to food security by providing multiple products and benefits to farmers. These benefits include food (fruit), timber, renewable wood energy, poles, fodder, stakes for climbing beans and shade for livestock. Through its multi-functionality, agroforestry has considerable potential to:

- conserve biodiversity – higher than in conventional agriculture (including agro-bio diversity);
- combat land degradation and desertification, through erosion control and appropriate re-greening;
- address climate change issues, through mitigation (carbon storage is generally higher in agroforestry) and adaptation (trees may buffer microclimate experienced by agricultural crops, diversify production systems conferring resilience and produce a sustainable mix of renewable energy and food);
- improve agricultural soil health and hence productivity by increasing and maintaining soil organic matter content and supporting the biological activity of soils through increasing the abundance and activity of beneficial soil organisms; and
- improve nutrient and water use efficiency in agriculture production through reducing tightening nutrient and water cycles and reducing leaching.

Agroforestry is preferred for carbon sequestration and avoiding deforestation to contribute to the green growth and build the resilience of the climate. In addition, it contributes to sustainable

[1] http://www.fao.org/sustainable-forest-management/toolbox/modules/agroforestry/basic-knowledge/en

intensification of farmer livelihood as it provides numerous products and ecosystem services. These benefits make agroforestry a champion of sustainable and resilient agriculture. Specifically in Rwanda, the farmers plant various tree species as:

a. shrubs for erosion control on slopping lands, thus creating progressive terraces;

b. shrubs and trees for stabilization of risers of bench terraces;

c. fertilizer trees for land restoration and healthy soil through nitrogen fixation and incorporation of biomass;

d. fruit trees for improving nutrition and generating income;

e. fodder trees rich in proteins for improving livestock feeding, milk production and manure quality;

f. timber trees for construction purposes;

g. trees and shrubs for renewable wood energy (firewood and charcoal), as remedial strategy to fuelwood collection from forests and use of crop residues and cow dung;

h. shrubs for stakes of climbing beans, which increase the yield of bean by 29-100 percent;

i. medicinal plants to cure health problems and fight diseases.

1.2 Global policy context of agroforestry

Agroforestry being at the confluence of forestry and agriculture, with trees connecting all landscapes, it appears at the heart of many conventions and global initiatives that are intrinsically linked. In particular, the contribution of agroforestry to sustainable development has been recognized in international policy meetings, including the Convention to Combat Desertification (UNCCD), Convention on Biological Diversity (CBD), and the United Nations Framework Convention on Climate Change (UNFCCC. Agroforestry is an important element in:

i. The Bonn Challenge (2011), the global aspiration to restore 150 million hectares of the world's deforested and degraded lands by 2020 and 350 million hectares by 2030.

ii. Underlying the Challenge is the 'forest landscape restoration approach', which aims to restore ecological integrity at the same time as improving human wellbeing through multifunctional landscapes. Agroforestry systems are considered as one of the restoration opportunities to explore in order to restore large contiguous tracts of degraded or fragmented forest land, while enhancing soils, meeting energy needs and improving food security.

iii. The UNCCD which calls for land degradation neutrality. To achieve it, degradation of productive land should be avoided and already degraded lands need to be restored, with these targets: zero net land degradation by 2030 for 190 million hectares and zero net forest degradation by 2030. Agroforestry has been proven as an excellent choice for reversing land degradation, which meets multiple goals.

iv. Several targets of the Strategic Plan for Biodiversity (2011-2020) of the CBD which have direct relevance to tree diversity in agricultural landscapes:

- Promoting the conservation and sustainable use of biodiversity (Target 3)
- Halving of the rate of loss of all habitats, including forests (Target 5)

- Sustainable management of agriculture, aquaculture and forestry systems as part of efforts to significantly reduce degradation and fragmentation (Target 7)
- Maintaining the genetic diversity of on-farm plants and animals (Target 13)
- Restoring and safeguarding ecosystems that provide essential services taking into consideration the situation of women, indigenous and local communities, the poor and vulnerable (Target 14)
- Enhancing ecosystem resilience (Target 15)
- Integration of traditional knowledge and participation of indigenous and local communities (Target 18).

v. Nationally Determined Contributions (NDCs) emerged as the main tool for defining, communicating and potentially reporting party contributions to the Paris Agreement on climate change. Agroforestry has been identified as one of the land uses with most potential to fulfil commitments set out in NDCs and reduce emission from agriculture. In line with UNFCCC, agroforestry is expected to contribute directly to reducing emissions from deforestation and forest degradation. Agroforestry has the merit to indirectly contribute to REDD+ strategies by avoiding deforestation through sustainable intensification and diversification and by avoiding forest degradation as farm trees can relieve forests off the pressure arising from demand for fuelwood, charcoal, and timber that are some major causes of forest degradation.

vi. Agroforestry contributes to several of the 17 Sustainable Development Goals (SDGs), principally: No poverty (SDG 1); Zero Hunger (SDG 2); Responsible production & consumption (SDG 12); Climate action (SDG 13); and Life on land (SDG 15) that includes:

(a) protection, restoration and promotion of sustainable use of terrestrial ecosystems,

(b) sustainably managed forests,

(c) combating desertification,

(d) halting and reversing land degradation, and

(e) halt biodiversity loss.

vii. The African Landscape Restoration Initiative (AFR100) which seeks to bring 100 million hectares of deforested and degraded landscapes across Africa into restoration by 2030. Through this initiative, national governments, regional institutions, public and private sector partners and international development programs greatly recognize agroforestry systems as valuable options for restoring degraded landscapes is needed in restoration plans and policies.

1.3 Context of agroforestry in Rwanda

1.3.1 Promotion of agroforestry

Agroforestry is a traditional practice that has become increasingly important for sustaining agricultural production and energy supply in the modern era. Before exotic tree species such as eucalyptus were introduced, in 1920s and 1930s, indigenous trees and shrubs were components of the traditional homestead which remains an important location for agroforestry, particularly for fruit trees. There is a strong body of local knowledge about agroforestry, not only harking back to

traditional practice but also based on contemporary observations and experimentation by farmers.

For the last 40 years, agroforestry has been researched and promoted, through successive research programs and development projects, especially in terms of systems and technologies, tree management and adaptation of exotic tree species in the various agro-ecological zones of the country.

Important investments have been made in agroforestry research by ISAR (actual RAB) and various partners of which ICRAF has been a major contributor[2]. The research results, success stories and lessons learnt highlight the potential of agroforestry to contribute to food security, poverty reduction and provide diverse and inclusive agroforestry options to meet the needs of farmers across the country. The country has lots of potentials to expand agroforestry but constraints and drivers of greater increased agroforestry adoption need to be understood in order to implement effective scaling-up strategies.

1.3.2 Current agroforestry systems and technologies in Rwanda

Farmers have long been implementing various types of agroforestry practices that match with specific topographic, climatic and soil conditions in all the agro-ecological zones and land use systems of Rwanda. The main agroforestry systems, inventoried and described by Mukuralinda et al. (2017), are presented below:

- ✓ **Countour hedgerows** are found on sloping lands (25-55 percent) at high altitude (1,600 m-2,400 m), mainly in Buberuka and Volcanic Highlands and Nile-Congo Crest Divide. *Alnus acuminata* and *Vernonia amygdalina* are among the dominant tree species, associated with maize, potato and climbing beans.
- ✓ **Boundary planting** is mainly found in Lowlands of Eastern savannah savannah h & plateau and Central plateau & collines, on slopes ranging from 6-13 percent at altitude of 1,200 -1,400 m; Grevillea robusta, Eucalyptus spp. and Calliandra calothyrsus are the dominating tree species associated with cassava, maize, banana and beans.
- ✓ **Scattered tree systems** are found everywhere, on slopes at high altitude (1100-1,700 m), with Alnus acuminata (a timber tree), associated with potato and climbing beans, more or less frequently cropped, and avocado tree with cassava, maize, banana and beans. Such scattered trees are more frequent in the Central Plateau and Collines and the Dry lowlands of the Eastern region, with Senna spectabilis and Mangifera indica (mango), associated with maize, bush beans, cassava and banana.
- ✓ **Woodlots**[3] are very frequently found in all agroecological zones with the exception of the Lowlands of Eastern Rwanda. Planted on slopes of 25-55 percent and altitude of 1,800-3,000 m, often on very acidic soils, they are mainly composed with Eucalyptus spp., Pinus patula and Acacia melanoxylon.
- ✓ **Homegardens** are found everywhere; they are mainly composed with fruit trees *(Persea americana, Mangifera indica, Carica papaya, Solanum betaceum...)* and native species

[2] See notably Dusengemungu et al (2006) : Etat de la Recherche agroforestière au Rwanda, Etude bibliographique, période 1987-2003 ; and Depommier et al (2017) : Agroforestry background studies analysis, A summary report

[3] According to Rwanda definition, woodlot less than 0.25 are considered as part of agroforestry (part of the agroforestry tree cover) while woodlot more than 0.25 ha are considered as forest (part of the forest cover)

(Markhamia lutea, Erythrina spp., Ficus spp.) associated locally with maize, potato, climbing beans and bush beans, grown under banana.

- ✓ **Fodder banks** are promoted in zero grazing areas to increase livestock productivity (milk) and improve integrated use of manure. They consist of Napier grass associated with *Calliandra calothyrsus* and *Leucaena* spp., usually grown on contour lines in the Central plateau & Collines, and Buberuka highlands, but not widely adopted elsewhere. Few good fodder species are suitable for high altitudes.
- ✓ **Intercropping** predominantly found at low altitudes in east savannah zones, associating trees or shrubs with maize and bunch beans. It is much less practiced elsewhere because farmers believe that high density of trees is competitive, affecting crop yields.
- ✓ **Live fences** are essentially found in the rangeland Eastern Savannah zone of Rwanda. Composed mainly with the robust and easy to propagate *Euphorbia tirucalli*.
- ✓ **Shade trees on rangelands** are also predominant in the Eastern savannah zone, notably with *Acacia* and *Albizzia* trees that are retained in pastureland by livestock breeders.
- ✓ **Companion trees in coffee stands** are common in Lake Kivu farms that may have more than ten species associated with coffee (*Ficus thonningii, Markhamia lutea, Grevillea robusta, Erythrina abyssinica,* etc.) and include fruit *(Persea americana, Citrus spp., Psidium guajava, Carica papaya, Mangifera indica,etc)*.

1.3.3 Policy framework for agroforestry in Rwanda

Vision 2050

Agroforestry is one the key interventions to ensure environmentally friendly and climate resilient surroundings. Essentially, agroforestry's main goal is to combine both modern and traditional land use systems where trees are managed together with crops or animal production. Agroforestry, therefore, is defined as an agricultural system that involves the interaction of trees, shrubs, and agriculture where they are designed and managed as a whole unit. Agroforestry is one of the pillars to mitigate the effects of global warming.

