

GHANA FOREST PLANTATION STRATEGY: 2016-2040



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Cover Photos:

- (TL) Garden furniture manufactured for the domestic and export markets
- (TR) Thinning operation within a 14-year old teak plantation established by Form Ghana in partnership with the Forestry Commission within the Asubima Forest Reserve, Offinso Forest District, Ashanti Region.
- (BL) Bamboo seedling nursery established by Ecoplanet Bamboo LLC in the Ashanti Region.
- (BR) 14-year old mixed indigenous species timber plantation established by Ayum Forest Products Limited, in the Amama Forest Reserve, Sunyani Forest District, Brong-Ahafo Region.

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FOREWORD



"We do not inherit the Earth from our Ancestors, we borrow it from our Children" is an ancient proverb that reverberates in my ears any time I think of the wonderful natural resources we are blessed with. The key word in the proverb is "borrow" – we do not "own" the earth to do with it as we please – we borrowed it. And if you borrow something you must make every effort to protect and return it in a good condition.

The pure simplicity of this proverb is quite piercing because it shows the effect of our ancestors' actions on our current situation and it also serves as a warning of the impact of our current actions on future generations. It therefore behoves on us to be careful to use our natural resources in the interest of our children as well as our own.

Today, all around us, we are losing and degrading our tropical rainforests and other terrestrial biomes at an alarming rate; we are indiscriminately mining our watersheds and other ecologically sensitive areas, human-induced annual wildfires ravage the landscape destroying natural vegetation, wildlife and their habitats, and we fell trees indiscriminately without replacement.

The Ghana Forest Plantation Strategy, which I consider a blueprint for landscape restoration in Ghana over the next 25 years constitutes a clarion call to take strategic and decisive action to restore our deforested and degraded landscapes.

This Strategy has been developed through a multi-stakeholder consultative process led by the Forestry Commission, a key agency under the Ministry of Lands and Natural Resources charged with the regulation, conservation and sustainable management of Ghana's forest and wildlife resources. The Forestry Commission, in line with its vision "to leave future generations and their communities with richer, better and more valuable forest and wildlife endowments than we inherited" has clearly outlined in this document the strategic pathways and resources required to achieve sustainable supply of planted forest goods and services so as to deliver a range of economic, social and environmental benefits through landscape restoration.

The Strategy translates my Ministry's policy direction on forest plantation development, stated in the 2012 Ghana Forest and Wildlife Policy, to specific targets for plantation establishment, maintenance and rehabilitation, together

with the strategies, actions and resources required to promote productive and sustainable forest plantations by the private sector and government.

Consistent with the Sustainable Development Goals (SDGs) and the Ghana Shared Growth and Development Agenda II (GSGDA II), the interventions proposed under this Strategy will contribute positively to the socioeconomic development of Ghana through the huge numbers of jobs to be created, especially in rural areas across the country, with its concomitant reduction in rural poverty levels and rural – urban migration.

Landscape restoration strategies proposed include trees-on-farm (climate smart agriculture), woodlot establishment, enrichment planting interventions, watershed restoration, etc., which together with commercial forest plantation development will significantly contribute to achieving Ghana's commitments both under the Bonn Challenge - a global landscape restoration initiative, as well as the Paris Agreement on Climate Change.

It is my belief that the implementation of this Strategy, having been developed through critical reflection and analyses, wide consultation and validation processes by both internal and external stakeholders, will be pivotal in driving our landscape restoration efforts and transformation of our forest plantation sector while contributing significantly to Ghana's economic development.



HON. NII OSAAH MILLS
MINISTER FOR LANDS AND NATURAL RESOURCES



Black hyedua (*Guibourtia ehie*) seedlings at the Achimota Central Nursery of the Forest Services Division, Accra.

EXECUTIVE SUMMARY



Forest plantations worldwide have the potential to supply two thirds of global industrial round wood. Over 260 million hectares of the world's land area is covered by forest plantations, which account for 7% of global forest area, representing 2% of global land area. Globally, there has been a significant increase in forest plantations since the year 2005, with an annual expansion of 5 million hectares. This trend is expected to continue and possibly increase in the coming years (FAO, 2010).

In Ghana, the forest estate has been impacted by various pressures including population and economic growth, both of which fuel high domestic wood consumption and high demand for timber for the export market. This situation has resulted in high rates of deforestation and forest degradation principally driven by agricultural expansion, wildfires, logging and fuel wood harvesting, mining and infrastructural development.

The Ghana Forest Plantation Strategy (GFPS) is consistent with Policy Objective 2 of the Ghana Forest and Wildlife Policy (2012) and aligns perfectly with the following national and international initiatives: Ghana's Medium Term Development Plan (GSGDA II), the anticipated 40-year National Socio-economic Transformational Plan, the United Nations' Universal Sustainable Development Goals, Ghana's Nationally Determined Contributions to address Climate Change, and the Paris Climate Change Agreement (2015).

The GFPS identifies challenges to past efforts and consequently outlines the strategic direction, actions and resources required to promote the development of productive and sustainable planted forests. It indicates the technical and financial resources required and performance indicators necessary to track progress over the period (2016 to 2040).

The goal of GFPS is therefore to achieve sustainable supply of planted forest goods and services to deliver a range of economic, social and environmental benefits over and beyond the planned period.

This goal will be achieved through specific strategic actions directed towards the establishment and management of 625,000 ha of forest plantations, enrichment planting of 100,000 ha of poorly-stocked and degraded forest reserve compartments, facilitating the incorporation of trees within farming systems (trees-on-farms) covering 3.75 million (ha) of agricultural landscapes, maintaining and

management of small, medium and large scale forest plantations, create employment opportunities and sustainable livelihoods in rural communities through forest plantation development, increase investments in research and development, extension, training and capacity building for forest plantation development, timber utilization and marketing and improving governance in the regulation and management of forest plantations using best practice principles.

The proposed interventions are expected to support the development of a sustainable forest resource base that will satisfy future demand for industrial timber and enhance environmental quality. Additionally, they are expected to contribute to relieving the pressure on the existing natural forests for timber, enhance connectivity between the agricultural and forest landscapes to promote biodiversity conservation, manage barriers to forest plantation investments, while providing optimum income generation opportunities for forest plantation owners, forest-fringe communities, the timber industry and the national economy.

The GFPS advocates the incorporation of food crops during the establishment of forest plantations (Taungya System) and promotion of under-storey planting or alternative livelihood activities (e.g. cultivation of spices and medicinal plants, apiculture, etc.) to provide additional short-term income to improve livelihoods and enhance household incomes. It is projected that a total of 3,039,500 jobs will be created over the 25-year strategy period.

Round wood production from the 625,000 ha of new plantations is estimated at 82.5 million cubic meters over the 25-year period or an average annual production of 3.25 million cubic meters. An additional average annual round wood production of 1.41 million cubic meters is expected from the existing 235,000 ha of forest plantations. Total income is estimated at US\$9,411,553,539 with expected investment cost of US\$4,064,389,800 over the period with an Internal Rate of Return (IRR) of 19.4%. Additionally, significant income is expected from carbon offset schemes (i.e. Compliance Carbon Markets, Voluntary Carbon Markets, etc.), REDD+ (e.g. performance based payments for emission reduction) and payment for other ecosystem services (PES).

Funding for the GFPS will be sourced from government (30%) and private sector (70%). Government (GoG) funding is expected to come from direct budget support, levies, pension funds, and contributions from development partners (DPs). Private sector funds are expected to be sourced mainly from debt and or equity financing and grants. GoG/DPs will mainly fund activities aimed at facilitating the creation of an enabling environment for investment in forest plantation development. These will include promulgation of legislations, policies and establishment of institutional structures that promote investment in forest plantations; creation of land banks; genetic tree improvement and subsequent provenance testing and establishment

of seed stands; licensing of tree nurseries and plantation development contractors; capacity building within key agencies charged with supporting forest plantation development; research; etc. Private sector investments will mainly target the actual implementation of forest plantation projects.

This strategy will be reviewed every 5 years to evaluate achievement and adapt the strategic objectives and actions to changing conditions and priorities thus ensuring that the GFPS stays on course to achieve the overarching goal.

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ACRONYMS

AAC	- Annual Allowable Cut
AfDB	- African Development Bank
ARLI	- African Resilient Landscapes Initiative
AGCL	- Ashanti Goldfields Company Limited
BAT	- British-American Tobacco
BPA	- Bui Power Authority
CBOs	- Community Based Organizations
CDM	- Clean Development Mechanism
CFMP	- Community Forestry Management Project
CFP	- Commercial Forest Plantation
COP	- Conference of the Parties
EDAF	- Export Development and Agricultural Investment Fund
EIA	- Environmental Impact Assessment
ESIA	- Environmental and Social Impact Assessment
EPA	- Environmental Protection Agency
FAO	- Food and Agriculture Organization of the United Nations
FC	- Forestry Commission
FCTC	- Forestry Commission Training Centre
FD	- Forestry Department
FDMP	- Forestry Development Master Plan
FPDF	- Forest Plantation Development Fund
FPDC	- Forest Plantations Development Centre
FORIG	- Forestry Research Institute of Ghana
FPRI	- Forest Products Research Institute
FSD	- Forest Services Division
FPDFMB	- Forest Plantation Development Fund Management Board
FSC	- Forest Stewardship Council

FPTSC	- Forest Plantation Technical Steering Committee
GoG	- Government of Ghana
GPDP	- Government Plantation Development Project
GIPC	- Ghana Investment Promotion Centre
GNFS	- Ghana National Fire Service
GSGDA (II)	- Ghana Shared Growth Development Agenda (Volume II)
HFZ	- High Forest Zone
HIPC	- Highly Indebted Poor Country
IFM	- Innovative Financing Mechanism
INDC	- Intended Nationally Determined Contribution
IRR	- Internal Rate of Return
MAI	- Mean Annual Increment
MLNR	- Ministry of Lands and Natural Resources
MoFA	- Ministry of Food and Agriculture
MoFEP	- Ministry of Finance and Economic Planning
MoP	- Manual of Procedure
MTS	- Modified Taungya System
NDPC	- National Development Planning Commission
NFPDP	- National Forest Plantation Development Programme
NPV	- Net Present Value
NREG	- Natural Resource and Environmental Governance
NTFPs	- Non-Timber Forest Products
NRMP I	- Natural Resource Management Programme, Phase I
PES	- Payment for Ecosystem Services
PEFC	- Programme for the Endorsement of Forest Certification
RWE	- Round Wood Equivalent
REDD+	- Reducing Emission from Deforestation and Forest Degradation
SDGs	- Sustainable Development Goals

SIPL	- Subri Industrial Plantations Limited
SZ	- Savannah Zone
TUC	- Timber Utilization Contract
ToF	- Trees on Farms
UENR	- University of Energy and Natural Resources
UN	- United Nations
UNCED	- United Nations Conference on Environment and Development
VRA	- Volta River Authority
WFC	- World Forestry Congress



Officials of Forestry Commission and FORM Ghana undergoing training in best practice thinning operations

PART I – INTRODUCTION & BACKGROUND

1.1 INTRODUCTION

Forest plantations cover approximately 264 million hectares of the world's land area. They account for 7% of global forest area or about 2% of global land area, but have the potential to provide two thirds of global industrial round wood demand. From 2005 to 2010, the area of forest plantations expanded each year by 5 million hectares on the average. This trend is expected to continue and possibly increase in the coming years (FAO, 2010).

