National Commercial Tree Improvement Strategy (NCTIS)

DRAFT FRAMEWORK

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April 2021

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Foreword

Kenya Forestry Research Institute (KEFRI) is a state corporation mandated to: Conduct research in forestry and allied natural resources; Disseminate research findings; Build capacity of stakeholders and Establish partnerships with relevant institutions and organizations. In accomplishing its mandate, KEFRI generates, collaborates, disseminates and shares information and technologies with a wide range of stakeholders including government ministries and state corporations, private sector, international organizations, institutions of higher learning, Community Based Organizations, Non-Governmental Organizations and farmers. KEFRI implements its research mandate under four research and development thematic areas. Among the four is the Forest Productivity and improvement theme under which tree improvement falls.

In 2019, Gatsby Africa supported KEFRI in carrying out a series of studies whose objective was to undertake a strategic gap analysis in forest productivity for commercial tree species with emphasis on research in tree breeding, seed production and management, and forest health. The involvement of Gatsby Africa was in line with their mission which is to accelerate inclusive, competitive and resilient economic growth in East Africa by demonstrating how key sectors can be transformed. This is achieved by: Funding and implementing programmes that look to catalyse and influence large-scale and lasting change in priority sectors; building and supporting local organizations dedicated to sector transformation and; sharing lessons learnt with others such as governments and donors who are trying to transform various sectors.

In its country programs in Kenya, Gatsby Africa has partnered with GoK to transform the commercial forestry into a competitive, inclusive and sustainable sector. This appreciates that market trends and demands by processors and consumers of wood and timber products must be supported by the country's efforts of increasing timber production through greater productivity and efficiencies. More importantly, it is this demand for improved planting material now and in the future, that will drive investments in tree growing through the development of planted forest sector and linked to creating higher income streams for investors in tree growing through the development of planted forest sector as envisaged in the Vision 2030, National Forest Conservation and Management Act (2016), Draft National Forest Policy, the National Forest Programme (NFP) 2016-2030. It is under this understanding that Gatsby Africa supported KEFRI to undertake a review of the tree improvement program. Further support has been availed by Gatsby Africa for the development of this National Commercial Tree Improvement Strategy (NCTIS).

The National Commercial Tree Improvement Strategy (NCTIS) will provide a road map to meet the short, medium and long-term investments needs by catalysing production and distribution of improved tree germplasm and where necessary acquisition from other improvement

programs. This is intended to increase the productivity of planted commercial forests to meet the demand for forest products. The Strategy combines tree breeding, silvicultural considerations and integrated pest management which are the core elements of a tree improvement programme which aims to increase productivity of trees per unit area.

This Strategy will contribute directly to implementation of national policies and initiatives, particularly the National Forest Programme (NFP) (2016-2030), which has set the agenda for the development and coordination of forestry sector, to meet the needs of Kenyans, based on the Kenya's Constitutional values and principles of Vision 2030. This Strategy will also be key in achieving the objectives of the Forest Productivity Cluster of the NFP and will enhance implementation of the Government's Big 4 Agenda on manufacturing, food security, universal health care and affordable housing, as well as Sustainable Development Goals (SDGs). Ultimately, a vibrant commercial forestry program will lead to increase in forest cover beyond the 10% stipulated in the NFP (2016-2030).

The KEFRI Board of Directors and Directorate are committed to the full implementation of this Strategy, and will work closely with Gatsby Africa, the parent ministry and all stakeholders to ensure its implementation. The KEFRI Board and Management will also ensure that this Strategy is implemented through timely provision of resources, preparation of annual work plans and regular monitoring and evaluation through quarterly Board and Management meetings.

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Director, KEFRI

1 Introduction

Globally, forest tree breeding started in mid twentieth century, and since then, the use of improved material for forest regeneration has become an essential part of forestry in many countries. The demand for forest tree seed and planting stock has increased rapidly, and frequently exceeds the supply. Due to high demand, most nurseries do not stock material of high genetic quality and known origin.

Tree improvement is the cornerstone of commercial forestry, as it provides the means through which tree growers access superior germplasm to optimize tree and forest productivity. Tree improvement combines principles of tree breeding, silviculture, and pests and diseases control. The principles are best actualized through a strategy, which outlines the means of achieving the desired outputs.