GGCRS

Agroforestry is a major component of the vision of the Green Growth and Climate Resilience Strategy (2011) to reach a developed climate-resilient, low-carbon economy by 2050. Through its Program 12 on 'Sustainable Forestry, Agroforestry and Biomass Energy'; it notably proposes to formulate a joint strategy for agroforestry between MoE and MINAGRI.

NST1

Agroforestry in Rwanda is supported by several policies, strategies and legislation. The National Strategy for Transformation (NST) 2017-2024 prioritizes the promotion of sustainable management of natural resources and environment to transition Rwanda towards a carbon neutral economy. The strategy emphasizes on strengthening forest management and their sustainable use, in collaboration with the private sector. Furthermore, it supports the promotion of agroforestry by orienting tree species planted towards commercially viability, and increasing the area of agricultural land covered by agroforestry. The agroforestry is recognized to contribute to (1) sustaining the development of an intensified and productive agriculture, through the provision of ecosystem services and the

diversification of the production, and (2) the private sector based rural economy through boosted value chain of agroforestry products (fuelwood, charcoal, fruits, etc.).

NDCs

The Rwanda's Nationally Determined Contributions (NDCs) puts a strong emphasis on sustainable forestry, agroforestry and biomass energy as one of the programmes under which specific actions are implemented to achieve direct and indirect mitigation benefits. In conformity with NDC, Rwanda targets to reach 100 percent of the farms implementing agroforestry by 2030, and making a larger use of soil conservation techniques and crop intensification practices through agroforestry. Agroforestry has high potential to fulfil NDC commitments by reducing emissions from agriculture and making it resilient through appropriate investments and innovations.

FOREST SECTOR STRATEGIC PLAN

Agroforestry has gained importance in the new Forest Sector Strategic Plan (FSSP) 2018-2024. The plan recognizes that, in order to address the issue of imbalance between forestry demand and supply, one solution is to increase tree resources on agricultural land through support and dissemination of adequate agroforestry practices. Consistently, it recognizes the management of the land scarcity for agricultural development, which is conflicting with the need of lands for settlement and forest establishment. Therefore, the FSSP 2018-2024 emphasizes the increased number of scattered trees on cropland and agroforestry areas up to 50 trees/ha by developing and intensifying agroforestry techniques on all suitable lands.

PSTA

Rwanda's Strategic Plan for the Transformation of Agricultural in Rwanda (PSTA II, III and PSTA IV) considers agroforestry as a tool for soil conservation and land husbandry. It recognizes that agroforestry is important for reducing soil erosion, increasing the economic returns from the land and providing fuelwood. In response to these objectives, MINAGRI develops and implements strategic plans that incorporate agroforestry as a component of agricultural strategy for soil and land protection.

REGULATORY FRAMEWORK

The National Forest Law (2013), New National Forestry Policy (2018) and Forest Investment Plan (2017) are all in support of wide-scale promotion of agroforestry in the country. The National Forest Law points out that agroforestry trees shall be planted on land reserved for crop and livestock, in urban areas and on roadsides for protection and beautification purposes. The Rwanda National Forestry Policy (2018) recognizes the use of agroforestry practices and local and exotic tree species to contribute to increasing overall forest resource output and agricultural land productivity. Through this policy, the government pledges to mainstream agroforestry in agricultural policies and strategies and strengthen cooperation with the agricultural sector in order to obtain significant benefits from agroforestry. The revised forestry policy has also pledged to enhance the capacity of extension services in agroforestry by improving "outreach" and supporting private land owners – in particular through collaboration with existing Farmer Field School (FFS). Moreover, the New Forest policy focuses on creating incentives to attract private land owners to plant trees on their own land.

FIP

The Forest Investment Plan (FIP) identifies agroforestry as one of the key investment area that will develop agroforestry systems in support of sustainable agriculture and environment protection. It recognizes that agroforestry provides employment to local communities, cooperatives and the private sector and has a considerable impact on poverty alleviation through increased crops and livestock (fodder trees) production for smallholder farmers. Moreover, through value chain development of agroforestry products, farmers' income and livelihood are enhanced. FIP also argues that, through agroforestry practices, substantial costs are avoided from reduced soil erosion, landslides and flooding as well as better regulated water supplies of higher quality. It recognizes also that the implementation of agroforestry practices curtails the pressure on forests for the supply of wood and non wood products. Hence, agroforestry is valued for its role in reducing deforestation, forest degradation and in enhancing forest carbon stock.

Other environment and natural resources legislation provide for frameworks to promoting and developing agroforestry in Rwanda. Key aspects of sector policies and regulation that are in line with agroforestry joint strategy are:

- **Land policy:** Provides for agroforestry to be applied on the hills since it contributes to the soil protection and provides environmental benefits.
- **Environment policy:** Emphasis on improving people's well-being, with a view to guarantee sustainable utilization of natural resources and the protection of vital ecosystems for present and future generations.
- **Land law:** Provides room for agroforestry to be legally integrated in the protection and sustainable use of land. The land use must help to minimize the need for land development based on the excessive use of land, energy and natural resources. To enforce this statement, there is a need to ensure that agroforestry aligns to these initiatives.

Agroforestry is also implemented by Rwanda in its efforts to implement international agreements and regional commitments aiming at environmental protection and sustainable agriculture development, food security and nutrition. In particular, Rwanda made its pledge to the Bonn Challenge to restore 2 million hectares which is the highest national commitment to the challenge. The development of agroforestry in Rwanda requires to be mainstreamed in other policies and strategies to build strong synergy with the implementation of other policies, strategies and programmes such as Crop Intensification Programme (CIP) and Livestock Intensification Programme (LIP), etc.

1.4 Challenges of agriculture and Environment in Rwanda

1.4.1 Agriculture and the food security challenge

Rwandan agriculture sector employs 80 percent of working people and occupies about 77 percent of the country area[4]. The sector is dominated by rainfed subsistence farming, characterized by low productivity and low use of inputs and technologies (e.g. fertilizer, improved seeds, mechanization, etc.). Agriculture however provides 90 percent of national food needs and will have to feed an

[4] 1,9 million ha are dedicated to agriculture; 63% of the country land is arable (1,656 660 ha) according to WB/CIAT, 2015

increasing population in a near future while its density is already very high (estimated to 450 inhabitants /km^2 in 2017).

1.4.2 Poor agricultural practices

Various reforms and programs including crop intensification and soil and water conservation measures have brought about an increase in agricultural production in Rwanda over the last 15 years. However, over-cultivation and exploitation of natural resources along with poor farming practices have led to extended land degradation, soil erosion, deforestation, loss of biodiversity, poor performance of crops and yield, watershed imbalance and landslides. In a context of land scarcity, improving productivity remains a priority but it needs to adapt and innovate to ensure its sustainability in a context of global change. Production of energy to meet the demands of an increasing population needs to be considered alongside the production of food. As rural population will continue to heavily depend on fuelwood, agroforestry will have to play a major role in energy production in the coming years.

1.4.3 Pressure on land and its environment, the link with poverty

Due to the heavy pressure on land, agriculture has developed at the expense of forests, pastures and vulnerable environments, including very steep lands (90 percent of the total land is on slopes), degraded lands, drylands and wetlands. As a result, land is becoming more and more scarce and fragmented as the population keeps increasing. Limited available land is a major constraint to increasing agricultural production in addition to low soil fertility. Shortage of land is perceived by the farmers themselves as the major cause of poverty, 50 percent of the farms being under 0.33 ha, with food crop production as their top priority. In fact, poverty currently affects 38.2 percent of the population, with 16.0 percent of the population falling in extreme poverty [5].

1.4.4 Impact of climate change, the need for resilient practices

In climate change context, notably with temperature rise that will affect crop yields, the dominant rain fed, small-scale farming systems of Rwanda could be highly affected in the near future if climate smart agriculture practices which are based on sustainable production and climate resilience, are not adopted. Such practices include agroforestry, a land use system that intentionally integrates and manages trees, crops, and/or livestock.

1.5 SWOT analysis of Agroforestry development

Strength, Weaknesses, Opportunities and Threats (SWOT) analyses conducted by Mukuralinda et al. (2017) and in the context of three background studies to the development of the agroforestry strategy and action plan (see Nzeyimana 2017, Mukuralinda et al. 2017, and Ndayambaje 2017)[6] provide an overview of what should be considered in taking agroforestry forward in Rwanda. Weaknesses for agroforestry development are presented by key areas of the gap analysis that was carried out in the framework of the development of the agroforestry strategy for Rwanda (Table1).

[5] Integrated Household Living Conditions Survey, EICV5 (2016/17) Rwanda Poverty Profile Report 2016-2017; by NISR,2018

[6] Nzeyimana B. (2017). Study on legal and policy constraints to agroforestry in Rwanda; Mukuralinda A., et al (2017). Technical review of agroforestry experience to inform the Rwanda strategic plan; Ndayambaje JD (2017). Market opportunities for agroforestry products and services in Rwanda, a background study to support the development of the Agroforestry Strategy and Action Plan.