In Ghana, an extensive forest estate, consisting of 1.6 million hectares of forest reserves, was gazetted in the High Forest Zone (HFZ) in the 1920s (Oduro et al., 2012). At the time there were large areas of forests outside these gazetted forest reserves across the country. Over the period significant portions of these forests have been lost or degraded. The key underlying causes of deforestation and forest degradation include population and economic growth and weak governance structures. High population and economic growth have led to high domestic wood consumption and high demand for timber to satisfy export markets. Additionally growing domestic and export demand for agricultural commodities such as cocoa, oil palm, cashew, and food crops has led to large scale conversion of forests to agricultural uses.

The principal drivers of deforestation and forest degradation in Ghana have been identified as follows:

- Agricultural expansion (e.g. permanent cultivation, free range cattle ranching, shifting cultivation/traditional slash and burn);
- Wildfires;
- Logging and fuelwood harvesting;
- Mining; and
- Infrastructural development (roads, settlements and other infrastructural development).

In line with Ghana's Medium Term Development Plan - the Ghana Shared Growth Development Agenda (GSGDA II), the anticipated 40-year National Socio-economic Transformational Plan, the United Nations' Universal Sustainable Development Goals, Ghana's Nationally Determined Contributions to address Climate Change, the Paris Climate Change Agreement (2015) and consistent with Policy Objective 2 of the Ghana Forest and Wildlife Policy (2012), this Strategy outlines plans by the government, private sector and

rural communities to restore degraded landscapes through the development of commercial forest plantations, smallholder plantations, enrichment planting of degraded forests and to provide support for the incorporation of trees within farming systems.

The Strategy identifies challenges to past efforts and consequently outlines the strategic direction, actions and resources required to promote the development of productive and sustainable forest plantations. It indicates the technical and financial resources required and performance measures necessary to track progress over the period (2016 to 2040).

The proposed interventions are expected to support the development of a sustainable forest resource base that will satisfy future demand for industrial timber and enhance environmental quality. These interventions are expected to relieve the pressure on the existing natural forests, enhance connectivity between the agricultural and forest landscapes to promote biodiversity conservation, manage barriers to forest plantation investments, while providing optimum income generation opportunities for forest plantation owners, the timber industry, forest-fringe communities and the national economy.

1.2 BACKGROUND

1.2.1 International Policy Framework on Forest Plantations

United Nations Conference on Environment and Development (UNCED)

The United Nations Conference on Environment and Development (UNCED) Earth Summit held in Rio de Janeiro in 1992, and subsequent international fora, have recognized the significance of forest plantations in supporting sustainable forest management as reflected in the Forest Principles, Chapter 11 of Agenda 21 that states:

“The role of planted forests and permanent agricultural crops as sustainable and environmentally sound sources of renewable energy and industrial raw material should be recognized, enhanced and promoted. Their contribution to the maintenance of ecological processes, to off-setting pressure on primary/old growth forests, and to providing regional employment and development with the adequate involvement of local inhabitants should be recognized and enhanced.”

Rio + 20

At the United Nations Conference on Sustainable Development organized in Rio de Janeiro from 20th – 22nd June, 2012 (Rio + 20), the world re-affirmed its commitment to among others, fully implement the Rio Declaration, Agenda 21, the programme for further implementation of Agenda 21 and to support green economy policies in the context of sustainable development and poverty eradication.

The Bonn Challenge

In September 2011, world leaders met in Bonn, Germany to launch the largest global initiative on the restoration of degraded landscapes. It is an implementation platform for several global commitments and aims at the restoration of 150 million hectares of degraded forests and deforested lands by 2020.

According to the Global Partnership on Forest and Landscape Restoration, the Bonn Challenge is leading to real progress on the ground and assessments of restoration opportunity are ongoing in numerous countries leading to restoration pledges being incorporated into national plans and strategies.

The New York Declaration on Forests

The New York Declaration on forests (NYD) is a voluntary and non-legally binding political declaration by both developed and developing nations to halve the rate of natural forest loss by 2020, and strive to end it by 2030. This declaration was made at the UN's Climate Summit held in New York in 2014.

The NYD calls for the restoration of at least 350 million hectares of degraded forests and cropland which will bring significant climate benefits and also take the pressure off the natural forests.

(UN Sustainable Development Goals (SDGs)

Following the expiration of the Millennium Development Goals (MDGs) in 2015, member states of the UN, at the Sustainable Development Summit dubbed "2030 Agenda for Sustainable Development" on 25th September 2015, adopted 17 SDGs and 169 targets aimed at ending poverty, fighting inequality and injustice, and tackling climate change by 2030.

Goal#15 looks broadly at the protection, restoration and promotion of sustainable use of terrestrial ecosystems, sustainable management of forests, combating desertification, halting and reversal of land degradation and halting of biodiversity loss. Target #2 of Goal#15 advocates for the sustainable management of all types of forests and particularly supports substantial increase in afforestation and reforestation globally by year 2020.

Goal#15a aims to:

"Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems."

African Forest Landscape Restoration Initiative - AFR100

This is a country-led effort to restore 100 Million ha of deforested and degraded lands in Africa by 2030. This initiative, launched formally on 6th December, 2015 at COP 21 in Paris, will support the Bonn Challenge, the New York Declaration on Forests, and the African Resilient Landscapes Initiative (ARLI) - an initiative to promote integrated landscape management with the goal of adapting to and mitigating climate change.

Paris Climate Agreement

On 12th December 2015, during COP 21, 195 UN member countries adopted the first-ever, universal, legally binding, global Climate Agreement, requiring member states to embark on ambitious pathways towards a clean economy

and avert the undesirable effects of climate change.

Forest Certification

There are greater market access opportunities for products from forest plantations that are certified for compliance with social, economic and environmental standards. In addition, there is an international market for young established forest plantations as going concerns if they are certified.

One of the recent emerging prospects is the forest related carbon finance and its synergies with forest certification. It is expected that a new carbon element will be included in the scope of forest certification guidelines in the future that may open up opportunities for financing forest management operations.

Forest Law Enforcement, Governance and Trade (FLEGT)

The FLEGT initiative spearheaded by the EU Action plan works through Voluntary Partnership Agreements (VPA). Ghana ratified the VPA with the EU in 2009 with common commitment to the sustainable management of all types of forest, to provide a legal framework aimed at ensuring that all timber product imports into the EU Community from Ghana covered by this Agreement have been legally produced and in doing so to promote trade in timber products. These partnerships will also facilitate third party certification processes.

The Parties further agreed that in order to address the root causes and drivers of illegal logging, supplemental measures are required to strengthen sector governance and the legal framework. Particularly with regard to tackling the challenges of growing domestic timber demand, Ghana shall endeavor to undertake measures such as plantation development, which in addition to expanding domestic wood supply will create opportunities for CDM and REDD+ initiatives.

1.2.2 National Legal and Policy Framework

The Ghana Shared Growth and Development Agenda (GSGDA) Vol.II, recognizes the need to reverse forest degradation and restore degraded landscapes through sustainable land management and intensification of the National Forest Plantation Development Programme (NDPC, 2015).

As a result of the importance the Government of Ghana (GoG) attaches to forest plantation development, a number of strategies, policies and legislations have been introduced, in addition to funding a number of studies and projects since the mid -1990s, to provide direction and impetus for the development of

forest plantations in Ghana. These include the following:

Policies and Legislations

- I. Control and Prevention of Bushfires Act, 1990 (PNDC Law 229).**
(An ACT to prohibit the starting of bushfires and to provide for related matters. It repealed the Bush Fire Law, 1983 (P.N.D.C.L. 46)).
- II. Ghana Investment Promotion Centre Act, 1994 (Act 478).**
(An ACT to encourage, promote and facilitate investments into the country. It's also to initiate and support measures that will enhance the investment climate in Ghana).
- III. Ghana Investment Promotion Centre Act, 2013 (Act 865).**
- IV. National Land Policy, 1999.**
(Provides the framework and direction for dealing with land ownership, security of tenure, land use and development, and environmental conservation on a sustainable basis).
- V. Forest Plantation Development Fund (FPDF) Act, 2000 (Act 583).**
(Provides financial assistance for the development of forest plantations; provides funds for research and technical advice).
- VI. Forest Plantation Development Fund (Amendment) Act, 2002 (Act 623).**
(Sections (iii), (iv) and (v) support public and private investment in forest plantation development).
- VII. Forest Protection (Amendment) Act, 2002 (Act 624).**
(An ACT to amend the Forest Protection Decree 1974 (NRCD 243) to provide for higher penalties for offences therein and to provide for related purposes).

- VIII. The Timber Resources Management (Amendment) Act, 2002 (Act 617).**
(Excludes private forest plantations from being allocated by government under a Timber Utilization Contract (TUC), in addition to the provision of fiscal and other incentives and benefits to investors in the forestry sector).
- IX. Internal Revenue Act, 2000 (Act 592) and its Amendments.**
(Provides tax rebates, capital allowances, and such other benefits to investors).
- X. National Wildfire Management Policy, 2006.**
(Promotes effective and efficient management of wildfires for the sustainable management of natural resources and maintenance of environmental quality to improve on the socio-economic well-being of the citizenry).
- XI. Ghana Forest and Wildlife Policy, 2012**
(Policy Objective 2: advocates the development and implementation of a National Forest Plantation Strategy, with realistic annual targets based on best practices and updated forest plantation information for both the savannah and forest areas).
- XII. National Climate Change Policy, 2012 (CDM, REDD+)**
(Provides a clearly defined strategic direction for dealing with the challenges of climate change within the current socio-economic context of Ghana, presenting the opportunities and benefits of a green economy).

Plans/Strategies/Projects

- XIII. Forestry Development Master Plan (1996 – 2020).**
- XIV. Ghana: Biodiversity Conservation Strategy. MEST, 1998.**

- XV.** Natural Resource Management Programme (NRMP I) Phase I, the World Bank, 1999–2003. The High Forest Development Component inter alia established a Forest Plantations Development Centre (FPDC) to promote and encourage private forest plantation development.
- XVI.** Strategic National Energy Plan (2006 – 2020) (Energy Commission, 2006).
- XVII.** Mapping Forest Landscape Restoration Potential in Ghana (IUCN, 2013).
- XVIII.** Ghana Shared Growth and Development Agenda (GSGDA) II, Costing Framework (2014 – 2017).
- XIX.** Ghana's Intended Nationally Determined Contribution (GH-INDC) to address Climate Change, 2015.
- XX.** Ghana REDD+ Strategy, 2016.

Studies

- XXI.** Private Sector Forestry Plantations Development Project. Preparation Report. FAO Investment Centre, 1998.
- XXII.** Forest Plantations Support Project. Feasibility Study. Pat Hardcastle, OFI, 1998.
- XXIII.** Plantations Investment Feasibility and Promotion Study: Final Plantations Donor Proposal – Consultancy under the NRMP (Coillte, 2002).