Tree improvement programmes have been implemented in Kenya at varying levels of intensity since 1936, to address the deficit of wood supply, which is currently estimated at 15 million m^3. Other challenges experienced include; climate change, forest excisions, poor forest management practices, and wanton clear felling of seed orchards, experimental plots and other forest areas, and this has interfered with tree improvement activities. Formulation of this Strategy arose out of the need to streamline tree improvement activities for maximum outputs and to align need of revitalizing commercial forestry in the country, This Strategy will play a central role in promoting commercial forest development in Kenya and will be key in enabling the forestry sector to achieve profitability and meet the Government's Big 4 Agenda on manufacturing, food security, universal health care and affordable housing. The scope of this Strategy is national, covering all the agro-ecological regions.

From the outset, the tree improvement programme in Kenya initially focused on three highland fast growing exotic timber species namely: *Cupressus lusitanica*, *Pinus patula* and *Pinus radiata*. Subsequent expansion of the programme included lowland pines and later involved diversification of priority species such as *Eucalyptus grandis*, *E. urophylla*, *E. camaldulensis*, *Grevillea robusta*, *Markhamia lutea, Melia volkensii* and *Gmelina arborea*. More recently, two indigenous species; *Melia volkensii* and *Acacia albida* have been incorporated under breeding for drought tolerance.

The key elements of tree improvement programme in Kenya have been species prioritization, identification and expansion of base populations; selection and testing of the plus trees through progeny trials; and establishment of seed orchards. Although some achievements have been made in terms of volume increment and establishment of seed sources, there is need to upscale tree improvement activities to obtain higher outputs.

However, from results of benchmarking studies carried out by KEFRI in 2019 with the support of Gatsby Africa, it is apparent that there are a number of challenges constraining the supply of globally competitive improved seed. There are also incomplete breeding strategies, for a number of major commercial tree species, limited market alignment, under resourcing/support and minimal sector/stakeholder collaboration among others. These challenges have limited the comparative genetic gains and competitiveness of most commercial species seed resources currently produced in the country.

There is therefore need to provide breeding for desired wood properties, quality germplasm to create resilient commercial forestry in the face of a changing climate, increase productivity, provide what the markets need and give a competitive advantage to local producers in terms of quality. The overall goal of this National Tree Improvement Strategy is to provide an appropriate national, sustainable and well-resourced tree improvement programme in Kenya.

The objectives of the Strategy are to.

a) Facilitate enhancement of production, marketing and promoting the use of genetically appropriate and adapted high quality tree seed and other germplasm for commercial forestry and private sector investments;
b) Ensure preservation of genetic diversity of priority tree species for future breeding;
c) Promote Stakeholder engagement, create awareness, catalyse partnerships, emphasizing involvement of all key stakeholders in tree improvement process and provide information on benefits of using high quality germplasm;
d) Enhance institutional and human resource capacity for tree improvement.

2 Guiding principles

The ultimate success of the implementation of the National Commercial Tree Improvement Strategy is strongly linked to availability high quality tree germplasm (Reproductive material) and the promotion of public-private-stakeholder partnerships in the germplasm production, supply and use. The strategy presented herein is therefore prepared by giving due regard to these considerations, and to align efforts of building an efficient and sustainable tree reproductive materials development and distribution system, where the private sector will be involved collaboratively. The success of the strategy will be guided by eight fundamental principles;

a) Availability of high-quality tree reproductive materials

b) Stakeholder involvement

c) **Species/variety site matching**

d) **Quality assurance**

e) **Research guided tree improvement program**

f) **Maintenance of breeding populations with broad genetic base**

g) **Effective communication system**

h) **Capacity Development**

3 Rationale

Market demand for commercial timber and other wood products in Kenya is growing yet the supply is declining creating a huge deficit. Wood products supply deficit is projected to grow to 6.3 million m^3 by 2045 (excluding charcoal), implying imports needed will be greater than 60% of the demand. However, commercial forestry has the potential to significantly contribute to alleviating this situation through productivity enhancement of existing plantation resources, of both public and private holdings and through afforestation of suitable land resources as well as stimulating economic growth based on targeting higher value timber market. This can be achieved through the use of improved germplasm.

It is well established that the free market is the most efficient means to address market needs, and as such there is a need to remove barriers in the interaction between the market (growers) and the suppliers of competitive improved seed sources. As is the case with most countries, Kenya has some competitive local seed sources (such as Melia and Cypresses spp.) and also has the need to import the best available material internationally. Growers (the market) have a need for access to scientifically- sound information as to the suitability of different seed sources for different regions and for various target end markets. There is also a need to have an assessment the health of a rich diversity of seed sources in the local context. KEFRI can play a key role in linking the market to the best resources, thereby unlocking the maximum potential for the sector and the country. Various international and local sources can be experimentally tested in strategically selected regions and the results shared with the growers, enabling them to leapfrog their current situation. The free seed market will enable growers to make informed decisions, comparing price to value and this in turn will drive the local price to be competitive whilst quality to increase over time.