Tree tomatoes are some of the fruit trees mixed with crops.©FAOTeopista Mutesi

Table 1. Results of SWOT analysis of agroforestry development in Rwanda

STRENGTHS	WEAKNESSES
• Traditional agroforestry practice and knowledge exists • Transformative power (in terms of food security and income) of some agroforestry practices in some context demonstrated • Experience in the region has demonstrated feasibility of using structured stakeholder engagement to develop diverse and inclusive AF options • Tools for characterising soil degradation and restoration potential and skills to apply them exist nationally • Political will to use agroforestry to address key economic and environmental issues exists together with commitments for action as reflected in long-term development goals, Vision 2020, (EDPRS 1&2) policy & strategy initiatives • Land use zones have been identified across the country for promoting agroforestry • Increased yields of crops, wood and fodder for livestock • Increased provision of environmental services (e.g. erosion control on slopping land) • Diversification of income and risk reduction • Income generation (selling of wood products and fruit) • Climate change adaptation and mitigation benefits	**1. Policy, legal, institutional and governance** • Lack of focused agroforestry strategy for coordinating (scattered) efforts that have impacts on agroforestry • Lack of institutional and dedicated home for agroforestry • Weak coordination and linkage amongst sectors i.e. Government, private sector, and NGO actors in promoting locally relevant AF practices that can have transformative impact **2. Research, education, extension and capacity building** • Insufficient investment in research and development of technologies • Lack of high quality tree seeds and seedlings • Few tree species propagated and promoted • Limited range of agroforestry practices promoted in each land use zone especially in pasture land • Local knowledge not harnessed in the development and promotion of agroforestry options across contexts locally and nationally • Lack of knowledge about appropriate range of high value timber tree species for most parts of the country • Weak link between research and development, and knowledge transfer • Absence of dedicated agroforestry extension service along with poor or inadequate offer of capacity building in agroforestry and poor institutional capacity, skills, and means • Limited financial and technical capacity of the farmers to invest in long-term land use management like agroforestry • Delayed benefits from agroforestry practices • Lack of appropriate monitoring and evaluation tools in agroforestry **3. Information, awareness and communication** • Insufficient information and awareness on potential economic, social and environmental benefits of agroforestry technologies at all levels • Insufficient knowledge on various aspects of agroforestry technologies and tree management in site specific applications • Limited farmers access to knowledge in agroforestry system and tree management • Lack of agroforestry database, knowledge sharing, and popularization

	4. Market and value addition • Specific tree and produce constraints to investing into agroforestry • Limited supply and high quality value addition of agroforestry tree products • Limited capacity in agroforestry products processing and storage • Lack of market information and infrastructure • Lack of financial instruments, incentives and low value of by-products • Poor organization of tree producers and farmers to connect with markets • Market failure leading to land degradation and loss of soil carbon because they do not attract immediate market value **5. Women and Youth issues** • Limited access to resources (land and environmental, inputs, training and credit facilities, including information) as well as in decision making • Underemployment, socio-economic marginalization effects
OPPORTUNITIES	**THREATS**
• Increased consciousness of policy makers and the public awareness about the role of trees in watershed management, land rehabilitation, climate mitigation and adaptation, along with growing awareness for eco-friendly agriculture, green agriculture • Rwanda as REDD+ program participant has developed important investment programs (FIP/PPCR) that give special emphasis on practices including agroforestry for attaining food security, and climate change adaptation and mitigation • Stakeholder engagement to develop diverse and inclusive agroforestry options for each land use zones and districts in order to improve food security, livelihoods and environment • Presence of several NGOs working in agroforestry as their programme area • Nested-scale (local building on FFS, land use zones, etc.) innovation platforms (involving all stakeholders) to foster co-learning about the performance of agroforestry options • Trained farmer facilitators across the country that could also be used as an avenue to demonstrate/disseminate the various agroforestry technological options • Local organizations, cooperatives and farmers/producers associations more	• Promotion of narrow tree diversity could lead to reducing resilience of livelihoods and landscapes • Promotion of narrow set of agroforestry practices may fail to reach many people for whom these practices are not appropriate • Promotion of narrow set of agroforestry practices and species will result in variable performance of agroforestry, patchy adoption and eroding confidence of farmers in the practices that are promoted • Lack of synchronization of policy, market, extension system and technological innovation result in co-limitation of adoption • Agriculture sector not sufficiently aware or supportive of using agroforestry practices for sustainable intensification • Boundaries of land use zones and administrative units are incongruent making rational implementation of agroforestry options for different contexts complex • Potential risk of pests and diseases • No formal government agroforestry strategy to support agroforestry development • Climate change and climate variability (e.g. drought)

involved in the management of natural resources, including agroforestry development • Establishment of a national cross-sector agroforestry scaling platform to ensure coherence and delivery of benefits from widespread adoption of agroforestry practices across the country • Use of options by context analysis across each land use zone to guide local action and prioritize research • Establish a network of rural resource centres (RRCs) to multiply and promote diverse, quality tree germplasm together with knowledge and skills on its deployment • Promote timber growing on farms to substitute for imports and provide income earning opportunities • Potential linkages of agroforestry with Crop Intensification Programme (CIP) and Livestock Intensification Programme (LIP) • Availability of land for agroforestry development particularly on slopping land through erosion control • Provision of technical knowledge and other material support (e.g. seeds, seedlings, other tree nursery inputs) encourage farmers to practice agroforestry • Agroforestry can be part of ecosystem restoration and natural resources protection activities • Need to satisfy higher demand in wood products, non-wood products and fodder, in line with population growth and national economy stability • Opening up market opportunities (carbon markets, poles and wood industries, agribusiness…); with emergence of investors in the agro-industrial sector • Increasing availability of natural resource management, forestry and agroforestry graduates from colleges and universities	

1.6 Rationale of the strategy

Rwanda has a limited land available to expand its forest plantations while the population trend keeps increasing and the majority depends on wood for cooking despite efforts to promote other affordable sources of energy. Agroforestry is proposed as the long-term solution as it has a high potential to provide wood for fuel and social protection while avoiding deforestation. Different tree species are used in agroforestry systems to provide construction materials as well as livestock fodder and food (fruit and nuts) which improve food security. Agroforestry has multiple additional benefits which are but not limited to reduced soil erosion and increased resilience to heavy rains through improved slope stability; water management and nutrient recycling which improve agricultural production; and carbon sequestration. Agroforestry systems have significant potential for contributing to the objectives of poverty alleviation through income generation and diversification; biodiversity, energy and water security; and sequestration of carbon by increasing above and below-ground sinks. In line with NST1 (2017-2024), in order to achieve the 85 percent of agricultural land covered by agroforestry, Rwanda needs to redouble efforts towards agroforestry promotion.

Agroforestry in Rwanda faces numerous challenges but also has important strengths, drivers and opportunities for increasing adoption of agroforestry practices and the development of the subsector as sustainable system of land use practices that generate biological, economic, and environmental benefits to the population. The proposed strategy will look at how agroforestry systems could sustain the continuous supply of goods and services by building on the strengths while minimising the threats facing agroforestry development. Challenges such as unfavourable policy, lack of investment in agroforestry research, capacity building, tools and infrastructures, inadequate knowledge dissemination, legal constraints and poor coordination are among the factors that hinder the agroforestry development. It is noticeable that certain sectors such as agriculture, forestry, energy, environment, do not frequently have the same understanding of agroforestry, its multi-functionality and complexity, and may eventually compete, while synergy should be sought. Agroforestry is not sufficiently addressed in national policymaking, sustainable land use management and rural development programs. As a result, its potential contribution to the economy and sustainable development goals has not been fully expressed.

As an activity affecting land management, agroforestry belongs to the different sectors, but as provided in the legal and policy context, it belongs to none of them. In the present state, agroforestry falls between agriculture and forestry sectors, but no relevant institution takes a leading role in the advancement of agroforestry. Consequently, the implementation of agroforestry is not coordinated at all levels. The harmonization and synchronization of plans require strategic actions and efforts of coordination across the departments in charge of agriculture and forestry sectors. This strategy clarifies the strategic activities to boost agroforestry, establish clear required institutional framework and coordination mechanisms and a well elaborated monitoring and evaluation framework.

Agroforestry Strategy

1.7 Vision

The agricultural landscape of Rwanda is enriched with useful trees or shrubs and agroforestry is widely adopted by the farmers and communities as an integrated land use system that contributes to the sustainable management of land thus an increase in productivity of agricultural land to meet

the demand for food, fibre, biomass energy and mitigation or adaptation to climate change.

1.8 Mission

The Mission of the "Rwanda Agroforestry Strategy" is to promote leadership and synergies in agroforestry, and engage coordinated action and implementation, through the procurement of knowledge, capacity, tools, rules and regulations, to increase the adoption and development of agroforestry at scale, for the benefit of the farmer, community and the whole Country.

1.9 Basic principles and key entry points of the agroforestry strategy

1. A national inter ministerial agroforestry platform is necessary to ensure coherence, coordination and delivery of benefits from widespread adoption of agroforestry as a sustainable practice across the country, including policy interventions that underscore the need for agroforestry to support sustainable agricultural intensification and provide incentives to farmers.

2. Innovations and participative approaches integrating options by context approach across each agro-ecological zone (AEZ) and land use system (LUS), are key for guiding local action and prioritizing national agroforestry research, creating a bottom-up mechanism for ensuring that research results meet farmers' needs.

3. Strengthening extension services and capacity building of local actors in agroforestry with appropriate training and communication tools are key to foster co-learning for performing agroforestry options and scaling up.

4. Stakeholder engagement shall be necessary to develop and document diverse and inclusive agroforestry options suitable across AEZ and LUS combining traditional and scientific knowledge, to create a basis for coherent development action in land restoration and soil health, fruit trees for improved nutrition of local population and income generation, for wood energy and timber production as well as in reducing climatic change effects, degradation of land, forests and watersheds, wood shortage (including fuelwood), crop failure, malnutrition and poverty.

5. Profitable quality tree produce and diverse value chains shall be structured through optimization and innovation to offer opportunities for smallholder farmers, youth and women. The strategy shall focus on setting up an enabling environment for farmers to access the markets of multiple agroforestry products, investment in agroforestry value chains and value addition. It shall promote and empower women and youth through vocational training and development and agroforestry entrepreneurship.

1.10 Strategic Objectives and Priority Actions

To realize the vision and mission of the agroforestry strategy, strategic objectives and priority actions have been formulated in six interconnected thematic areas. These thematic areas are interlinked and should be regarded as an ongoing process in the development of the agroforestry sub-sector in Rwanda. Coordination, monitoring and evaluation are integral to sustaining the strategy and its action plan toward a continued development of the subsector. Themes and their underlying strategic objectives are discussed in terms of key actions in the next sections.

1.10.1 Theme 1: Creating Policy and Institutional Framework for Agroforestry

Background/Rationale

Rwanda has several sectoral policies and laws that are relevant to agroforestry where it is a key component within the Agriculture, environment, forest, and land sectors. Among them, the new Forest Policy encourages agroforestry practices by recognizing its important role in landscape restoration, increasing overall forest resource output and agriculture land productivity. However, certain rules and regulations on tree harvest and transportation are still constraining agroforestry development. In the absence of systematic and comprehensive provisions in existing policies and laws, agroforestry cannot gain appropriate recognition and operationalization, with the risk of limited adoption at the country level.

Agroforestry development in Rwanda falls into mandate of several institutions which will be required to join their efforts and significantly contribute to the development and scale up of agroforestry. Weak linkages and coordination between them could constitute a major constraint to agroforestry planning, development and significant impacts on the livelihoods and environmental management in the country.

Strategic Objective 1.1.
Create an enabling legal framework and institutional arrangement for agroforestry development

a) Elaborate agroforestry guidelines and regulations based on Forest Policy and research

b) Mainstream agroforestry in existing policies including ministerial instructions and orders, and Prime Minister's Orders

c) Establish interministerial committee in charge of coordination and monitoring of agroforestry activities.