1.2.3 Historical Perspectives – Forest Restoration in Ghana

1.2.3.1 Enrichment Planting

Attempts at increasing the stocking of high value timber species within forest reserves in Ghana dates back to 1946. Such efforts included enrichment plantings to improve the stocking of the poorly stocked Wet Evergreen forest reserves as well as to sustain the supply of the then “desirable” species, *Khaya*, *Entandrophragma*, *Lovoa* and *Heritiera*. After planting an area of about 2,500 ha, the programme was discontinued. (Nolan & Ghartey, 1992). The success of the intervention was limited largely due to inadequate budgetary allocation and knowledge of the silvicultural requirements of the planted tree species.

1.2.3.2 Forest Plantation Initiatives

(a) Past Species Trials

The interest in tree planting in Ghana dates back to the 1920s. The general policy at the time was to plant mainly indigenous species in the High Forest Zone (HFZ). The few exotic species that were planted in the HFZ were introduced mainly for fuelwood near large population centres and to fuel boilers for electricity generation or for mining use. The exotic species included *Eucalyptus torelliana* and *Eucalyptus tereticornis* (FAO, 2002).

In the Savannah Zone (SZ) and Dry Semi-Deciduous Forest Zone (DFSZ) however, a large number of exotic species were tried from 1951 to supply timber, poles and fuelwood. Species that showed promise included *Azadirachta indica*, *Senna siamea*, *Cedrela mexicana*, *Dalbergia sissoo*, *Gmelina arborea*, and *Tectona grandis*.

Between 1927 and 1990, over 150 tree species were assessed in research trials in various ecological zones in the country. Out of these, about 30 species (20%) are indigenous (Foli et al., 1997).

(b) Public Forest Plantations

A major forest plantation development effort under the erstwhile Forestry Department (FD), now the Forest Services Division (FSD) of the Forestry Commission, was undertaken from 1963 to 1987 mostly in the degraded parts of the forest reserves due to easy access to land in these areas. They were undertaken mainly through the Taungya system.

Existing government forest plantations established prior to the implementation of the National Forest Plantations Development Programme in 2002 cover an area of 19,378.26 ha in the High Forest Zone. Over 70% of these plantations consist of *Tectona grandis* (Teak). Other species established include *Cedrela odorata* (Cedrela), *Terminalia spp.* (Ofram and Emire), *Gmelina arborea* (Gmelina), *Senna siamea* (Cassia), *Eucalyptus spp.* (Eucalyptus), *Heritiera utilis* (Nyankom), *Aucoumea klaineana* (Aucoumea), *Nauclea diderrichii* (Kusia), *Khaya ivorensis* (Mahogany), *Triplochiton scleroxylon* (Wawa) and *Mansonia altissima* (Oprono).

Forest plantations in Northern Ghana (Upper East, Upper West and Northern Regions) are estimated to cover 2,553 ha and were primarily established for fuel wood production and environmental protection. Tree species planted include Teak, Gmelina, Anogeissus and Eucalyptus.

(c) Private Sector Efforts

Forest plantations developed by the private sector prior to the year 2002, cover an estimated area of 44,198 ha (FAO, 2002) and are made up of:

- 35,000 ha by individuals and tree grower associations (mainly teak);
- 4,000 ha of *Gmelina arborea* by Subri Industrial Plantations Limited (SIPL); and
- 5,178 ha of teak by British-American Tobacco (3,096 ha), Ashanti Goldfields Company Ltd. (100 ha), Global Green (1,315 ha) and Dupaul Wood Treatment Limited (667 ha).

(d) Past Experiences with Forest Plantation Management

The management of forest plantations in the past has not always been consistent with best practice. Proper site-species matching was not observed in some cases, and planting material of unknown provenances were used in many cases (FAO, 2002). The provision of extension services to the private sector was minimal and limited to only a few areas.

Funding of public plantations has been very erratic and inadequate. Tending of established plantations was therefore undertaken based on the availability of funds. Thinning was generally delayed until commercial tree sizes were attained. Fire outbreaks are recurrent especially in forest plantations in the Savannah and Dry Semi-Deciduous Forest Zones due to budgetary constraints and ineffective fire management regimes.

1.2.4 National Forest Plantation Development Programme (NFPDP, 2002-2015)

The National Forest Plantation Development Programme (NFPDP) was launched in September 2001, to accelerate the rate of establishment of forest plantations. Key objectives of the programme comprised the following: restoring the forest cover of degraded forest lands; generating employment as a means to reducing rural poverty; addressing the future wood deficit situation and enhancing food production through the adoption of the Modified Taungya System. Field implementation however, commenced in 2002. The following paragraphs provide a brief description of each of the components:

1.2.4.1 The Modified Taungya System (MTS) 2002 - 2009

The MTS involved the establishment of forest plantations by the Forestry Commission (FC) in partnership with farmers in forest fringe communities.

The FC provided technical direction, surveyed and demarcated degraded forest reserve lands and supplied pegs and seedlings while the farmers provided all the labour inputs in the form of site preparation, pegging, planting, tending and fire protection.

The farmers were permitted to cultivate their food crops which were inter-planted with the tree crops on the same piece of land. The farmers, in addition to the food crops they harvested, have a 40% share in the Standing Tree Value (STV) of the planted trees. The Government has a 40% share while the landowner and community will have a 15% and 5% share respectively. It is envisaged that the MTS will be re-introduced during the Strategy period and it is expected to play a key role in achieving set targets.

1.2.4.2 Community Forestry Management Project (CFMP): 2005 - 2009

The Community Forestry Management Project (CFMP) was funded with a loan from the African Development Bank (AfDB) and adopted the MTS model for the establishment of forest plantations.

It was implemented within degraded forest reserves in the Brong Ahafo (Sunyani Forest District), Ashanti (Offinso Forest District) and Eastern Regions (Begoro and Akim Oda Forest Districts).

1.2.4.3 Government Plantation Development Project (GPDP) 2004 - 2009

The Government Plantations Development Project (GPDP) utilized hired labour and contract supervisors to establish forest plantations. Plantation workers were hired and paid a monthly allowance to establish and maintain the plantations while plantation supervisors were engaged on contract basis to supervise and offer technical direction at the site level.

The FC exercised general oversight and monitored field activities to ensure compliance with quality standards for plantation establishment. This Strategy was funded through the Highly Indebted Poor Countries (HIPC) benefits. Under the scheme, plantations developed are owned by government and the respective landowners who are entitled to royalty payments.

1.2.4.4 Private Commercial Plantation Developers On-Reserve: 2002 to Date

The Private Commercial Plantation Developers On-reserve component involves the release of degraded forest reserve lands by the FC to private entities after vetting and endorsing their reforestation/business plans; and signing of Land Lease/Benefit Sharing Agreements (LL/BSAs). The private investor earns 90% of the total proceeds from the plantation while the FC, Landowner and Community earn 2%, 6% and 2% respectively. The investor additionally pays ground rent of the Ghana Cedi equivalent of \$2/ha/year throughout the life of the investment.

1.2.4.5 Public Private Partnership (PPP): 2013 to Date

This arrangement is similar to the Private Developers on-reserve but with the FC taking up costs of survey and demarcation, registration of agreements and fire education within fringe communities, in addition to jointly developing project documents and assisting in fire suppression as part of its contribution to the project. Within the partnership, the investor is entitled to 80% of the plantation proceeds and benefits with the Forestry Commission, Landowners and Forest fringe communities entitled to the remaining 20%. The investor also pays ground rent of the Ghana Cedi equivalent of \$2/ha/year to the land-owner together with a facilitation fee of \$2/ha/year for the customary and conflict resolution role expected of the traditional authorities.

A 50-year land lease together with a benefit-sharing agreement are executed and registered at the Lands Commission.

1.2.4.6 Model Plantation component: 2007 - 2009

In 2007 the Model Plantation component, a purely research based scheme was introduced to offer the FSD plantation managers the opportunity to undertake mixed species trials and experiment with various planting designs and tree spacing. Tree spacing so far tried include 3m x 3m, 3m x 2m and 2.5m x 2.5m. Mixed exotic-indigenous species planting designs implemented include MS 3-12, MS 4-8, and MS 3-6-12.

1.2.4.7 Expanded Plantation Program (EPP) 2010 - 2012

Under the EPP, forest plantations were established on private lands located outside forest reserves in addition to degraded forest reserve lands. The EPP ensured that most of the Metropolitan/Municipal/District Assemblies without degraded forest reserves also benefited from the job opportunities being created through the NFPDP.

Private companies were contracted to undertake the establishment and maintenance of plantations and the supply of tree seedlings. Messrs. Zoil Services Ltd. and Ecotech Services Ltd. undertook the establishment and maintenance whilst Messrs. African Foresters Brigade Ltd. supplied the tree seedlings. The Forestry Commission played a monitoring and reporting role under this program. After the expiration of the contracts in 2013, the successfully established plantations were handed over to the Forestry Commission.

The on-reserve plantations are owned by government and the respective land-owners who are entitled to royalty payments. Government is currently negotiating the benefit sharing arrangements with private landowners off-reserve since the original benefit sharing proposal (GoG - 66.67% and Landowner - 33.33%) was not accepted.

1.2.4.8 FC/Timber Industry Plantation Development Fund Plantations 2010 to Date

The Forestry Commission – Timber Industry Plantation Development Fund Committee (FC/Timber Industry Fund Committee) contracted the Forestry Research Institute of Ghana (FORIG) to establish Best Practice commercial forest plantations of fast growing indigenous and exotic timber species with funding from the FC/Timber Industry Fund for the Government of Ghana. In addition, FORIG has been contracted to carry out Paulownia species trials.

FORIG has accordingly been establishing forest plantations on behalf of the FC/Timber Industry Fund Committee since 2010. These plantations have been established in the Eastern and Ashanti Regions, within selected degraded forest reserves.

Components of the programme and funding sources are tabulated in Table 1:

Table 1: NFPDP components and funding sources

PROGRAMME COMPONENT	FUNDING SOURCES
Modified Taungya System (MTS)	Forest Plantations Development Fund Management Board (FPDFMB), FC, GoG
Community Forestry Management Project (CFMP)	AfDB / GoG
Government Plantation Development Project (GPDP)	GoG (HIPC)
Private Commercial Plantation Development	Private Funds, FPDFMB
Public – Private Partnership (PPP)	Private Funds, FC
Model Plantations	GoG / NREG
Expanded Plantation Program	GoG, EDAIF, FPDFMB, FC
FC / Timber Industry Plantations	Timber Export Levy

An estimated 190,449 ha of forest plantations has been established nationwide under the NFPDP by both public and private sector, mainly within degraded forest reserves from 2002 to 2015 as summarized in Table 2 and with details in Appendix 1.

Table 2: Plantation Establishment Achievements under the NFPDP (2002-2015)

YEAR	PUBLIC SECTOR (ha)	PRIVATE SECTOR (ha)	TOTAL(ha)
2002	17,341.00	1,609.00	18,950.00
2003	17,541.00	1,609.00	19,150.00
2004	21,599.84	1,609.00	23,208.84
2005	13,582.93	1,609.00	15,191.93
2006	14,407.50	1,609.00	16,016.50
2007	14,468.32	1,613.00	16,081.32
2008	5,007.67	5,986.65	10,994.32
2009	7,763.14	3,894.35	11,657.49
2010	14,115.66	4,612.84	18,728.50
2011	6,990.48	4,439.88	11,430.36
2012	5,949.64	3,549.89	9,499.53
2013	3,038.35	4,309.51	7,347.86
2014	487.56	7,795.51	8,283.07
2015	108.00	3,802.20	3,910.20
TOTAL	142,401.09	48,048.83	190,449.92



Forestry Commission officials, a Private Investor and a Community Leader undertaking a reconnaissance survey in the degraded Tain II Tributaries Forest Reserve, Sunyani Forest District, Brong Ahafo Region.