The market demand is in the case of the locally bred *Melia volkensi,* for example, outstripping the supply. In such cases, there is a need to innovatively increase the supply whilst maintaining and improving the seed and genetic material quality through tree breeding and research.

In summary, of importance to commercial forestry in Kenya will be access to high quality genetically improved germplasm aligned with markets through short, medium, and long-term breeding programs and; development of improved seed sources and sourcing of seed from credible international breeding programs. In addition, seed resource policy and management providing sustainable supplies of high-quality germplasm and deployment of technology that enhances seed quality and its deployment into the sector will be key in this strategy.

4 Mission statement

The National Tree Improvement Strategy (NCTIS) aims to empower a national commercial forestry sector (both small and larger growers) through providing a portfolio of competitive genetic resources which also enable mitigation of risks such as pests and diseases and climate change. NCTIS aims to promote economic value and investments in commercial forestry sector.

5 Vision

Availability of diverse high quality tree reproductive materials of major commercial species adapted to the different agro-ecological regions for enhanced commercial forestry productivity in Kenya. This Vision has been divided into short, Medium, and long term as described below:

5.1 Short term vision (0 – 8yrs)

Our short-term vision is to enhance a participatory tree improvement program that develops, acquires and deploys quality improved germplasm that responds to the ever-growing demand of various wood products.

5.2 Medium term vision (8- 15yrs)

Make commercial forestry an attractive investment in Kenya through breeding for short rotation trees resistant to biotic and abiotic factors with desired wood properties.

5.3 Long term vision (>15 yrs)

Our long-term vision is to make Kenya a sustainable, resilient, dynamic, attractive and inclusive economic hub for commercial forestry through provision of quality germplasm.

6 Goals and Objectives

The NCTIS has four goals that address themselves to deliver on the different facets of a sound tree improvement namely; tree breeding, integrated pest management and silvicultural considerations.

Objectives for respective goals have been formulated (Table 1) to enable the Strategy to achieve desired goals.

Table 1: The goals and objectives for the strategy

Goal	Objectives
Goal 1: *Have a responsive sustainable aptly paced tree improvement program for major commercial tree species in Kenya*	1. To develop a sound understanding of the key markets for products from major commercial tree species 2. To develop market driven tree improvement programs for commercial tree species 3. To establish an effective tree improvement centre for major commercial tree species in Kenya 4. Improve resource mobilization for implementation of tree improvement program
Goal 2: *To have a state-of-the-art knowledge management system for commercial tree improvement program*	1. To create and run a centralized digital database for all breeding programs for commercial tree species 2. To develop effective and well-coordinated communication platforms for information on tree improvement between KEFRI and stakeholders
Goal 3: *To have mechanisms for effective exchange and acquisition of genetic material for tree improvement programs in line with national and international standards and regulations*	1. To develop guidelines for exchange and acquisition of genetic material including a model Material Transfer Agreements for germplasm exchange 2. To develop guidelines for equitable sharing of benefits accruing from tree improvement programs
Goal 4: *To have an established system for provisioning improved germplasm and propagation materials for commercial to tree species to stakeholders*	1. To establish healthy seed/propagation materials production units that are optimally sized, well sited and properly maintained. 2. To develop guidelines for the deployment of improved commercial tree germplasm based on verified species/varieties site matching. 3. To develop a national seed/propagation distribution system for commercial tree species including guidelines for involvement of private seed/propagation distributors

7 SWOT analysis

The evaluation of the present status of the tree improvement in Kenya, carried out in 2019 revealed major strengths, weaknesses, opportunities and threats. The proposed National Commercial Tree Improvement Strategy will look at how enhanced tree improvement programs could sustain the continuous supply of high quality tree germplasm (to support profitable commercial forestry) in the country by building on the strengths while minimizing the issues and challenges facing tree improvement.

Currently, the tree improvement activities and consequently improved seed supply chain are not efficient enough to cover the short, medium and long-term supply of high-quality improved germplasm for major commercial forestry species in Kenya. Public and private sectors are insufficiently equipped and involved in tree improvement processes. Sustainable and productive and profitable commercial forestry plantations in the country will depend largely on the degree of success in tree improvement and subsequent reproductive material production and distribution. The key results of the SWOT analysis are presented in Table 2 below.