1.10.2 Theme 2: Innovative Research and Knowledge for Agroforestry Development

Background/Rationale

Over the last 40 years, through successive research and development programs and projects, agroforestry technologies and companion trees have been tested and developed, intensively for some of them, but unequally in terms of site specific conditions and adaptation to the various agro ecological regions and land use systems and farmers' needs. As a result, a number of agroforestry have been developed but their adoption and expansion was limited. Hence, a first step is to properly plan agroforestry research, taking into account past experiences, successes, failures, and prioritize national research, based on farmers' needs, site specific conditions and adaptation to various agro-ecological regions and land use systems by using participative approach allowing regular mutual interaction between farmers and their organizations.

Operationalizing such research for development (R4D) plan in agroforestry which is complex and multidisciplinary by nature, goes through strengthening the capacity of concerned institutions (research and higher education) and teams, and requires performing (and often costly) equipment for labs and field work for reliable measurements, data collection and analysis to assess, monitor and model agroforestry systems and technologies.

The design, development and fine tuning appropriate agroforestry models and technologies through innovation and option by context approach, in correspondence with the various site specific conditions of AEZ/LUS and farmers' constraints and needs, is key for adoption. Considering the low diversity of tree species and dominancy of exotic species in current agroforestry systems, it is important to promote local agroforestry tree species, for conservation of biodiversity, but also for the provision of wood and non-wood products and other ecosystem services that can boost agroforestry adoption if properly developed and supported. Finally, as transfer of agroforestry research findings (technologies) to farmers is a major challenge (low adoption), appropriate tools and process have to be developed to reduce the knowledge and information gaps.

Strategic objective 2.1
Develop and operationalize an agroforestry research program to address a range of contexts and farmers' needs

a) Conduct a gap analysis in agroforestry research and develop a research programme for agroforestry.

b) Establish and strengthen linkages and partnerships within national institutions for the implementation for the research programme.

c) Promote scientific cooperation at regional and international levels in order to get support in training, education, collaborative research and networking.

d) Strengthening institutional research, teaching and education capacity in agroforestry through updating existing curricula, research grants, vocational trainings.

e) Identify and acquire appropriate equipment and tools for agroforestry research program and strengthening of existing R4D structures.

Strategic objective 2.2
Develop innovative, performing and sustainable agroforestry models and technologies adapted to the different agro-ecological zones of Rwanda

a) Conduct a baseline study on agroforestry models and technologies.

b) Develop appropriate agroforestry models and technologies.

c) Test and disseminate approved agroforestry models and technologies.

Strategic objective 2.3
Increase tree diversity and high-quality germplasm for increased adoption and scaling up of agroforestry systems

a) Inventory and document sources of good agroforestry germplasm for both indigenous and exotic species.

b) Test and select a large diversity of indigenous tree and shrub species for their suitability to agroforestry systems and technologies in various site conditions and potential to give more products, services and revenues.

c) Establish and manage sources of quality agroforestry tree planting materials.

Strategic objective 2.4
Develop appropriate approaches for the transfer of research results and technologies to farmers and other stakeholders

a) Incorporate agroforestry in the existing incubation centers under Integrated Polytechnic Regional College (IPRCs) by establishing an environment for the provision of agroforestry education, training and outreach.

b) Set up an easily accessible information system of agroforestry research results, knowledge technologies, and related data, to support technology transfer and adaptive management.

1.10.3 Theme 3: Strengthening Communication and Extension for Agroforestry Adoption and Scaling-Up

Background/Rationale
Although tree based systems are found in most of the agricultural landscapes of Rwanda, agroforestry systems and technologies is not yet sufficiently diversified, unequally developed and performing. Agroforestry itself, its multiple roles and systems, management practices and benefits are not properly understood by all practitioners, technicians, managers, and decision makers. As a result, the perception of agroforestry sometimes appears negative or partial (tree competition).

Information and communication on agroforestry are generally poor or fragmented, from central/ Governmental level to District and Sector level, and appear marginalized compared with information and messages given on agricultural production (crop & livestock). When information on agroforestry exists, it is not made accessible or not adequately disseminated to the farmers. Agroforestry information is needed as a mean of facilitating agroforestry adoption by the farmers since appropriate information and communication are important in extension process.

The adoption of agroforestry at scale would require adopting research findings and appropriate technical supports to be provided to the farmers. Hence, strong local extension services, available expertise and facilities, and supporting organizations such as development partners and NGOs are required through projects. However, the capacity of current extension services in agroforestry is still low and requires to be strengthened at farmer's satisfaction. In addition, the linkage between research and development need to be strengthened to insure that research findings in agroforestry are valued and disseminated to extension agents and finally to farmers.

Strategic objective 3.1.
Develop a knowledge sharing and communication strategy for agroforestry information and make it widely accessible to the general public.

a) Develop a communication plan and toolkit on agroforestry for farmers, agencies and other stakeholders in agroforestry.

b) Conduct regular awareness campaigns on agroforestry and main environmental issues at District level.

c) Educate farmers, natural resource professionals and the general public by providing agroforestry outreach.

Strategic objective 3.2.
Strengthen extension services in Agroforestry

a) Conduct a needs and capacity assessment of extension services.

b) Build the capacity extension staff and farmer-facilitators in the dissemination of agroforestry knowledge and information.

c) Mainstream agroforestry in existing agriculture extension approaches (FFS).

d) Establish coordination mechanisms of extension services carried out by all stakeholders to increase the efficiency and effectiveness in implementing the agroforestry activities.

1.10. 4 Theme 4: Promotion of priority agroforestry Practices

Background/Rationale

In Rwanda, about 96 percent of the rural households rely directly or indirectly on agriculture for their livelihoods, while 79.9 percent of households use biomass as a source of cooking energy (EICV5). The higher dependence on natural resources for the livelihoods of an increasing population is one of the major causes of the rapid depletion of natural resources, leading to high pressure on land, forest and water resources. Nationally fuelwood demand continues to increase as most rural people rely on wood for their energy needs. Currently, the national annual wood deficit is estimated at 9.5 million m3 (RNRA, 2016) while soil loss is estimated at 1.4 millions of tons per year, accounting for a loss of USD 320,000 (FAO, 2018). Agricultural productivity becomes very low due to the overexploitation of the resources without addition of inputs to compensate for the exportation of soil nutrients. It is worsened by effects of climate change through more frequent droughts, landslides and flooding particularly reported in many districts of the Eastern Province, Western province and Kigali City (REMA, 2015). Agroforestry is not yet adopted on farmer's field at sufficient scale for soils wealth and increased crop yield. Consequently, there is low agricultural productivity and food security is affected in many areas of the country and becomes the root cause of malnutrition and stunting. An estimated 20percent of the Rwandan households are food insecure and 38 percent of the children are stunted.

Towards addressing the challenges above, the Government of Rwanda, in 2010, committed in Bonn Challenge and in the Africa Forest Restoration Initiative (AFR100) to restore 2 million hectares of the degraded lands by 2030. In 2014, the government published the National Restoration Opportunities Assessment (MINIRENA, 2014). This assessment, a global first, identified that agroforestry represented the single most significant restoration opportunity with a total potential area of 1.1 million hectares. Agroforestry, therefore, provides a potential restoration solution to land degradation in Rwanda and Eastern Province in particular providing multiple benefits including the reduction of soil loss, increase of soil biomass, carbon and nutrients, provision of essential farm resources such as a livestock fodder, fruits, fuel wood (for cooking), construction and other woody biomass needs.

Agroforestry is one of the options that could contribute to many of the country's strategies toward landscape restoration, enhancing food security, improved nutrition, resilience to climate change and carbon sequestration particularly through increasing tree cover on agricultural land. High level economic analysis showed that there was a significant return on investment for farmers that make the transition from traditional agriculture to agroforestry (MINIRENA, 2014). Furthermore, evidence shows a positive relationship between tree cover and indicators of children's dietary quality and increased consumption of fruits and tree leafy vegetables. Tree products ranging

from fuelwood and timber to fruits are all locally commercially valuable, and could significantly contribute to improved livelihood and income generation in the households. Additionally, exotic and local fodder trees and shrubs are the only means of livestock production especially during droughts when pasture shortages are catastrophic to livestock production. Therefore, incorporating appropriate tree/shrub and fruit species in farming systems could build soil health, water use efficiency, improved and sustained yields of crops and livestock, nutrition security, fuelwood and timber for different uses.

Strategic objective 4.1.
Promote agroforestry for land restoration and soil health

a) Mapping degraded land in all the agro ecological zones of the country where agroforestry is suitable for land protection and soil physical and chemical properties improvement.

b) Identify and apply appropriate agroforestry technologies for soil and water conservation (SWC) measures on slopping and other degraded lands.

c) Set up agroforestry based on SWC models, in the form of demonstration plots and sites, as places of exchanges and training for adaptive management and adoption.

Strategic objective 4.2.
Diversify the species of fruit trees and fodder in agroforestry systems to improve human and livestock nutrition and income generation

a) Provide farmers with access to high quality fruit tree planting material by establishing sustainable, decentralized seedling supply systems.

b) Mobilize private sector, farmers (entrepreneurs) and their associations to promote fruit trees for food security and income generation.

c) Develop agroforestry models suitable to different rangeland areas according to farmers' priorities.

Strategic objective 4.3.
Produce agroforestry fuelwood and timber and enhance their quality and economic value

a) Create and support entrepreneurship in quality tree seedlings production for establishing fuelwood and timber species in agroforestry systems across the country.

b) Increase the planting of high value timber species in agroforestry.

c) Support the diversification and adoption of suitable agroforestry tree species through the supply of quality tree germplasm.

d) Increase the productivity of agroforestry products on farmlands.

1.10.5 Theme 5: Marketing of Agroforestry Products and Development of their Value Chains

Background/ Rationale

In Rwanda, agroforestry has been developed for subsistence, emphasizing on increasing production level of trees, crops and livestock, with little attention being paid to the markets of agroforestry trees products. A lot of different tree products comes from diverse agroforestry systems and include food (fruits, nuts, and leaves used as legumes), fuel (wood and charcoal), fodder (leaves and fruits),

timber and service wood (sawn wood, poles, stakes), fibres, tannins, medicines and drugs, resins and gums, and indirect products such as honey and mushrooms. It is difficult to market such a diversity of products as many of them are produced in small (and often erratic) quantities and not sufficient to cope with the demand and market specifications.

Although such products have a huge value addition potential and despite an increasing demand, the marketing mechanisms for agroforestry tree produce are weak or unavailable in the country. Farmers and producers' organizations or cooperatives are scarce, market information and investment are still limited and often agroforestry produce is unable to satisfy market specifications, and offer low returns and opportunities for the farmers. Improvement of the production conditions and all the sectors that depend on them (commercialization, transformation, sales, etc.) will become more conducive to investment, which in turn will create jobs.