PART II – SWOT ANALYSIS, GOAL & STRATEGIC OBJECTIVES

2.1 SWOT ANALYSIS

The Strategic Planning methodology used was built around the SWOT Strategic Planning Framework. This methodology ensured that relevant issues relating to the forest plantation industry were examined. Contextual analysis identified a number of critical challenges that define the framework of Ghana's Forest Plantation Strategy.

An analysis of the current strengths, weaknesses, opportunities and potential threats confronting the forest plantation industry in Ghana is summarized in Table 3.

Table 3: SWOT Analysis – Forest Plantation Industry, Ghana

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Availability of labour. • Availability of skill mix within the FC. • Experience in implementing various silvicultural and management models of plantation establishment. 	<ul style="list-style-type: none"> • Gaps in key data (i.e. growth rates of key plantation spp. and expected returns, site class delineation, extent of private sector plantations, etc.). • Inadequate plantation infrastructure. • Inadequate knowledge of best management practices for key indigenous species and mixtures. • Low productivity of existing plantations (site selection, quality of planting materials and silvicultural treatments). • Poor tradition of maintenance of established plantations leading to poor wood quality and low yields. • Lack of genetically improved planting material within the country.

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Favourable policy framework for plantation development. • Good international investor experiences. • Availability of lands with suitable soils and climatic conditions for plantation development. • Political and economic stability. 	<ul style="list-style-type: none"> • Low application of Geo-Information Technology in monitoring resource development. • Low capacity of timber processing industry in the utilization of small-diameter plantation logs. • Inadequate extension services. • Lack of sustainable financing framework for plantation development. • Existing bureaucracy within FC slows down decision making. • Over-centralized FC operational / management systems. • Weak enforcement of performance standards. • Lengthy land acquisition processes. • Absence of a PES scheme. • Weak legal and institutional framework for plantation development. • Lack of a unified legal framework for regulating plantation development, benefits sharing, financing etc. • Plantation development has not gone hand-in-hand with industry retooling.

OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Availability of genetically improved planting material of high-value exotic timber species in other countries. • Knowledge in best practice in plantation management exists and can be acquired. • Strong political will to create jobs through plantation development. • Community enthusiasm. • Increasing demand for industrial timber and other wood products. • Increasing demand from niche markets for certified (legally sourced, sustainably managed forest plantations) wood products. • Carbon market and payment for environmental services. • Over 60% of our population are farmers and offers opportunities for agro-forestry. • Plantation development generates jobs, income and wealth for local communities. • Availability of competitive credit rates on the international markets arising from the global financial crises. • General consensus for the promulgation of a new law (Forest Plantation Act) that provides the requisite legal framework for forest plantation development including incentives and other benefits to investors. 	<ul style="list-style-type: none"> • Lack of investment in research and development. • Low stumpage prices of naturally grown timber. • Multiplicity of interest and rights in land ownership off-reserve. • Lack of sustainable financing. • High cost of capital and unwillingness to extend long term credits for Forest Plantation Development. • Illegal farming within forest reserves. • Free-range cattle grazing (Activities of nomadic herdsmen). • Destruction of forest plantation by wildfires. • Pests and diseases. • Illegal Mining activities (i.e. Galamsey¹, sand winning). • Illegal logging (including chainsaw lumbering, pilfering etc.). • Illegal charcoal production. • Climate change (i.e. unpredictable weather resulting in floods, prolonged droughts etc.). • Poor market development and linkages to markets. • Undeveloped domestic market. • Increasing and unregulated use of herbicides. • Plantation development has not gone hand-in-hand with industry retooling.

¹ Artisanal Mining

2.2 Risk Assessment And Mitigation Measures

Based on the SWOT Analysis, key risk factors to plantation investments have been identified and analyzed. In addition, a menu of mitigation measures have been proposed to address these risks depending on prevailing circumstances and available capacity (Appendix 2).

2.3 Determination of Strategic Targets for Forest Plantation Development

2.3.1 Projected Demand for Forest Plantation Products

The Timber Industry

The timber industry currently relies mainly on a dwindling supply of large hardwood logs from the natural forest which can only sustain an annual allowable cut (AAC) of 1 million cubic meters (AAC administratively reviewed upward to 2 million cubic meters since 2003) compared to the industry installed capacity of about 2 million cubic meters (from 3.7 million cubic meters in 1996).

Historically, the timber industry in Ghana has been involved in mainly primary and secondary processing of large diameter logs using band saws, rip saws and frame saws. However, due to the dwindling supply of such large diameter logs from the natural forest, a significant number of these mills have folded up and the supply of logs in the long term from short rotation timber plantations will necessitate retooling as most of the timber processing mills in Ghana are not equipped to process small-diameter plantation logs.

In order to compete effectively in both local and international markets, there is an unquestionable need for the industry to adopt more modern technological competencies to move into value added processing. A viable value added strategy for the timber industry should combine market intelligence, clearly defined market targets, product development and the application of appropriate technology to produce products that meet key market criteria – quality, specifications, price, assured supply and packaging (TIDD, 2011).

Woodfuel

It is estimated that about 85% of the population, mainly in the rural areas, depend on woodfuel (charcoal, firewood etc.) for cooking. It is sourced mainly from the natural forest/savannah.

The annual per capita woodfuel consumption is estimated to be about 1.0m^3 round wood equivalent (RWE) in the year 2010 (FAO, 2010). Since then there has been significant economic improvement with the attainment of lower middle income status. This has contributed to large sections of the population switching to more advanced forms of energy other than woodfuels. It is therefore expected that 6 years since the survey, the per capita woodfuel consumption will be much less. According to the 2010 population and housing census, 49.1% (approximately 50%) of Ghana's population live in rural areas with an equal number in the urban areas. The national average household size was reported to be 4.4 persons. The population growth rate is estimated at 2.5%, therefore the estimated current population stands at 28.6 million. To estimate the current annual consumption of woodfuels the following assumptions were made:

- The rural population is 50% of the total national figure (approximately 14.3 million) and consume $1.0\text{m}^3/\text{capita}$ (4.4m^3 per household/year) of woodfuel; and
- The urban population (including rich, middle class and poor) constitute 50% of the national population. They use a mix of fuels including gas, kerosene and electricity with a woodfuel consumption of $0.25\text{m}^3/\text{capita}$ (1.1m^3 per household/year). Based on the above, the national annual consumption of woodfuel is estimated at 17.9 million m^3 (RWE).

Poles

Historically, thinnings from the FC Teak plantations have been the main source of raw material for the wood pole treatment plants in Ghana. However, over the past 10 years majority of the supplies have come from smallholder private teak plantations. The current demand, however, exceeds the supply and some of the pole treatment plants in the country have been importing softwood poles to supplement the local supplies. It is estimated that about 100,000 wooden poles per year would be required for the national electrification programme for the next 30 years (Odoom, 1998).

We project that this demand will remain constant throughout the Strategy period, therefore using an average pole volume of 0.2m^3 , this will amount to $20,000\text{m}^3$ per year. The projected demand will be met mainly through commercial thinnings from Teak and Eucalyptus timber plantations.

Bamboo and Rattan

Bamboo and Rattan resources in Ghana constitute the two largest non-timber forest products that have been identified to be suitable substitutes to timber. Currently, rattan is extensively used in the furniture and handicraft industry while bamboo is mainly used for construction. The rattan processing industry is a source of livelihood for a significant number of artisans. However, the industry is threatened by decline in stock and availability of rattan. It is projected that 50,000 ha of bamboo and rattan plantations would be required to augment the supplies from natural stands over the next 25 years (Table 4).

Environmental Uses

A total area of 1,480 ha will be planted annually for environmental purposes. This is equivalent to 10% of the annual planting target for the timber industry requirements of 14,800 ha (domestic and export). This is expected to be composed of watershed plantings, green firebreaks, slope stabilization plantings, rehabilitation of mined sites, restoration of mangroves, biodiversity offsets etc.

Restoration of mangroves is particularly considered due to the important role they play in the ecosystem and livelihood of coastal communities. Mangroves, as good nursery grounds, provide a safe hiding place for fingerlings, shrimps, crabs and many important young sea animals to grow, away from many predators.

Additionally, the application of best practice principles in the development of forest plantations will contribute significantly to enhance environmental conditions. Appropriate stream and riverine buffers will be enforced and restored and remnant healthy indigenous trees will be left as standards within forest plantations. Minimum standards (percentage) for planting of indigenous tree species will be enforced and fire management plans will be implemented to curb the annual destruction of forests and habitats.

Table 4: Projected Planting Requirements for Identified Plantation End Uses

End-Use	Est. Annual Demand (m ³ RWE)	Supply From Existing Forests (m ³ RWE)	Balance (to be met from Plantations) (m ³ RWE)	Total Plantation Area Req'd ^a (ha)	Annual Planting rate (Rotation = 25 years) (ha)
Timber Industry (mostly export + some local) ¹	2,000,000	800,000	1,200,000	120,000	4,800
Domestic Timber Market (mostly chainsawn lumber)	2,500,000 ²	0	2,500,000	250,000	10,000
Energy (Wood Fuel / Biomass)	17,875,000	15,355,000 ³	2,520,000	168,000	6,720
Bamboo & Rattan				50,000	2,000
Environmental uses (watersheds, rehabilitation of degraded mined sites, green firebreaks, biodiversity offsets, restoration of mangroves etc.)				37,000	1,480
Total	22,375,000	16,155,000	6,220,000	625,000	25,000

¹Sawmill, bush mill, veneer & plywood, excluding chainsaw (includes logging and sawmill waste) ²Marfo 2010 ³86% assumed from natural forests/savannah woodlands ⁴MAs (m³/ha/yr): 15 for energy plantations; 10 for timber plantations

2.4 Classification of Forest Reserves in the High Forest Zone

The forest reserves in the high forest zone were classified according to the status of the growing stock through the 1986-94 forest inventory (Table 5). Table 5 indicates that approximately 32% of the area within forest reserves were degraded and needed both rehabilitation (122,000 ha) and reforestation (conversion of 397,000 ha to forest plantations) to enhance their productive capacity (FDMP, 1996).

Table 5: Area of Forest Reserves in the High Forest Zone

Forest Management Category	Area (Ha)	Percentage(%)
Timber Production Area	762,400	47.0
Permanent Protection Area	352,500	22.0
Convalescence Area	122,000	7.0
Conversion Area	397,000	24.0
Total Reserve Area	1,633,900	100.0

Since the last forest inventory that ended in 1994, significant decline has been experienced in forest condition. Significant portions of the Timber Production Areas have further degraded and converted to Convalescence Areas, while some Convalescence Areas have further degraded and currently been converted to plantations (Conversion Areas). Large portions of the Conversion Area have been converted to forest plantations by government and the private sector.