Table 2: SWOT analysis for tree improvement and allied key disciplines

Strengths	**Weakness**
1. A strong foundation of well trained and experienced scientific and technical staff in diversified research disciplines **2.** Modern research facilities that are decentralized to various eco-regional centres **3.** An operational national tree seed centre **4.** A strong policy support and institutional support	**1.** Inadequate information to guide improvement programs and market demands **2.** Insufficient breeding populations **3.** Lack of well documented management protocols for all established seed sources leading to contamination and obsolete unproductive seed sources **4.** Poorly sited seed sources affecting optimum growth, health and seed production **5.** Many small seed orchards which are uneconomical and difficult to manage **6.** Low funding for breeding and IPM programs leading to inadequate quality and quantity of improved tree seed **7.** Lack of modern equipment for seed collection, processing, testing, storage, and distribution **8.** Weak tree seed certification system **9.** Lack of a market driven tree improvement program and limited ability to respond to

	unpredictable seed demand **10.** Weak linkages between KEFRI and stakeholders on tree improvement and IPM
Opportunities 1. Availability of base populations for some of the priority tree species 2. Existing linkages with many stakeholders 3. Operational national, regional and international cooperation 4. Rising demand for improved germplasm for various wood products 5. Growing demand for specialized forest products by the industry	**Threats** 1. Decimation of base populations in forests 2. Conflicting policies guiding commercial forestry 3. Inadequate land for tree improvement research including tenure uncertainty 4. Effects of climate change 5. Limited financial resources 6. Emerging pest and diseases

8 Stakeholders matrix

Our stakeholders are our most prized assets. They help us create a steady and healthy tree improvement program. During the strategy formulation we undertook stakeholder identification, their key areas of interaction and stakeholder consultation in a bid to have an all-encompassing strategy (Table 3).

Table 3: Stakeholder matrix

Category	Stakeholder (*Case examples*)	Areas of interaction
Nurseries	Aberdare Technologies	1. Commercial seedlings production 2. Marketing and distribution of commercial tree seedlings
	KOMAZA	
	TBPT	
	Better globe	
	Vi Agroforestry	
Growers	James Finley	1. Seed clients 2. Information sharing 3. Collaborative breeding 4. Advocacy and dissemination
	KFS	
	KTDA	
	COMPLY/Timsales	
	WETPA (Western tree planters association	
	Sotik Tea Company	
	Kakuzi	
	Tree Growers Association of Nyandarua	
	FFSPAK (Farm Forestry small holder producers Kenya)	
	SCOFOA	
	Kenya Network of tree Growers Association	
	BETTER GLOBE Forestry	
Seed stockist	One Acre Fund	1. Seed distribution 2. Information sharing
	Kenya Seed Company	
Processors, manufacturers	Association of saw millers	1. Information on desired wood products 2. Market information on category of products and trends
	Timber Manufacturers Association	
	Biashara Masters	
	Kenya Association of Manufacturers	
	COMPLY/Timsales	
	RAIPLY	
	Timber Treatment International	
	Association of wood science	

Category	Stakeholder (*Case examples*)	Areas of interaction
	specialists	
End Users	Kenya Power and lighting	
	KEPSA	
	PG BISON	
Development partners	JICA	Financial and technical support for; 1. tree improvement program 2. research and development
	World Resources Initiative	
	Finish Embassy	
	FAO	
	UNDP	
	Swedish Embassy	
	GIZ Kenya	
	GATSBY AFRICA	
	Kenya Climate Change Innovation Centre (KCIC)	
	Rainforest Alliance (RFA)	
	European Union	
Forest Standards	Forest Stewardship Council	
Commercial Banks	ADB	Financial and technical support for; 1. tree improvement program 2. research and development
	Commercial Banks	
Government agencies and advocacy	MoEF	3. Policy and institutional support 4. Collaboration on acquisition of germplasm 5. Land acquisition 6. Funding
	KFS	
	Min. of Industrialization	
	KEPHIS	
	Kenya building research Centre	
	Kenya Wildlife Service	
	NEMA	
	National Lands Commission	
	National Treasury and Planning	
	KEBS	
	Council of Governors (COG)	
	Forestry Society of Kenya	
Research and institutions of higher learning	Universities and professional bodies	1. Collaboration on research and development 2. Training and education 3. Exchange programs and benchmarking
	TVETs	
	KALRO	
	ICRAF	