Strategic objective 5.1.
Establish a conducive environment for farmers to access markets of agroforestry products

a) Develop marketing strategies for agroforestry tree produce and possible services.

b) Create an enabling policy environment for smallholders' participation in value chain of agroforestry products.

c) Generate and disseminate agroforestry market information and data.

Strategic objective 5.2.
Improve the readiness of farmer-producers in the marketing of agroforestry tree products

a) Organize collective action among the farmers and farmer cooperatives for the marketing of agroforestry products and the strengthening of the value chains.

b) Train farmers and their organizations on various issues and models related to quality and marketing of agroforestry tree products, from project investment and management to marketing techniques of agroforestry tree products.

c) Facilitate access to loans, credits and facilities to trained farmers and their organizations from financing institutions, private sector and other parties, to support and develop projects aiming at the marketing of their agroforestry tree products.

d) Identify participatory best-fit models for the marketing of agroforestry products.

Strategic objective 5.3.
Mobilize investment in marketing and value chains of agroforestry tree products

a) Conduct market studies and value chain analyses of major and lesser known agroforestry tree products.

b) Design and operationalize Public-Private Partnership in the promotion and marketing of most promising agroforestry tree products, based on stakeholders mobilization, technical requirements and opportunities for value addition.

c) Support the establishment of wood based industries with investments in relation to identified markets and marketing channels.

d) Support the establishment of industries and value chains of high quality and standardized agroforestry food products.

e) Develop incentive and support structure for the private sector to invest in agroforestry tree based products and services.

1.10.6 Theme 6: Empowering Women and Youth through Agroforestry Development

Background/Rationale

Agriculture can be an important engine of growth and poverty reduction. But the sector is underperforming in many countries in part because women and youth who are often a crucial resource in agriculture and the rural economy, face constraints that reduce their productivity. In Rwanda, women and youth represent a large part of the Rwandan population and the majority rely on agriculture. Empowering women and youth is needed to unlock the full productive potential of agriculture through agroforestry to accelerate and strengthen its adoption and development. In this perspective, women and youth should have a better access to knowledge and information, including capacity building for acquisition of skills, involvement in entrepreneurship, and be given the necessary voice for participating in institutions and decision making.

Women are usually responsible for most of the farming works and procurement of food, fodder, fuel wood and other tree products for the family, while men are mainly looking for off-farm incomes. In order to accelerate the adoption of agroforestry technologies used in tree planting, management or maintenance and value addition of the agroforestry related products, women and youth should be engaged from planning to implementation of the agroforestry set targets.

While youth constitutes the highest majority of work force in Rwanda, it faces significant challenges in accessing gainful and remunerative employment and entrepreneurial opportunities and this affects the national economy. Youth has the potential to become the driving force for inclusive agricultural transformation. However, access to high value commodity chains like those associated with wood processing is often limited for the youth given the requirements for capital, technologies and skills. With appropriate training and support, youth can contribute in agroforestry development, for instance in tree growing, small-scale wood processing, and market-oriented activities. Creating decent job opportunities for youth, and tapping into their potential for innovation and entrepreneurship could generate significant social and economic returns, making it an effective target for sustainable development.

Strategic objective 6.1.
Promote and empower women in agroforestry

a) Inform and sensitize women and women's cooperatives on roles, uses and benefits of agroforestry, tree products and their marketing.

b) Conduct a knowledge audit of women in the production and commercialization of agroforestry products and services;

c) Train women's groups and cooperatives in agroforestry and agricultural production, value addition, product quality assurance and marketing of products;

d) Organize women in cooperatives for agroforestry based activities and increase their participation in agroforestry projects planning and management;

e) Mobilize, train and support the creation of self-help women's cooperatives as main actors in the development of agroforestry value chains;

f) Organize rural women in cooperatives for running agroforestry based enterprises and establish suitable linkages with credit and financial institutions.

Strategic objective 6.2.
Involve and empower youth in agroforestry development

a) Sensitize youth on agroforestry potential and benefits;

b) Conduct a need assessment and knowledge audit of youth in the production and commercialization of agroforestry products and services;

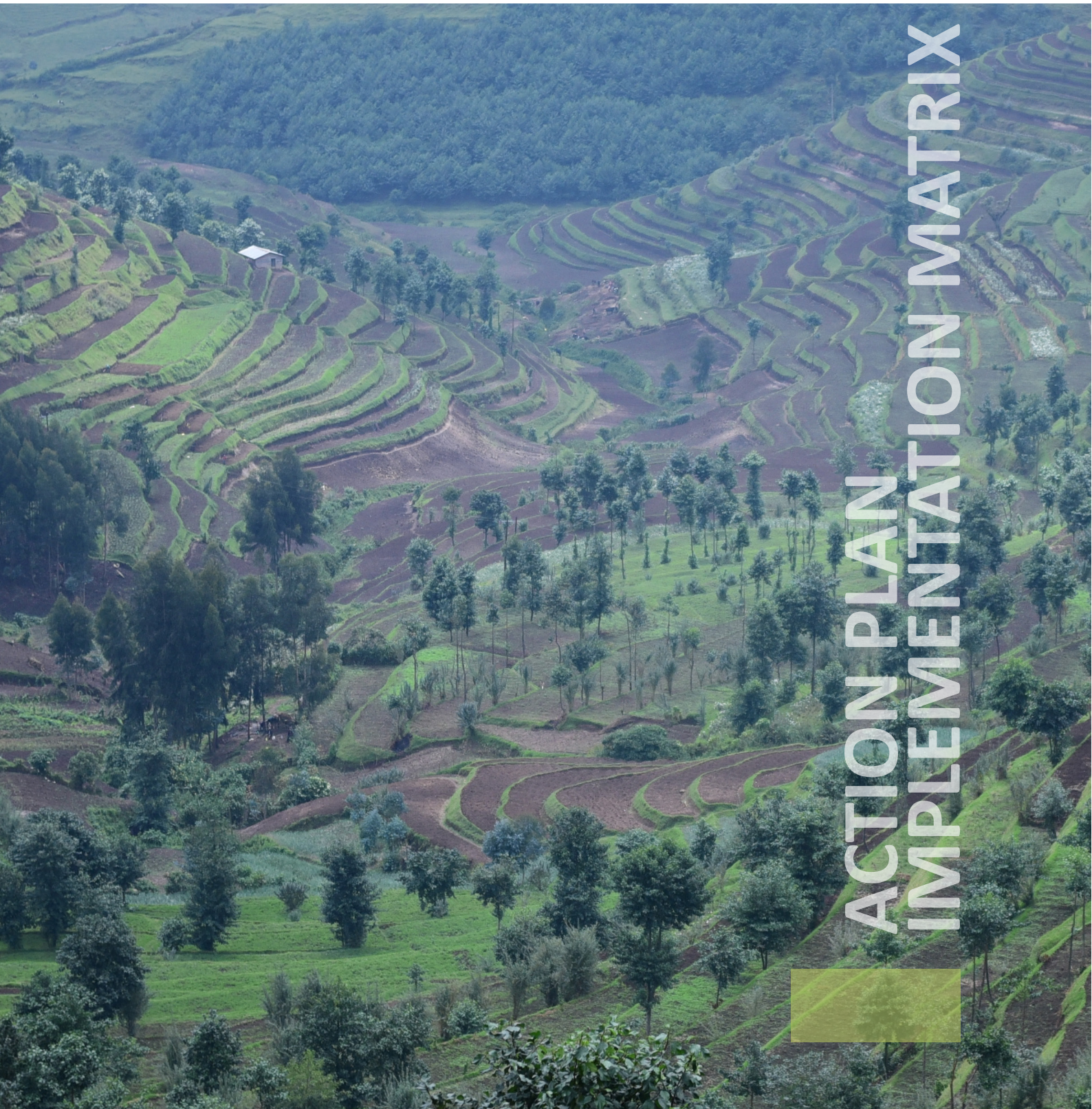
c) Provide information on agro-forestry innovations and job opportunities to youth through various channels including cooperatives, agribusiness dealers and social media;

d) Provide vocational training, performing tools and technologies, and market information to youth entrepreneurs, on demand basis to address downstream business challenges and opportunities;

e) Promote and support the creation of small and medium-sized forest enterprises in tree growing, wood processing, along with the provision of ecosystem services.

2. PLAN

The implementation of the strategy requires an action plan which details all expected outputs required to meet strategic objectives. Timelines are set to insure that activities are implemented as planned and in timely manner. The effective implementation will be guided by annual plans set up jointly by relevant stakeholders. A coordinating institution will oversee the implementation of specific priority actions and will be responsible for reporting implementation progress. An overview of the action plan is given below.



2.1 Agroforestry Action Plan implementation matrix

Thematic areas, strategic objectives and priority actions	Output	Indicator	Responsible institution	Timeline	Estimated Budget
Theme 1: Creating Policy and Institutional Framework for Agroforestry					
Strategic Objective 1.1. Create an enabling legal framework and institutional arrangement for agroforestry development					
Elaborate agroforestry guidelines and regulations based on forest policy and research	Guidelines and regulations for agroforestry implementation elaborated	Types and number of guidelines developed and implemented	**MoE** MINAGRI	Yr 1	70,000,000
Mainstream agroforestry in existing policies including ministerial instructions and orders, and Prime Minister's Orders	Ministerial instructions for agroforestry integrated in current concerned policies and laws are drafted, coherently linked and implemented	Instructions and Orders establishing implementation framework for agroforestry development	**MoE/RWFA** MINAGRI/RAB	Yr 2	25,000,000
Sub Total					**95,000,000**
Theme 2: Innovative Research and Knowledge for Agroforestry Development					
Strategic objective 2.1. Develop and operationalize an agroforestry research program to address a range of contexts and farmers' needs.					
Conduct a gap analysis in agroforestry research and develop a research programme for agroforestry	A national agroforestry research programme is elaborated and validated by all stakeholders	• Baseline report on the status of agroforestry research available • Stakeholders' meetings and workshops reports • Research agenda available	**MINAGRI/RAB** MoE ICRAF UR and High learning institutions	Yr 1-2	25,000,000
Establish and strengthen linkages and partnerships within national institutions for the implementation of the research program	Multidisciplinary teams of researchers and specialists are constituted for research under RAB coordination, their dedicated roles and	• List of institutions and partner scientists in the implementation of research programmes	**MoE** MINAGRI/RAB ICRAF UR and High Learning Institutions	Yr 1-10	200,000,000