Enrichment planting interventions will focus on Convalescence Areas and understocked Timber Production Areas.

Since 2011, the FSD has piloted enrichment planting covering an estimated area of 850 ha in 5 Forest Districts in the High Forest Zone. The knowledge and experience acquired during the pilot phase will be applied to targeted enrichment planting areas.

2.5 Potential Areas For Plantation Expansion

A review (February - March, 2012) by the FSD of potential areas suitable for plantation development within forest reserves in the high forest zone indicated an estimated total area of 175,000 ha. An estimated 300,000 ha of potential sites, representing 70% of total forest reserve area in the Northern Savannah, was projected.

In addition, under the Forest Preservation Programme (Pasco, 2013), an estimated total area of 5.2 million hectares of cropland (both cropped and farm fallows) and 8.2 million hectares of grassland (including shrublands) were identified off-reserve, as at 2010. It is anticipated that these off-reserve shrublands and farm fallows will constitute potential lands suitable for plantation development nation-wide.

It is projected that 75% of the cropland area (i.e. approximately 4 million ha) across the high forest, transition and Savannah zones will be targeted for trees-on-farms/farm boundary planting/climate smart agriculture by 2040. The expectation is that about 20% of the fallow and shrubland area (i.e. 2.68 million ha) could be sourced for forest plantation development.

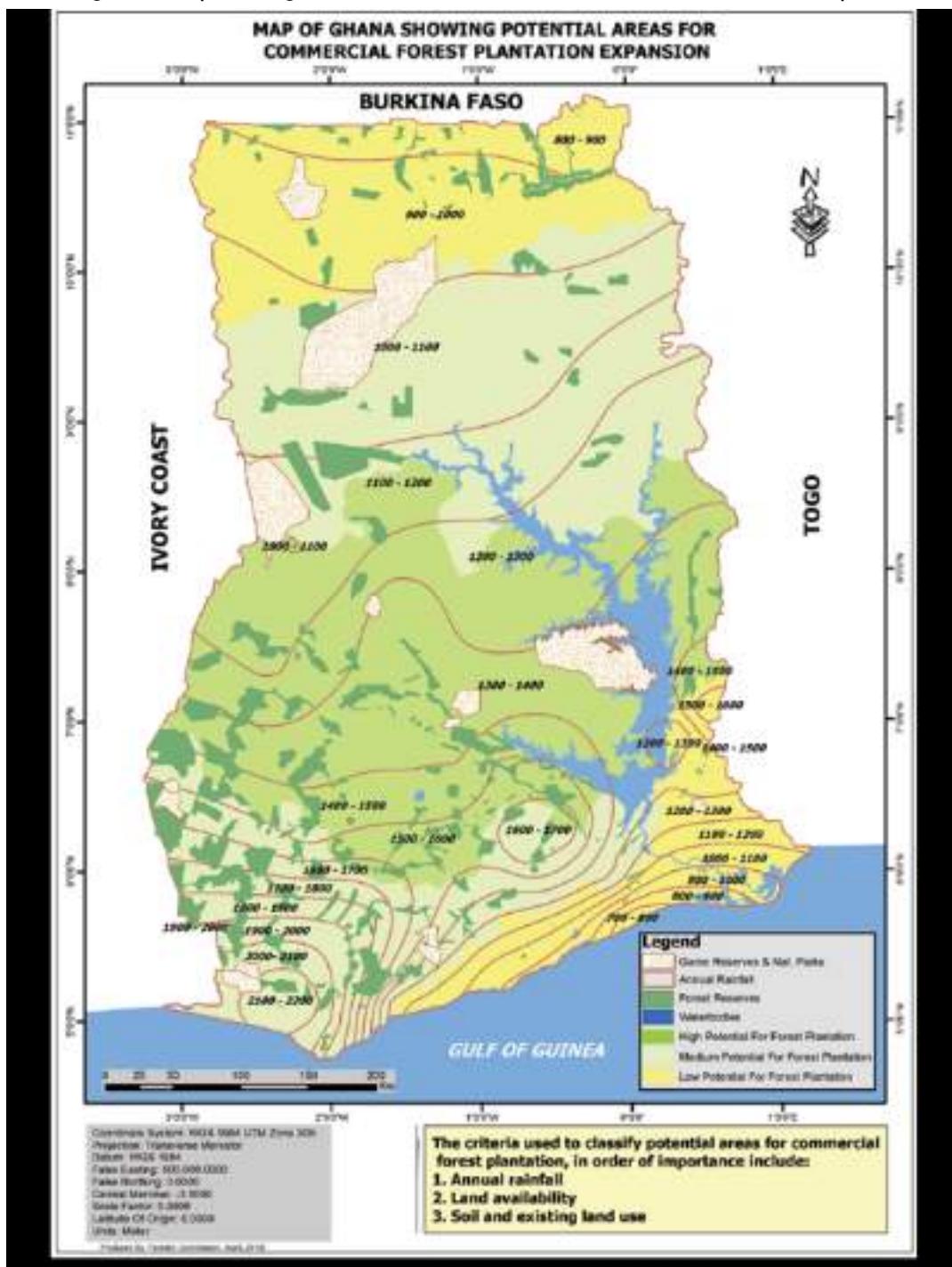
A summary of potential sites (on and off-reserve) for forest plantation expansion is presented in Table 6.

Table 6: Summary of potential lands for forest plantation establishment

Location	Area (ha)
On-reserve (High-forest Zone)	135,000
On-reserve (Savannah)	283,000
Off-reserve	2,680,000
Total Reserve Area	3,098,000

Figure 1 highlights the potential of various parts of the country for commercial forest plantation expansion. Extensive surveys (ground-based and remote sensing), data collection, and consultation with land owners and other key stakeholders would be undertaken to confirm status, suitability and availability of these potential areas both on and off-reserve. However, the green and pink portions on the map indicate areas within the country where the planned targets under the Strategy are expected to be concentrated.

Figure 1: Map showing Potential Areas for Commercial Forest Plantation Development



2.6 Species Selection

Species selected for promotion under commercial forest plantation were based on the following factors:

- i. Past local forest plantation experiences and knowledge about the silvicultural characteristics of the species;
- ii. Timber industry preference and market trends; and
- iii. End use of the forest plantation products.

The recommended species for planting in the various vegetation zones of Ghana, in addition to timber production, include tree species targeted at renewable energy, pulp and paper and environmental services as shown in Appendix 3. The choice of planting stock must however be based on suitability to the site conditions and management objectives.

Eighteen (18) tree species will be prioritized under the Strategy while 7 others will be planted under various plantation trials (Table 7). Apart from planting the indigenous tree species within commercial forest plantations, they will also be incorporated within farming systems, especially Emire, Ofram and Mahogany. Enrichment planting would be undertaken using solely indigenous tree species. It is expected that the exotic species will be primarily planted in commercial forest plantations.

Table 7: Priority species for commercial forest plantations and trials

Usage	Priority Species
Timber	
Indigenous	Emire, Ofiram, Wawa, Kusia, Ceiba, African Mahogany, Nyankom, Mansonia
Exotic	Teak, Cedrela, Eucalyptus spp. (including hybrids), Bamboo, Gmelina, Pinus spp. (including hybrids)
Energy	
Exotic	Cassia, Eucalyptus, Neem, Acacia, Bamboo
Species Trial	<i>Swietenia macrophylla</i> (Mahogany), <i>Aucoumea klaineana</i> (Aucoumeal), <i>Shorea</i> spp. (Light and Dark Red Meranti), <i>Dalbergia sissoo</i> , <i>Dalbergia retusa</i> (Rosewood), <i>Azadirachta excelsa</i> (Sentang), <i>Pterocarpus erinaceous</i> (African Rosewood), <i>Paulownia</i> spp., Rattan ((<i>Eremospatha</i> spp. (Mfe), <i>Laccosperma</i> spp. (Eye), <i>Calamus</i> spp. (Demere)), <i>Rhizophora</i> spp. (Red mangrove), <i>Avicennia germinans</i> , (Black mangrove), <i>Laguncularia racemosa</i> (White mangrove)

2.7 Goal And Strategic Objectives

2.7.1 Goal

The goal of this Strategy is to achieve sustainable supply of planted forest goods and services to deliver a range of economic, social and environmental benefits.

2.7.2 Strategic Objectives

Five strategic objectives crucial for success will be the focus of the Strategy. They form the key levers for change and proposed actions must reflect them. The under-listed strategic objectives will be pursued to achieve the goal:

Strategic Objective 1:

To provide a sustainable supply of timber and non-timber forest products, and environmental services through the:

- (a) establishment and management of 625,000 ha of forest plantations and enrichment planting of 100,000 ha through the application of best practice principles, by year 2040;
- (b) provision of support for the incorporation of trees-on-farms within 3.75 million hectares of agricultural landscapes, by year 2040; and
- (c) maintenance and rehabilitation of an estimated 235,000 ha of existing forest plantations through the application of best practice principles.

Strategic Objective 2:

To promote investments in the establishment and management of small, medium and large scale forest plantations.

Strategic Objective 3:

To create employment opportunities and sustainable livelihoods in rural communities through forest plantation development.

Strategic Objective 4:

To increase investments in research and development, extension, training and capacity building for forest plantation development, timber utilization and marketing.

Strategic Objective 5:

To improve governance in the regulation and management of forest plantations.



14-year old mixed indigenous species timber plantation established by Ayum Forest Products Limited, in the Amama Forest Reserve, Sunyani Forest District, Brong-Ahafo Region

PART III – IMPLEMENTATION PLAN

3.1 Strategic Objectives And Action Plans

A discussion of the strategic objectives and the related action plans are given below:

3.1.1 Strategic Objective 1: Establishment and management of planted forests

Forest plantations are long-term investments that are expected to yield returns greater than or equal to returns on land under alternative uses (e.g. oil palm, cocoa, citrus, etc.). Plantation development requires accessibility to land without disputes and the application of best practice to attain high growth rates for the selected species. The application of best practice principles will ensure the maintenance of a balance of environmental, social and economic considerations and the minimization of economic and ecological risks (pests, diseases, forest fires etc.).

Enrichment Planting

This is a forest restoration intervention aimed at enhancing the commercial productivity and functionality of a degraded forest. It is undertaken where there are insufficient numbers of economically valuable trees in the natural stand. It accelerates the recovery of degraded forest with respect to its stocking, functions and resilience.

Under this Strategy, convalescence areas within forest reserves would be targeted.

Trees-on-Farms

The purpose of the Trees-on-Farms (ToF) intervention is to optimize the productivity and sustainability of smallholder farming systems by developing appropriate technologies that involve trees. It enhances connectivity between the agricultural and forest landscapes and improves biodiversity conservation.

This intervention will provide technical support in the protection of agro-forestry systems from pests and diseases that affect the tree component and facilitate uptake of Conservation Agriculture (Climate Smart Agriculture) by smallholder farmers. An estimated 5 million seedlings of suitable tree species will be provided annually to farmers for incorporation into their farming systems and boundary planting, to provide environmental benefits and

additional income from improved land productivity and tree products in the medium to long term. It will also afford them opportunities to access emerging markets in which conservation agricultural products attract price premium.

Key actions to be implemented under this component (Strategic Objective 1) include the following:

- Create land banks for forest plantation development on and off-reserve;
- Promote integration of trees into farming systems;
- Promote the development of NTFPs (i.e. spices, rattan, essential oils, apiculture etc.) within forest plantations to provide additional short-term income;
- Procure improved seeds of selected exotic and indigenous tree species;
- Establish seed orchards (clonal and seedling) of improved cultivars of selected exotic and native timber tree species (1,000 ha);
- Maintain and tend seed orchards (existing and new)/Seed Production Areas;
- Develop protocols for mass production of selected genetically improved planting material;
- Establish and operate a Biotechnology (Tissue Culture etc) Laboratory and other facilities (Vegetative Propagation Centre);
- Establish and operate at least three (3) State-of-the-Art central tree nurseries - 6 million seedlings capacity/year;
- Review and consolidate existing forest plantation Manuals of Procedure (MoPs; A, B and C) and publish document;
- Develop and publish MoP for Enrichment Planting;

- Implement FC's MoP on wildfire management;
- Certification/licensing of forest plantation contractors and forest tree nurseries;
- Facilitate forest plantations management and chain of custody certification (FSC, PEFC, etc);
- Undertake and maintain 100,000 ha of enrichment planting sites within under-stocked/convalescence forest reserves;
- Establish and maintain 168,000 ha of energy (fuelwood/biomass) plantations;
- Establish and maintain 457,000 ha of forest plantations for industrial, environmental and other uses;
- Liaise with relevant institutions (i.e. Minerals Commission, Water Resources Commission, MMDAs, VRA, BPA, EPA etc.) to rehabilitate mined sites and reforest degraded watersheds etc. (target of 50,000 ha);
- Maintain an estimated 235,000 ha (160,000 ha public and 75,000 ha private) existing forest plantations;
- Undertake coppice management and/or replanting of harvested coupes; and
- Facilitate the enactment of policy/legislation to support ownership by farmers of planted trees-on-farms.

Details of targeted actions and timelines for this Strategic Objective are presented in Appendix 4.

3.1.2 Strategic Objective 2: Forest plantation investment promotion (establishment and management)

Current Government Incentives and Benefits

Forest plantations have long gestation periods and the related investments have long payback periods and high risks that make them generally unattractive to financial institutions. The economic viability of commercial forest plantations depend primarily on secure, long-term access (i.e. transparent Land Lease and Benefit Sharing Regimes) to suitable lands and access to suitably packaged long-term financing.

The Government of Ghana (GoG) has introduced some general incentives and benefits to attract investments in commercial forest plantation development as follows:

Forest Plantation Development Fund (FPDF) Act, 2000, Act 583.

(Provides financial assistance to the private sector for the development of forest plantations; provides funds for research and technical advice).

Forest Plantation Development Fund (Amendment) Act, 2002, Act 623.

(Parent act amended to provide financial assistance to both public and private plantation developers).

The Timber Resources Management (Amendment) Act, 2002, Act 617.

(Excludes private forest plantations from being allocated by government under a Timber Utilization Contract (TUC), in addition to the provision of fiscal and other incentives and benefits to investors in the forestry sector).

Internal Revenue (Amendment) Act, 2006, Act 710.

(Amended section 97(3a) of the Internal Revenue Act, 2001 (Act 592) by substituting 15 years with 20 years. It also amends section 131(2) of Act 592).

Additionally, the Forestry Commission leases/allocates land in degraded forest reserves to the private sector (including community groups) and the public sector, for commercial forest plantation development. This comprises the Modified Taungya System implemented with forest fringe communities (small to medium scale), Private Commercial Developers on-reserve (medium scale and large) and Public Private Partnerships on-reserve (large scale).

Required Incentives for Large-scale Plantation Developers

In addition to the general requirements of plantation developers, large-scale plantation developers additionally require reliable data on available land, climate, soil characteristics, topography, drainage and availability of skilled and unskilled labour with respect to proposed reforestation areas. Accurate information and assistance is also required on the processes and procedures required to secure land leases and to process applications for tax exemptions and incentives.

Required Incentives for Small and Medium-scale Plantation Developers

Small to medium-scale plantation developers require innovative financing mechanisms such as reforestation levies and taxes, REDD+ Carbon Credits, Payments for Ecosystem Services (PES) and environmental offsets (i.e. carbon offsets, biodiversity offsets, reforestation offsets) from which grants, concessionary loans and performance based payments may be sourced for the establishment and maintenance of their forest plantations. They in addition require extension services and well developed markets for their products at fair prices.

Funding Sources

- Forest Plantation Development Fund (FPDF)**

This provides a key source of public funding for both private and public forest plantation development in Ghana. The Fund Board mainly disburses loans and grants to private and public entities undertaking forest plantation development. This funding source, which is derived mainly from levies imposed on air-dried lumber of selected timber species (Timber Export Levy), is inadequate and has been dwindling over time.

The amount of funds available under the Forest Plantation Development Fund would be improved by the expansion of the coverage of the levy to include all key timber species exported as air-dried lumber.

- Forestry Commission/ Timber Industry Fund**

In 2008, the FC and the Timber Industry reached an agreement to set aside 0.5% out of the 1.5% Export Levy for the establishment and management of commercial forest plantations to provide industrial timber to the timber industry. Since then, the FC has retained 1% while the 0.5% is paid into an escrow account and managed by the FC/Timber Industry Fund Management

Committee for the establishment and management of public forest plantations in degraded forest reserves.

Consistent with good governance principles in the management of public funds, it is expected that the Export Levy, the Fund and the Committee that manages it would be regulated by an appropriate legislation.

- **Other Potential Sources of Funding**

Additionally, a broad-based Reforestation Levy should be imposed on all industries whose operations negatively impact the environment. Funds realized from this levy would be allocated as grants to public and private entities/landowners undertaking reforestation projects and for research. Targeted industries include: transport, mining, oil and gas, power/energy production, cement, telecommunications, construction, textile, logging and timber processing, etc.

- **Proposed Actions for Investment Promotion**

This strategic objective, seeks among others to identify and pursue a number of innovative financing mechanisms for forest plantation investments in Ghana, together with advocacy for appropriate legislation to among others promote investments in forest plantations.

Key actions to be implemented under this strategic objective include the following:

- Facilitate the enactment of a Forest Plantation Act to provide a legal framework for the regulation of the forest plantation sector and the provision of benefits and incentives to investors. Additionally, the Act is expected to provide innovative financing mechanisms (e.g. through the introduction of environmental levies/taxes, carbon credit revenues) to support forest plantation establishment, management, harvesting, processing, marketing and research among others;
- Facilitate the expansion of the coverage of the Timber Export Levy to include all key timber species exported as air-dried lumber;
- Explore innovative financing sources e.g. REDD+ Performance-based Payments, Payment for Ecosystem Services (PES), environmental offsets (e.g. carbon offsets, biodiversity offsets, reforestation offsets), etc.;

- Introduce performance-based payment systems targeted at small and medium scale commercial forest plantation investors covering the first 5 years of plantation establishment (Annual payments or grants would be paid based on the achievement of key minimum criteria after independent assessment of the forest plantation – Funds would be sourced mainly from local innovative financing schemes);
- Publish a forest plantation investor handbook to guide potential local and foreign investors;
- Facilitate the establishment of a specialized market for the trading of forest plantation stands;
- Establish and facilitate platforms (investor fora) for periodic meetings and information dissemination among commercial private plantation developers and tree grower associations; and
- Undertake extension services targeted primarily at small and medium scale commercial forest plantations and smallholder forest plantations.

Details of targeted actions and timelines for this Strategic Objective are presented in Appendix 4.

3.1.3 Strategic Objective 3: Employment creation and sustainable livelihoods

This strategic objective seeks to offer various socio-economic benefits to the key stakeholders that will be involved in the implementation of the Strategy, especially the local communities.

These benefits include skills development and the creation of direct jobs such as: operating commercial tree nurseries; plantation establishment (e.g. site preparation, pegging and planting); maintenance (e.g. weeding, pruning, thinning, fire protection); participation in out-grower schemes; growing of shade-loving non-timber forest products (NTFPs) under plantations after canopy closure; Bee-keeping and cultivation of food crops under Taungya schemes as well as timber harvesting and processing.



Four-month old teak plantation intercropped with ginger, in the Bosomoa Forest Reserve, Kintampo Forest District, Brong-Ahafo Region

In terms of employment generation, it is estimated that one person's labour would be employed for a whole year in order to establish one hectare of forest plantation. Therefore, for the 625,000 ha of forest plantations to be established under the Strategy a total of 625,000 full time jobs will be created over the 25-year period. An estimated 1,125,000 persons (1person/2ha) will be required to undertake maintenance of the stands aged 2 to 5 years over the 25-year period. For stands aged 6 to 25 years, an estimated 1,050,000 persons (1person/5ha) will be engaged over the period of the Strategy. Therefore, a total of 2.8 million jobs will be created over the 25-year period.

Over the period an estimated 835 million seedlings will be required for establishing the 625,000 ha of forest plantations, an estimated 12 million seedlings for the 100,000 ha (approximately 800 compartments i.e. 40 compartments/year over 20 years) enrichment planting of poorly stocked forest reserves and 125 million seedlings for the trees-on-farm component making a total of 972 million tree seedlings over the Strategy period. Based on a seedling production standard of 10,000 seedlings/person/year, an estimated 97,200 full time jobs will be created over the 25-year period from tree seedling production or an average of 3,888 full time jobs per year.

Details of targeted actions and timelines for this Strategic Objective are presented in Appendix 4.

Tables 8-10 summarize the potential jobs to be created over the 25-year period through plantation establishment and maintenance (detailed analysis in Appendix 5).

² The one year employment is estimated to be 250 man days per annum

Table 8: Summary of potential jobs to be created from new plantations over the 25-year

COUPE / YEAR	ACTIVITY	WORK RATE	AVERAGE NUMBER OF JOBS CREATED / YR	NUMBER OF JOBS CREATED / 25YRS
1	Establishment	1 person / Ha	25,000	625,000
2 - 5	Maintenance	1 person / 2Ha	45,000	1,125,000
6 - 25	Maintenance	1 person / 5ha	42,000	1,050,000
Subtotal				2,800,000
6 - 25	Maintenance	1 person / 5ha	42,000	1,050,000
Total			115,888	2,897,200

Table 9: Summary of potential jobs to be created from existing plantations (2002- 2015) of an estimated area of 190,000 ha over the 25-year period

COUPE/YEAR	ACTIVITY	WORK RATE	JOB CREATED/25YRS
1	Establishment	1 person / Ha	0
2 - 5	Maintenance	1 person / 2Ha	20,000
6 - 25	Maintenance	1 person / 5ha	30,000
6 - 25	Seedling Production (est. 3 million seedlings for beating-up and rehabilitation)	10,000 seedlings/ person/yr.	300
Total			50,300

Table 10: Summary of potential jobs to be created from enrichment planting over the 25-year period

COUPE/YEAR	ACTIVITY	WORK RATE	JOB CREATED/25YRS
1	Establishment	25 persons/ Compartment (1 person / 5 ha)	20,000
2 - 10	Maintenance	10 persons / Compartment (1 person / 12.5 ha)	72,000
Total			92,000

The total number of jobs to be created under forest plantation establishment, maintenance, enrichment planting and seedlings production is estimated at 3,039,500 over the 25-year period of the Strategy. Additional jobs will be created through the maintenance of the existing 65,925 ha of forest plantations established prior to 2002. There will be conscious efforts to create an environment that fosters gender equity in accessing job opportunities.