	contributions to R4D programmes and projects identified and implemented	• Number of Coordination meetings/Conferences organised			
Promote scientific cooperation at regional and international levels in order to get support in training, education, collaborative research and networking	Regional and international scientific partnerships developed through agreements and MoUs	Number of Research Cooperation agreements and MoUs	**MoE** MINAGRI/RAB MINEDUC ICRAF UR and High learning institutions	Yr1-10	50,000,000
Strengthen institutional research, teaching and education capacity in agroforestry through updating existing curricula, research grants, vocational trainings	Institutional research, teaching and education capacity in agroforestry is strengthened and extended through joint programs between Research and Higher Education bodies	• Number of curricula developed and/or updated • Number of fundamental research conducted	**MoE** MINEDUC MINAGRI/RAB ICRAF UR and High learning institutions	Yr1-10	500,000,000
Identify and acquire appropriate infrastructure, equipment and tools for agroforestry research program and strengthen existing R4D structures	Infrastructure, equipment and facilities requirements for agroforestry research and related needs at laboratory and field levels are identified, rehabilitated/or and made available	Number of infrastructure, equipment and facilities availed for agroforestry research for development	**MoE/RWFA** MINEDUC MINAGRI/RAB ICRAF UR and High Learning Institutes	Yr 3-9	200,000,000
Sub Total					**975,000,000**
Strategic objective 2.2. Develop innovative, performing and sustainable agroforestry models and technologies adapted to the different agro-ecological zones of Rwanda					
Conduct a baseline study on agroforestry models and technologies	Current agroforestry models and technologies are evaluated and new ones are designed	Baseline studies reports available	**MoE** MINEDUC MINAGRI/RAB UR and High Learning Institutes ICRAF NGOs and development partners	Yr 2-4	70,000,000

Develop appropriate agroforestry models and technologies	Agroforestry models and technologies at multi-scale levels are developed	Types of models and technologies developed	**MoE** MINAGRI MINEDUC NGOs and Development partners	Yr 3-7	300,000,000
Test and disseminate approved agroforestry models and technologies	Agroforestry models and technologies at multi-scale levels tested and disseminated to suit farmers specific conditions	• Types of models and technologies tested and disseminated • Number of beneficiary households/Farmers	**MoE/RWFA** MINAGRI MINEDUC MINICOM ICRAF	Yr 4-10	100,000,000
Sub total					**470,000,000**
Strategic Objective 2.3. Increase tree diversity and high-quality germplasm for increased adoption and scaling up of agroforestry systems					
Inventory and document sources of good agroforestry germplasm for both indigenous and exotic species	Local and exotic tree and shrub species identified and characterized and their germplasm collected	Number of agroforestry tree species identified, characterised and their seedlings collected	**MoE/RWFA** MINAGRI/RAB MINEDUC UR and High learning institutions ICRAF	Yr 1-6	150,000,000
Test and select a large diversity of indigenous tree and shrub species for their suitability to agroforestry systems and technologies in various site conditions and potential to give more products, services and revenues	Increased number of adapted and productive high value indigenous tree species used in agroforestry systems and technologies across various site specific conditions	Number of indigenous agroforestry tree species selected and promoted	**MoE/RWFA** MINAGRI/RAB ICRAF UR and High learning institutions	Yr 1-10	150,000,000
Establish and manage sources of quality agroforestry tree planting materials	Increased supply of productive and high quality planting materials developed from indigenous and exotic tree species for their integration in various agroforestry systems and technologies	• Number and size of available sources of agroforestry tree reproductive material • Quantity of seeds and other tree reproductive materials produced	**MoE/RWFA** MINAGRI/RAB ICRAF	Y1-10	350,000,000

Sub total					**650,000,000**
Theme 3: Strengthening Communication and Extension for Agroforestry Adoption and Scaling-Up					
Strategic objective 3.1. Increase awareness and information on agroforestry, its benefits and best practices for a general public, and develop appropriate communication tools and products for local actors					
Develop a communication plan and toolkit on agroforestry for farmers, agencies and other stakeholders in agroforestry	Communication plan, actors' individual actions and awareness tools used to improve communication	Communication plan and awareness tools are available	**MoE/RWFA** MINAGRI/RAB Civil society Media (Radios, TVs) ICRAF FAO Development partners	Yr 2-4	300,000,000
Conduct regular awareness campaigns on agroforestry and main development issues at all decentralized levels	Information about agroforestry in terms of its potential benefits in addressing food insecurity, poverty and land degradation is provided to the development and extension staff at District and Sector levels	Number of Awareness campaigns conducted for concerned staff at decentralised levels	**MoE/RWFA** MINAGRI/RAB MINALOC NGOs and Development partners	Year 2-8	100,000,000
Educate farmers, natural resource professionals, and the general public by providing agroforestry outreach	Information on agroforestry is locally disseminated through organized events to explore opportunities of meetings with farmers	• Number of beneficiaries reached through various events and meetings • Number of trainings conducted	**MoE/RWFA** MINAGRI/RAB MINALOC MINEDUC UR and High Learning Institutes NGOs and Development Partners	Year 2-9	132,560,000
Sub total					**532,560,000**

Strategic objective 3.2. Strengthen extension services in agroforestry					
Conduct a needs and capacity assessment of extension services	Facilities, staffing and training needs for agroforestry extension are identified and recorded	• Types and number of needed facilities by extension services for agroforestry development • Number of staff to be recruited and number of staff to be trained in agroforestry	**MoE/RWFA** MINAGRI/RAB MINEDUC UR/CAVM and other high learning institutes FAO MINALOC	Year 1-2	65,000,000
Build the capacity of extension staff and farmer-facilitators in the science and practice of agroforestry	Capacity and skills in agroforestry practices of extension agents and farmer-facilitators improved	• Training reports • Training workshop reports • Number of extension agents and farmer-facilitators trained by subject matter	**MINAGRI/RAB** MoE/RWFA MINEDUC UR/CAVM.ICRAF MINALOC IPRCs KCCEM	Year 1-10	325,000,000
Mainstream Agroforestry in newly established or existing agriculture extension approaches	Agroforestry extension and advisory services are provided for in existing agriculture extension approaches (FFS)	• Number of FFS groups trained in and implementing agroforestry practices • Number of new FFS groups established, trained and implementing agroforestry	**MINAGRI** MoE MINALOC,FAO Development partners	Yr1-10	86,000,000
Set up coordination mechanisms of all actors in agroforestry extension activities	Improved coordination, synergy interaction and dialogue among stakeholders	• Number of workshops and meetings with stakeholders organized • Number and types of joint project activities implemented	**MoE/RWFA** MINAGRI MINALOC/RAB IPRC'KCCEM NGOs and Development partners UR and High learning instituttions	Yr 1-10	84,000,000
Sub total					**560,000,000**

Strategic objective 3.3. Enhance adoption of agroforestry by farmers through improvement of knowledge and material support					
Upgrading technical skills for collective action and increased adoption in extension	Knowledge and capacity of farmer promoters, FFS facilitators and local leaders to set up and develop agroforestry technologies is enhanced each year	• Number of refresher courses and trainings in agroforestry by subject • Number of farmers promoters and leaders trained in agroforestry	**MoE/RWFA** **MINAGRI**/RAB MINALOC NGOs and Development partners	Yr 1-10	215,000,000
Set up and maintain agroforestry demonstration plots and farms to promote innovation and up-scale agroforestry adoption in various AEZ at District and Sector level	Learning visits of agroforestry technologies and systems are increasingly and collectively organized across a network of demonstration plots and farms established across different districts and sectors	Number of demonstration sites established and regularly maintained to regularly serve as models to be scaled up	**MINAGRI/RAB** MoE/RWFA ICRAF UR/CAVM IPRC,KCCEM MINALOC FAO	Yr 2-8	320,000,000
Incentivise farmers to adopt agroforestry provided	An increasing number of farmers (and their organizations) is adopting agroforestry	Percentage of new farmers facilitated in adopting agroforestry practices	**MoE** MINAGRI MINALOC NGOs and Development partners	Yr 2-10	450,000,000
Sub total					**985,000,000**
Theme 4: Promotion of priority Agroforestry Practices					
Strategic objective 4.1. Establish an enabling environment framework for the farmers to access the markets of agroforestry products					
Mapping of degraded land in all the agro-ecological zones of the country, for agroforestry application and land improvement	Land area threatened by soil erosion under various conditions is quantified and mapped for new AF interventions for soil and water conservation	Area (ha) of degraded land with agroforestry potential mapped	**MoE/RWFA** MINAGRI/RAB NGOs, and Development partners	Yr 2-3	180,000,000
Identify and apply appropriate agroforestry technologies and soil and water conservation (SWC)	Trees for agroforestry based SWC measures are massively produced and planted in	Percentage of soil loss reduced and levels of soil fertility restored	**MoE/RWFA** MINAGRI/RAB NGOs, and	Yr 1-10	240,000,000

measures on slopping and other degraded lands	different agro-ecological zones (AEZs) and land use systems (LUS)		Development Partners		
Set up agroforestry based SWC models, in the form of demonstration plots and sites, as places of exchanges and training, for adaptive management and adoption	Demonstration plots and sites (e.g. watershed) are set up in eroded land or land susceptible to erosion, under various site specific conditions, into the form of a network of agroforestry based SWC technologies and models at District level	Number of SWC models established	**MoE/RWFA** MINAGRI/RAB MINALOC ICRAF IPRC,KCCEM UR and High learning institutions	Yr 3-8	420,000,000
Sub total					**840,000,000**
Strategic objective 4.2. Diversify the production of fruits and fodder in agroforestry systems to improve human and livestock nutrition and income generation					
Provide farmers with access to high quality fruit tree planting material	Production of improved seedling materials and make them available to farmer for multiplication and improved value chain	Quantity of high quality fruit trees availed through decentralised system	**MoE/RWFA** MINAGI (NAEB&RAB) MINALOC NGOs, and development partners Farmers' cooperatives	Yr 1-10	170,000,000
Mobilize private sector, farmers (entrepreneurs) and their associations to promote public private partnership (PPP) in the development of fruit tree value chains and value addition	Strengthened PPP in promoting agroforestry practices and products value chains	Number of Mobilised entrepreneurs for the development of fruit tree value chains and value addition	**MINICOM** MINAGRI/NAEB MoE/RWFA PSF NGOs, and Development Partners	Yr 1-10	97,000,0000
Integrate appropriate agroforestry options in the management of different rangelands	Agroforestry models suitable for the management of rangelands in different agro-	Agroforestry models suitable to different rangeland areas are available	**MINAGRI/RAB** MoE/RWFA ICRAF	Yr 2-5	120,000,000