There will be a multiplier effect from the direct jobs created. Such indirect jobs are expected to emanate from the development of the plantations as well as logging and harvesting and further processing of the harvested plantation timber. The indirect jobs are expected to accrue from food crop farming, and the development of enterprises such as: local restaurants; service contractors; petty trading; furniture and joinery, charcoal production, charcoal briquettes making, carving, auto mechanics, transport, general construction, etc. This may result in twice the number of jobs created directly from the development of the forest plantations (i.e. approximately 6 million jobs) which would improve local economies.

Key actions under this strategic objective include:

- Undertake skills and nature-based enterprise development for men and women (i.e. tree nursery development, snail farming, apiculture, mushroom farming etc.);
- Facilitate infrastructural development within forest fringe communities;
- Promote out-grower forest plantation schemes and establishment of private nurseries; and
- Promote the establishment of community fire protection crews.

Details of targeted actions and timelines for this Strategic Objective are presented in Appendix 4.

3.1.4 Strategic Objective 4: Investments in research and development, extension, training and capacity building for forest plantation development

The success of commercial forest plantation establishment is highly dependent on: selection of suitable species, use of high-quality genetic planting material, site-species matching, application of proven silvicultural techniques, availability of technical capacity and adoption of appropriate business models.

The Strategy recognizes these important factors and consequently proposes the necessary measures with regards to research in the priority areas, capacity building as well as the provision of extension services that are described below.

This strategic objective will focus on support to research on forest plantation development to provide the relevant data and information to minimize economic and ecological risks to investments in forest plantations; build the critical mass of the required technical and managerial expertise; and provide the essential extension support.

3.1.4.1 Research

Research under this Strategy will aim at developing technologies and providing information on site-species matching, propagation methods, tree improvement, tree and stand management techniques, site productivity management, establishment and regeneration of trees on farms, identification and evaluation of suitable tree species for incorporation into farming systems, generation of tree management techniques on farm and assessing the productivity of such systems.

There are currently low investments in research and development and gaps in key data relevant to forest plantation development in Ghana. Therefore, a Forest Plantation Research Fund will be established to provide support to priority research areas. The key focus of research in the short to medium term will be seed and tree improvement (S&Ti).

The purpose of this area of research is to optimize the availability of tree seeds of high quality and to provide relevant seed information for afforestation, reforestation and agroforestry programs in the country. Programs that involve establishment, certification and management of improved seed production areas and seed orchards (seed stands) for plantation tree species, research on the genetic improvement of selected tree species (indigenous and exotic), identification and certification of seed collection areas for indigenous species and general seed biology would be undertaken.

Other priority research and investigation areas include:

- Tree pest and disease identification, control and management;
- Development of best management practices and silviculture for key indigenous/exotic species and their mixtures;
- Growth and yield studies and prediction for the prioritized and potential tree species;

- Production of broad site-species maps for each prioritized species for the whole country;
- Economic calculations (IRR and Cost-Benefit Analysis) on the profitability of each prioritized species for various site qualities and scales of operation using the best available growth, cost and price information to guide the choice of species by current and potential investors; and
- Market research – Demand and trends in demand, competition and market forecast.

3.1.4.2 Capacity Building

Human capital development is an important consideration for the implementation of plantation development plans. Appropriate categories of manpower for plantation development (e.g. large-scale commercial forest plantations and the small-scale tree growers) would therefore be equipped with the necessary technical, supervisory and managerial skills to ensure effective and efficient delivery of best practice forest plantation management services.

Measures to develop and upgrade capacity in forest plantation development and management include the following:

- Targeted technical level short-term and refresher courses as well as training of trainers in hands-on forest plantation development, Forest Landscape Restoration (FLR) and management skills will be fast-tracked in collaboration with the FCTC, FORIG, KNUST, UENR, IUCN and the existing private commercial plantation developers;
- Training of Forest Guards and other frontline staff of the FSD, and Rapid Response Teams in forest law enforcement and forest protection (wildfire, encroachment, illegal logging, cattle grazing, etc.);
- Implementation of professional development programmes at the local and international levels to strengthen institutional capacity would be pursued. There will be collaboration with local universities and training institutions with programs in forestry to regularly review curricula in line with the demands of the forest plantation industry;
- Organize study tours and exchange programs with foreign public and private institutions implementing best practice plantation development, i.e. Malaysia, Costa Rica, Thailand,

Brazil, Chile, South Africa, Cote D' Ivoire, etc.;

- Sponsorship for priority advanced degree programmes in disciplines such as: genetics and tree breeding; plantation silviculture and management; forest economics, forest engineering and forest plantation pest and disease management/Control;
- Build capacity of tree grower associations by supporting group formation, administration, provision of technical support, access to markets and products development; and
- Farmer field schools and demonstrations on good agroforestry practices and integrated nature-based livelihood options.

3.1.4.3 Extension services

The private sector and community plantation efforts will be supported with education and extension services to promote adoption of best plantation management practices. Smallholder and small-scale forest plantations will be the main focus of this intervention. The appropriate linkages will be facilitated between the forest plantation industry, the FC, FORIG/other research institutions, and the Universities to ensure effective transfer of technology and the provision of feedbacks to promote the adoption of best practices generated by research. Model plantations will be established across the country for demonstration purposes.

There will be collaboration with the following, among others, for the provision of extension services:

- Plantation Developers Associations/Groups, Farmer Groups;
- Community level structures such as CREMAs;
- Relevant civil society organizations; and
- National Service Secretariat.

Key actions to be implemented under this strategic objective include:

- Develop integrated pest management systems and train personnel to implement the systems for monitoring, detecting and managing outbreak of pests and diseases within plantations;
- Undertake trials of selected exotic and indigenous timber tree species to determine their suitability for plantation establishment, enrichment planting and incorporation into agroforestry systems;



FC staff holding consultations with Nsoatre community leaders on the rehabilitation of the degraded Tain II Forest Reserve, Sunyani Forest District, Brong-Ahafo Region.

- Develop standardized guide books for forest plantation extension services;
- Build capacity of FSD Staff in extension services;
- Assess capacity building requirements for forest plantations development;
- Undertake genetic improvement of key plantation species (indigenous and exotic);
- Undertake mass production of improved genetic material;
- Undertake international educational tours to model plantation setups;
- Organize capacity building/training programs on fire prevention and management;
- Improve training in site productivity management;
- Build capacity of Forest Guards and RRTs in forest law enforcement and forest protection;
- Design certificate programs for the private sector to upgrade their skills and knowledge to maintain high operational standards within the industry;
- Build capacity of timber processing industry to improve efficiency and utilization of small diameter logs; and
- Build capacity of tree grower associations in plantations management, advocacy and marketing of their produce.

Details of targeted actions and timelines for this Strategic Objective are presented in Appendix 4.

3.1.5 Strategic Objective 5: Governance

3.1.5.1 Guiding Principles

In the promotion of the development of forest plantations, the following guiding principles with regards to good governance in forest plantation will be pursued:

- Assurance of clear land and tree tenure;
- Assurance of consistent and clear enabling Government policies, laws and regulations to sustain investor confidence;
- Prompt and efficient law enforcement and conflict resolution, especially with regards to land ownership and lease disputes;
- Promotion of multi-stakeholder dialogue approach as a platform for decision-making and the provision of feedback from the stakeholders;

- Distribution of benefits on an equitable basis to all relevant stakeholders;
- Transparency and Regular Disclosure of information through agreed channels to stakeholders at community, district and national levels; and
- Conflict management mechanisms.

3.1.5.2 Institutional Structures For The Strategy's Implementation

The Forestry Commission Act, 1999 (Act 571) mandates the Forestry Commission (FC), among others, to undertake and support the development of forest plantations for the restoration of degraded areas (on and off-reserves), the increased production of industrial timber and the expansion of the country's protected forest cover nationwide.

Currently, the FC's plantation development effort is coordinated by the Plantations Department (PD) of the Forest Services Division (FSD). The PD has a staff strength of eight – 1 Director, 2 Senior Managers, 4 Middle/Junior managers and 1 Secretary. The PD coordinates the execution of the FC's mandate through the FSD district and regional management across the country with the Resource Management Support Centre (RMSC) of the FC, based in Kumasi, providing management support principally in the form of standard setting and monitoring.

In view of the growing importance of forest plantations and the greater responsibility expected of the FC to effectively coordinate the planned actions and manage the expectations of the many stakeholders, especially the private sector investors, it is recommended that the current structure be reviewed accordingly and commensurate authority and resources provided to ensure effective delivery of planned outputs under this Strategy.

The FC fulfills its mandate in collaboration with a number of institutions and stakeholders including MLNR, FPDFMB, MoFEP, EPA, Landowners and forest fringe communities, Private Plantation Developers, Media, Timber Industry, Civil Society Organizations, Research and Academic Institutions, Lands Commission and GNFS. The collaborating institutions and their expected roles are summarized in Table 11.

Table 11: Roles of supporting institutions/stakeholders

Institution/Stakeholder	Roles
Ministry of Lands and Natural Resources (MLNR)	Policy formulation and monitoring.
Forest Plantation Development Fund Management Board (FPDFMB)	Provide funds for agreed plantation initiatives. Provide funds for research and technical support.
Parliamentary Select Committee on Lands and Forestry	Legislation and monitoring of strategy implementation.
Forest Plantation Technical Steering Committee (proposed)	Oversight, monitoring the achievement of set objectives and facilitate periodic reviews.
Ministry of Finance and Economic Planning (MoFEP)	Legislate for and regulate any tax incentives for forest plantations and will implement these through the Ghana Revenue Authority. Additionally MoFEP releases GoG funds for financing public forest plantations.
Metropolitan, Municipal & District Assemblies (MMDAs)	Support in infrastructural development, promote investments and ensure law and order. Conflict management. Institute bye-laws to protect forest plantation investments.
Environmental Protection Agency (EPA)	Evaluate and monitor environmental standards and approve EIA/ESIA for large-scale development.
Traditional Authority / Landowners	Provide land. Conflict management. Community mobilization.
Forest fringe communities	Support FC in the prevention of illegal activities and wildfires from destroying plantation areas, partner FC in the development of forest plantations. Form the bulk of labour for plantation development by both public and private investors.

Institution/Stakeholder	Roles
Timber Industry	Advise on species selection relative to industry needs.
Ministry of Food and Agriculture (MoFA)	Collaborate on trees-on-farm component and extension training and support.
Lands Commission	Identify land banks for off-reserve areas Register Leases for commercial forest plantation development.
Tree Grower Associations & Farmer Groups	Facilitate extension services to members. Information dissemination within groups. Lobby key stakeholders.
Ghana Investment Promotion Centre (GIPC)	Encourage, promote and facilitate investments into the country. Initiate and support measures that will enhance the investment climate in Ghana.
Research and Academic Institutions	Research, professional and technical education.
Ghana National Fire Service (GNFS)	Review fire management plans. Fire education and sensitization. Fire fighting.
The Media	Information dissemination and public education and sensitization.
Ghana Police Service & Military	Law enforcement, prosecution of forest offenders.
Civil Society Organizations (CSOs)	Monitoring, public interest and rights advocacy, information dissemination and awareness creation.
National Disaster Management Organization (NADMO)	Assist in disaster management, particularly fires and flood.
National Commission for Civic Education (NCCE)	Engage especially at the district level for education and conflict resolution/management.