	ecological zones identified and promoted	UR/CAVEM Farmers			
Sub Total					**387,000,000**
Strategic objective 4.3. Produce agroforestry fuelwood and timber and enhance their quality and economic value					
Create and support entrepreneurship in quality tree seedlings production for establishing fuelwood and timber species on farms across the country	Tree nurseries are created and operationalized by farmer entrepreneurs supported with appropriate training and tools (quality germplasm, nursery inputs, etc.)	Number of tree nurseries established and operationalized by private entrepreneurs in quality tree seedlings production	**MoE/RWFA** MINALOC MINAGRI/RAB ICRAF NGOs Farmers' cooperatives	Yr 1-9	125,000,000
Increase the planting of high value timber species in agroforestry	Quality timber trees for the production of sawlogs are planted in different agroforestry systems across all the AEZ and LUS	• Quantities of seedlings supplied to farmers • Number of farmers who planted timber species on farmland	**MoE/RWFA** MINALOC MINAGRI/RAB NGOs Farmers' cooperatives	Yr 2-10	150,000,000
Support the diversification and adoption of suitable agroforestry systems and components	Agroforestry systems and components that suit different AEZs and LUS are widely adopted by farmers	Number of farmers by types of agroforestry systems and components adopted and managed appropriately	**MoE/RWFA** MINAGRI/RAB MINALOC NGOs	Yr 1-10	235,000,000
Increase the productivity of tree products in agroforestry systems	The planting of diversified high value tree species in agroforestry is increased	Productivity (m3ha-1 year) of different agroforestry products increased	**MoE/RWFA** MINAGRI/RAB MINALOC NGOs	Yr 3-10	302,000,000
Sub total					**812,000,000**
Theme 5: Marketing of Agroforestry Products and Development of their Value Chains					
Strategic objective 5.1. Establish an enabling environment framework for the farmers to access the markets of agroforestry products					
5.1.1. Develop marketing strategies for agroforestry tree produce and possible services	A marketing strategy framework for key agroforestry tree products and their value chains is established and adjusted over time	Framework for AF marketing strategy available	**MINICOM** MoE MINAGRI NGOs PSF Development partners	Yr 1-2	44,500,000

	Protocols and guidelines for the marketing of agroforestry tree products and services are available	Types and number of protocols and guidelines developed	**MoE** MINAGRI MINICOM FAO ICRAF PSF	Yr 2-3	56,000,000
5.1.2 Create enabling policy environment for smallholders' participation in value chain of agroforestry products	Reduced taxes and transaction costs on AF tree products	Number of Measures taken to create enabling environment	**MoE** MINAGRI MINICOM PSF	Yr 1-3	12,512,000
	Performance of AF tree markets and farmer-producers profits is improved through provision of support/incentives.	Percentage increase in practitioners revenues and profit	**MoE** MINAGRI MINICOM FAO PSF	Yr 3-9	32,540,000
5.1.3. Generate and disseminate agroforestry market information and data	An agroforestry market information system is established, accessible to farmers and cooperatives, including prices on products	Agroforestry market information system established	**MoE** MINAGRI MINICOM MINEDUC ICRAF PSF	Yr 1-6	154,345,000
Sub Total					**299,897,000**
Strategic objective 5.2. Improve the readiness of farmer-producers in the marketing of agroforestry tree products					
Organize collective actions among farmers and farmer cooperatives for the marketing agroforestry products and strengthening the value chains	Cooperatives strengthened in business development and financial management at community levels	Number of cooperatives supported in business development and financial management	**MoE** MINAGRI MINICOM PSF NGOs and Development partners	Yr 1-8	234,455,000
Train actors in agroforestry on quality and marketing of AF tree products	Different trainings in marketing, commercialization techniques, quality issues, etc. for farmers-producers and their organizations are carried out at District and Sector levels	Number of actor***s*** trained on various issues and models related to quality and marketing of AF tree products	**MoE/RWFA** MINAGRI/RAB MINICOM PSF UR and High Learning Institutes	Yr 1-10	345,983,000

			NGOs and Development Partners		
Facilitate access to loans, credits and facilities to trained farmers and their organizations to support and develop projects aiming at the marketing of their agroforestry tree products	Trained farmers and their organizations as well as the private sector have access to loans, credits and other facilities from financing institutions	Number of farmers and farmers' cooperatives facilitated to access loan facilities	**MoE** MINAGRI MINICOM PSF RCA	Yr 3-10	671,876,000
Identify participatory best-fit models for the marketing of agroforestry products	Best fit-models of AF tree products marketing are developed with trained and supported farmer-producers through pilot projects, assessed	Number of models identified	**MoE** MINAGRI/RAB MINICOM UR NGOs and Development partners	Yr 1-5	128,330,000
Sub total					**1,380,644,000**
Strategic objective 5.3. Mobilize investment in marketing and value chains of agroforestry tree products					
Conduct market studies and value chain analyses of major and lesser known agroforestry tree products	Market studies on major and lesser known agroforestry tree products	Number of market studies conducted	**MoE** MINICOM MINAGRI/RAB ICRAF UR/CAVM	Yr 2-5	63,500,000
	Potential markets and marketing of secondary agroforestry tree products are assessed for the design of pilot projects	Number of potential markets and marketing of secondary agroforestry tree products identified	**MoE** MINICOM MINAGRI/RAB ICRAF UR/CAVM	Yr 2-6	48,450,000
Design and operationalize Public-Private Partnership in the promotion and marketing of most promising agroforestry tree products, based on stakeholders mobilization, technical requirements and opportunities for value addition	Private investment in marketing of main AF tree products initiated in the form of PPP projects, and maintained continuously	PPP in agroforestry is established and functional	**MoE** MINAGRI MINICOM MINALOC PSF	Yr 2-8	34,569,000

Support the establishment of wood based industries with investments in relation to identified markets and marketing channels	Wood based industries are designed through feasibility studies of marketable AF tree products, on 2 years, reviewed/extended 5 years later	Number of wood based industries supported	**MoE** MINAGRI MINICOM MINALOC PSF NGOs	Yr 1-10	356,500,000
Support the establishment of industries and value chains of high quality and standardized agroforestry food products	Fruit and food industries are designed through feasibility studies of high value added marketable products	Number of established industries and value chains of high quality and standardized agroforestry food products	**MINAGRI** MoE MINALOC MINICOM PSF NGOs	Yr 1-9	250,000,000
Develop incentive and support structure for the private sector to invest in agroforestry tree based products and services	Incentives including input subsidies and facilitated access to credits, payment for environmental services (PES) and carbon sequestration and innovative support structure in favour of local entrepreneurship are developed	Number and types of incentives and support provided to invest in Agroforestry tree products	**MoE** MINAGRI PSF NGOs and Development Partners	Yr 1-5	45,850,000
	Jobs are created through the development of added value agroforestry products, entrepreneurship and returns from the marketing of agroforestry tree products and services	Number of jobs created from the marketing of agroforestry tree products and services	**MoE** MINAGRI MINALOC MINICOM NGOs and Development partners	Yr 1-10	25,600,000
Subtotal					**824,469,000**
Theme 6: Empowering Women and Youth through Agroforestry Development					
Strategic objective 6.1. Promote and empower women in agroforestry					
Inform and sensitize women and women's cooperatives on roles, uses and benefits of agroforestry, tree products and their marketing	Women and women's cooperatives capacity and skills in agroforestry, tree products and their marketing are	Number of women and women cooperatives sensitized	**MoE** MIGEPROF MINAGRI MINICOM/RCA	Yr 2-9	345,400,000

	improved through collective actions		MINALOC		
	An increasing number of women are participating in agroforestry as FFS facilitators or trainers, farmer promoters and project managers	Number of women and women cooperatives participating in agroforestry practices	**MoE** MIGEPROF MINAGRI MINICOM/RCA MINALOC NGOs, and Development partners	Yr 2-9	535,000,000
Conduct a knowledge audit of women in the production and commercialization of agroforestry products and services	Gaps in knowledge, skills and organization of women to target, support and extend the range of marketable tree products and tree services are identified through surveys	Reports on knowledge audit of women in the production and commercialization of agroforestry products and services	**MoE** MINAGRI MIGEPROF FAO MINALOC NGOs, and Development partners	Yr 3	59,000,000
Train women's groups and cooperatives in agroforestry and agricultural production, value addition, product quality assurance and marketing of products	Technical capacity and knowledge of women and their cooperatives for the development of profitable agroforestry activities, tree products marketing and value chains, for themselves and the local community are increased	Number of women's groups and cooperatives trained in agroforestry, agricultural production, value addition, product quality assurance and marketing of products MoE	**MINAGRI/RAB** MIGEPROF MINICOM MINALOC NGOs and Development partners RSB	Yr 2-8	248,000,000
Mobilize, train and support the creation of self-help women's cooperatives as main actors in the development of agroforestry value chains	Tree germplasm, nurseries, seedlings, storage facilities for tree products and marketing are available and owned by women cooperatives	Number of agroforestry facilities owned by women cooperatives	**MoE** MINICOM/RCA MINAGRI Civil society	Yr 3-9	156,000,000
Organize women in cooperatives for running agroforestry based enterprises and establish suitable linkages with credit and financial institutions	Microcredit facilities dedicated to agroforestry products and their value chains are made available for women groups and cooperatives	Number of women cooperatives accessing finances and facilities	**MoE** MINAGRI MINICOM PSF MIGEPROF	Yr 6-8	86,000,000
Sub total					**1,429,400,000**

Strategic objective 6.2. Involve and empower youth in agroforestry development					
Sensitize youth on agroforestry potential and benefits	Awareness of youth on potential of agroforestry is created and progressively extended to all Districts and Sectors through collective actions	Number of youth Sensitized on agroforestry potential and benefits	**MoE** MINAGRI MINIYOUTH MINICOM/RCA MINALOC	Yr 1-10	95,000,000
Conduct a need assessment and knowledge audit of youth in the production and commercialization of agroforestry products and services	Knowledge, skills, organization and expectations of youth in agroforestry are assessed through surveys leading to identification of their potential contribution in tree product marketing and tree product based entrepreneurship and training needs	Need assessment report available	**MoE** MINAGRI MINIYOUTH MINICOM/RCA MINALOC NGOs and Development partners	Yr 1-2	65,000,000
Provide information on agroforestry innovations and job opportunities to youth through various channels	Opportunities for entrepreneurship and support to technological innovations and performing tools in agroforestry are created for youth	Information on agroforestry innovations and job opportunities to youth disseminated	**MoE** MINIYOUTH MINAGRI/RAB ICRAF Media	Yr 1-3	183,000,000
Provide vocational training, performing tools and technologies, and market information to youth entrepreneurs, on demand basis to address downstream business challenges and opportunities	Youth capacity for the development of profitable and innovative agroforestry entrepreneurship, from marketing of agroforestry tree products to wood processing and agroforestry based ecotourism is strengthened	Number of vocational training, performing tools and technologies, and market information to youth entrepreneurs conducted	**MINEDUC** MoE MINIYOUTH MINAGRI/RAB ICRAF UR and Higher learning institutions IPRCs KCCEM	Yr 1-10	385,450,000
Promote and support the creation of small and medium-sized agroforestry enterprises in tree growing, wood processing, along with the provision of ecosystem services	Small and medium-sized enterprises development in agroforestry and jobs for trained youth are created and progressively increased	Number and types of small and medium size agroforestry cooperatives supported	**MINICOM** MoE MINAGRI MINIYOUTH NGOs and Development partners	Yr 1-10	180,000,000

	Microcredit facilities for development of agroforestry tree products and their value chains are made available for youth and their cooperatives	Number of cooperatives/individuals accessing microcredits facilities	**MoE** MINAGRI MINICOM PSF MINIYOUTH	Yr 1-10	68,000,000
Subtotal					**976,450,000**
GRAND TOTAL (FRW)					**11,217,420,000**

3. IMPLEMENTATION OF AGROFORESTRY STRATEGY AND ACTION PLAN

3.1 Implementation arrangements

Agroforestry is by nature, crosscutting different disciplines and concerns different expertise from various sectors and structures, including multiple stakeholders. Consequently, the implementation of the agroforestry strategy requires a strong and acknowledged coordination of all concerned actors and stakeholders, able to synergize all needed efforts for successful execution.

Comprehensive approach to implement the agroforestry strategy is necessary given a number of implementation constraints that were identified through agroforestry SWOT analysis and taken into account for the formulation of the agroforestry strategy. The proposed way of implementing the agroforestry strategy and action plan will be constituted by an institutional framework whereby the Ministry in charge of Forestry and the Ministry of Agriculture and Animal Resources (MINAGRI) provide overall policy coordination and leadership in implementing and extension of agroforestry programmes respectively, while other concerned government ministries and their agencies (MINECOFIN, MINALOC, MINEDUC, RWFA, REMA), decentralized local governments, NGOs, academic institutions, civil society, farmers and community based organizations will take part in the implementation of the strategic plan and its priority actions.

As a multisector development strategy with multiple stakeholders, the implementation of Action Plan requires adequate mechanisms to facilitate coordination and implementation at the national and local levels. In this perspective, the agroforestry leading institution, the Ministry in charge of Forestry, shall coordinate efforts of all development partners, local and international NGOs that will deliver results and outputs to ensure horizontal and vertical synergies among them.

The Action Plan (2018-2027) shall be operationalized through Annual Work Programs in which the necessary and sufficient activities and their respective milestones required to deliver each yearly target shall be shared and specified for all partners involved in agroforestry development plan. Partners shall deliver results and outputs based projects that link to the national Agroforestry strategic priorities. It is also needed to have these Annual Work Programs linked to the staff annual Performance Contracts and which implement agroforestry strategic objectives.

The implementation of this joint Strategy will be influenced by the successive annual budget allocations provided to the department responsible for its implementation. Additionally, the status of implementation in any given year's plan will directly influence the ability to meet the following year's targeted milestones. Moreover, progress towards reaching intended outcomes for any given specific objective will depend on aspects of another sector's strategy.

3.2 Roles and responsibilities

The Ministry in charge of Forestry

The Ministry in charge of Forestry is the leading institution and will insure smooth implementation of the strategy by:

- facilitating harmonization of national agroforestry related policies and legislation;
- enforcing legislation, capacity building, and setting of standards and compliance

monitoring;
- mobilizing financial resources for the implementation of agroforestry strategy targets;
- enhancing vertical and horizontal integration, linkages and networking among institutions and stakeholders;
- coordinating activities of stakeholders within agroforestry subsector, promoting synergies and avoiding unnecessary duplication of work;
- supporting other players in the subsector to mobilize funds and other resources for the implementation of the strategy;
- promoting participation of local communities, Non-Government Organizations (NGOs) and Community based organizations (CBOs) in biodiversity conservation.

The Ministry of Agriculture and Animal Resources

The Ministry of Agriculture and Animal Resources (MINAGRI) will be responsible for ensuring the adoption of relevant agroforestry strategic actions. Specifically it will be responsible for:

- mainstreaming agroforestry considerations into the agricultural policies, plans and overall agroforestry extension system;
- enforcing legislation, capacity building, setting of standards and monitoring compliance;
- providing relevant guidance and support at national, District and local levels on agroforestry development;
- implementing agroforestry practices on agricultural land to notably reduce watershed degradation, soil erosion and improve soil fertility for sustainable agriculture and improve farmers' incomes and well-being;
- Improving readiness of farmer-producers to connect with markets and opportunities;
- disseminating agroforestry information to the land users.

Academia and Research Institutions

Agroforestry research services will be under the responsibility of the agency in charge of implementing policies related to forests management with support from key technical institutions (such as NISR, ICRAF and other international and regional R4D institutions, local and international NGOs, and dedicated projects. Agencies whose mandates are related to the promotion of agriculture activities will be conducting adaptive research and setting up facilities to effectively conduct extension services. Specifically, academia and research institutions will be responsible for:

- provision of technical assistance to strengthen systemic, institutional and operational capacity (methodologies, research, expertise, training etc.);
- development of user oriented research priorities;
- linking R4D and education in agroforestry;
- coordination of research activities;
- networking and scientific cooperation;
- developing innovative agroforestry models and technologies;
- promoting tree diversification and quality germplasm production ;

- technology acquisition, transfer and adaptation;
- data collection and tracking impact of research on agroforestry development;
- boosting the transfer of research findings and dialogue with farmers.

In this framework, multidisciplinary research and development teams will constitute a task force in agroforestry that provides guidance and advice to agroforestry R4D. The task force will meet regularly to examine agroforestry R4D issues and make recommendations for action.

Local Government

At local level, the strategy will be implemented through the local governance structures within the decentralized framework, with active participation of the local communities. District offices responsible for agriculture and natural resources sectors will undertake coordination and monitoring of agroforestry related programmes, projects and activities at the district level. They will be required to:

- coordinate the implementation and conduct day-to-day follow-up of the planned activities;
- Implement government policies and enforce laws on agriculture and forestry;
- Develop district agroforestry development plans and integrate them into the overall District Development Plans using existing platforms;
- Provide advisory services.

At this level, working groups will be (i) established and operationalized to provide guidance on development partner investments and programmes to be in line with implementation of the strategy, and (ii) stakeholders to facilitate agroforestry programs and projects implementation from the grassroots to the national levels. Together with the Ministry in charge of Forestry and Ministry of Agriculture and Animal Resources, they will organize periodic M&E of the agroforestry strategy implementation and recommend adjustments.

Civil Society and Private Sector

The civil society (NGOs) and private sector (service providers, professional organizations, women organizations and media) will be instrumental in the implementation of this strategy. Their functions will include, among others:

- carrying out advocacy and awareness on agroforestry practices and benefits;
- mobilization of different layers of Rwandan population to actively participate in the implementation of the agroforestry strategic actions;
- strengthening the capacity of community based organizations and local communities (farmers/producers organizations, cooperatives, women associations, etc.) to implement agroforestry development programmes;
- capacity building;
- environmental sensitization and education;
- provision of technical support.

In many cases, the agroforestry implementation structure will be required to recognize and promote explicitly their role. The implementation of several activities of the strategy including

social mobilization of farmers, extension services, and awareness campaigns will be conducted through civil society.

Media will regularly be informed by the responsible bodies who will frequently invite them to access the facts and figures through the information desks, social networks, and regular workshops, meetings and conferences.

3.3 Monitoring and Evaluation

Monitoring and Evaluation (M&E) system refers to all the indicators, tools and processes to measure if a program has been implemented according to the plan (monitoring) and is having the desired result (evaluation). As monitoring and evaluation will be used to measure accomplishments (and finally impact) and detect any deviation, appropriate and timely action will be taken – where and when there is need for adjustment.

To this regard, an M&E framework containing indicators in relationship with proposed targets, along with sources of data, means of verification for each indicator will be developed for specific projects aligned with this strategy. Baseline information will be gathered through studies and surveys and will be used to track implementation progress.

For effective monitoring and evaluation of the programs under the agroforestry strategy, the specific system for monitoring and evaluation, is to be linked with the existing monitoring and evaluation mechanisms in place; and ensure the increased and strengthened monitoring capacity of central and district level institutions.

The lead institution responsible for monitoring and evaluating implementation of the strategy will ensure that the M&E system is applied correctly and that all the involved entities and stakeholders provide the necessary information and data in a timely and proper manner.

At local level, M&E will be ensured by the district decentralized entities and will involve routine data collection and analysis on progress of the Strategic Plan implementation. The district offices will monitor programs and projects administered within their respective jurisdiction and submit annual M&E reports to the implementing leading institution. These reports will be reviewed regularly against the set targets to measure progress.

3.4 Budget requirements

The agroforestry strategy budget required for the 10 year period 2018– 2027, is estimated at RWF 11,217,420,000.

Mobilization for the implementation of the agroforestry strategy and action plan has been and will be targeted from different sources which include but not limited to:

- Internal public investment resources: this entails national budget allocation to the Environment and Natural Resource and agriculture sectors through the Ministry of Agriculture and the Ministry in charge of forestry and affiliated institutions.
- Donor sources mobilized into basket fund: Funding is expected to be mobilized through the Sector Wide Approach. This will be strengthened by partnerships from Environment and Natural Resource and agriculture Sector Working Groups; more funds to support the

Agroforestry will be generated through the development of project proposal that will be submitted to different donors.

- Non public sector resources: Additional funds are expected directly and indirectly from non-state intervening agencies specifically international NGOs, faith-based organizations, local NGOs and private sector investments.
- Cross-sector collaboration: Some of the outputs are expected to be implemented by or in collaboration with other sectors. For instance, additional funds are expected to come from MINAGRI, MINALOC, NGOs and Development partners.
- Private economic operators: Investing in forestry sector since this policy strongly supports the running of forestry related enterprises.
- Payment for Ecosystem Service (PES): As the private sector has not been active in exploring the investment opportunities in agroforestry, it has to be involved through Public Private Partnerships notably developing agroforestry entrepreneurship, marketing of tree produce and value chain development, allowing synergy and enhanced cooperation among different actors. In that regard, various private companies, groups and individual entrepreneurs will be targeted to invest in necessary agroforestry information, (vocational) training and development of technologies relevant for production of a diverse range of products, processes and services.

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