It is proposed that a multi-stakeholder advisory body to be known as the Forest Plantation Technical Steering Committee (FPTSC), be formed to guide the implementation of this forest plantation Strategy.

Key actions under this strategic objective would include:

- Strengthen enforcement of forest laws and regulations to address issues of illegal logging, wildfires and forest encroachment (illegal settlements, illegal farming, illegal mining, grazing, etc.);
- Ensure transparency in the implementation of the Ghana Forest Plantation Strategy by adopting collaborative M&E systems;
- Ensure adherence to social and environmental safeguard measures;
- Institute annual award scheme for exceptional performance in plantation development;
- Build structures and arrangements to facilitate equitable distribution of forest plantation benefits;
- Establish and inaugurate FPTSC;
- Develop consultative processes and systems to involve key stakeholders in decision making on forest plantation development;
- Develop and implement fair and transparent systems for allocating timber rights for forest plantations;
- Implement mechanisms that ensures fair pricing of plantation timber and other products and services;
- Develop and implement clear regulations for submission and approval of reforestation/afforestation/forest plantation development plans for establishments both on and off-reserve; and
- Liaise with Plant Protection Department of MoFA to grant approval for importation of all planting material for forest plantation/forest nurseries development.

Details of targeted actions and timelines for this Strategic Objective are presented in Appendix 4.



Thinning operation within a 14-year old teak plantation established by Form Ghana in partnership with the Forestry Commission within the Asubima Forest Reserve, Offinso Forest District, Ashanti Region.

PART IV – FINANCE**4.1 Budget And Funding Sources**

The total cost of implementing the Strategy over the 25-year period (2016 – 2040) is US\$4,064,389,800 (Appendix 6). Table 12 highlights the summary costs and expected funding sources.

Funding for the Strategy will be sourced from government (public) and private sector. Government funding is expected to come from direct budget support, levies (eg. a 5 percent carbon levy on petroleum products could yield an estimated US\$145million/year [based on an estimated average annual crude oil consumption of 24 million barrels from 2010 to 2013 and current weighted average fuel price of US\$0.76/litre]), pension funds (e.g. SSNIT) and contributions from development partners (DPs). Support from DPs would be in the form of loans, grants and direct budgetary support. Private sector funds are expected to be sourced from debt and/or equity financing and grants.

Public Private Partnership options for the establishment of new plantations, coppice management and maintenance of existing ones will be pursued to attract private sector investments for plantation development.

Other sources of funding will include revenue from issuance of conveyance certificates for woodfuel and private forest plantation timber.

Generally, the Government of Ghana and its agencies and development partners, apart from directly funding limited establishment and maintenance of public forest plantations, will mainly fund activities aimed at facilitating the creation of an enabling environment for investment in forest plantation development.

These will include promulgation of legislations, policies and establishment of institutional structures that promote investment in forest plantations; creation of land banks; genetic tree improvement and subsequent provenance testing and establishment of seed stands; Licensing of tree nurseries and plantation development contractors; capacity building within key agencies charged with supporting forest plantation development; research; etc. Private sector investments will mainly target the actual implementation of forest plantation projects.

Budget Summary (2016 - 2040)

COST ITEM	BUDGET (US\$)	FUNDING SOURCE(S)
STRATEGIC OBJECTIVE 1: Establishment and management of planted forests	4,031,198,800	GoG / DPs Private Sector
STRATEGIC OBJECTIVE 2: Investment Promotion	1,310,000	GoG / DPs
STRATEGIC OBJECTIVE 3: Employment creation and livelihoods	7,975,000	GoG / DPs Private Sector (47%)
STRATEGIC OBJECTIVE 4: Research and development, training and capacity building, and extension services	13,170,000	GoG / DPs
STRATEGIC OBJECTIVE 5: Governance	2,711,000	GoG / DPs
TOTAL	4,064,389,800	GoG / DPs Private Sector

4.2 Expected Yield and Income

In terms of yield, the extra 625,000 ha of plantation would supply an estimated 82.5 million cubic meters of round wood (standing tree volume) over the 25-year period. This translates to an estimated average of 3.25 million cubic meters of round wood annually over the 25 years [Mean Annual Increment (MAI) of 10m³/ha/year, 25-year rotation] (Appendix 7). The 3.25 million cubic meters of wood at an estimated average timber price of US\$80 per cubic meter would provide average timber revenue of US\$260 million annually.

The 235,000 ha of existing forest plantation would be expected to supply an average of 1.41 million cubic meters of round wood annually over the 25 year period of the Strategy (MAI of 6m³/ha/year, 25-year rotation). At an estimated average timber price of US\$80 per cubic meter, this would provide average timber revenue of US\$113 million annually.

Between Strategy years 1-2 (2016–2017) an average of approximately US\$15 million is expected to be generated annually from thinnings of the existing plantations. An average of US\$150 million is expected to be generated annually between Strategy years 3–9 (2018 -2024) from further thinnings and harvesting of saw logs from the existing plantations and an average of US\$520 million annually between Strategy years 10-25 (2025–2040) mainly from harvesting of poles, fuelwood and saw logs from existing and new plantations.

Poorly stocked stands within forest reserves would be enriched at an average of 100 stems per hectare. Assuming 50% of these stems survive and reach maturity then these would supply an average of 250m³ of round wood per hectare by year 40 (Mean round wood volume of 5m³ per tree; MAI of 6.25m³/ha/year 40-year rotation). Using an estimated average timber price of US\$60 per cubic meter, the targeted 100,000 ha would provide total timber revenue of US\$1.5 billion at the end of the 40-year rotation (or average annual revenue of US\$37.5 million).

Additionally, significant income is expected from carbon offset schemes (i.e Compliance Carbon Markets, Voluntary Carbon Markets, etc.), REDD+ (e.g. performance-based payments for emission reduction) and payment for other ecosystem services.

Significant environmental and socio-economic benefits such as environmental enhancement and conservation, livelihood support through job creation and promotion of economic activities within local communities, and the envisaged expansion in the timber and affiliated industries across the country would be realized as a result of implementing the Strategy.

4.3 Financial Appraisal

The financial appraisal of the Strategy was undertaken to determine its net worth or profitability over the 25-year period. Total project income is US\$9,411,553,539 with expected investment cost of US\$4,064,389,800 over the period. The Internal Rate of Return (IRR) for executing the Strategy is 19.4% and the Net Present Value (NPV) is US\$799,473,516 (Cost of capital of 10%) [Appendix 8]. It is therefore evident from the results that the proposed investments to be made under this Strategy would yield an attractive financial return.

Sensitivity analysis was conducted to determine the robustness of the investment in the face of adverse changes or uncertainties that may affect its viability. At a cost of capital of 10%, year on year expenditure (cost) was increased by 20% over the period of the Strategy and this yielded a positive NPV of US\$487,549,556, with an IRR of 15.1%. A 20% year on year decrease in revenue over the same period also yielded a positive NPV of US\$327,911,018, with an IRR of 14.2%. Finally, year on year cost was increased by 20% while revenue was decreased by 10%, and yet a combination of these two negative effects yielded a positive NPV of US\$252,024,472 with an IRR of 12.8%.

It is therefore evident from the above results that the proposed investments to be made under this Strategy would yield an attractive financial return, and would remain viable in the face of unexpected, but possible, extreme adverse income and expenditure regimes.

PART V – MONITORING, EVALUATION AND REPORTING

5.1 Monitoring & Evaluation

Progress monitoring will be undertaken by the Executive Director, FSD. Annual reports will be prepared indicating progress towards the achievement of the set milestones. The reports will be submitted to the Chief Executive of the Forestry Commission who will make copies available to the FC Board, FPTSC, Parliamentary Select Committee on Lands and Forestry, MLNR, Civil Society and other relevant bodies or institutions. These reports will form the basis for monitoring and evaluation of progress. The detailed M&E framework is shown in Appendix 4.

To enhance the process of monitoring and evaluation, a robust ICT platform will be developed to host all the data captured, processed and reported under the 25 year Ghana Forest Plantation Strategy. The proposed Plantation Management System and knowledge transfer is estimated to cost US\$300,000. Capacity building and training will be conducted for all users of the ICT management system across the country.

The Strategy will be reviewed every 5 years from the date of commencement of implementation to monitor progress and adapt the Strategy to changing conditions and priorities thus ensuring that the Strategy stays on course to achieve the overarching goal. A summative evaluation will be carried out by an independent party at the end of year 25 to determine the effectiveness of the Strategy in achieving the set objectives. Lessons learnt will inform the development of a new Strategy.

The process of developing a new Strategy should commence at least 2 years prior to the termination of this Strategy.

5.2 Indicators For Monitoring

The plan will be subjected to regular and objective reviews to determine its effectiveness and establish its impact. Although the future may hold developments that have not been anticipated, the detailed internal and external analyses undertaken stand us in good stead to manage the future.

Monitoring of the Strategy's indicators will be undertaken by the Executive Director, FSD with support from the FPTSC.

The performance indicators to be used in monitoring the implementation of the Strategy will include:

- number and types of forest plantation investors processed and approved;
- number of parcels and extent of lands in degraded forest reserves and off-reserves that are leased to investors;
- number of males and females who attended and completed the various training courses organized under the Strategy (e.g. short-term, refresher, formal etc);
- number of male and female trainees who have established themselves with skills acquired and are excelling 3 years after the training;
- extent of lands in hectares planted annually by each category of investor;
- number of genetically improved seedlings produced and delivered to tree growers;
- extent of existing plantations in hectares that have been rehabilitated;
- extent of enrichment plantings undertaken in hectares;
- number of jobs created;
- the disbursement of the available funds for implementing the Strategy;
- size (value) of investments in forest plantations; and
- number of investments in forest plantations.



Five (5)-month old teak plantation established by Mere Plantation Ltd. in partnership with the Forestry Commission within the Afram Headwaters Forest Reserve, Ashanti Region.

6.0 REFERENCES

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GLOSSARY

Best practice

A technique or a methodology that, through experience and research, has proven to reliably lead to a desired result. A commitment to using best practice in any field is a commitment to using all knowledge and technology at one's disposal to ensure success.

Commercial forest plantation

Forest plantation established purposely for producing timber and other forest produce as a business enterprise or for sale. In Ghana, this has been categorized into small (4 ha - 100 ha), medium (101 ha - 1,000 ha) and large (1,000+ ha) scale.

Convalescence Area

A degraded (Basal Area between 5 - 12m²/ha; forest condition score of 3 or 4) production area within the forest reserve that has been temporarily taken from production for a period of 40 years to enable it recover.

Conversion Area

A heavily degraded production area (Basal Area less than 5m²/ha; forest condition score of 5 or 6) which has poor regeneration of indigenous tree species and may be available for reforestation.

Deforestation

The conversion of a forest to other land use or the permanent reduction of the tree canopy cover, height and land area below the minimum thresholds for a "forest" (see forest definition).

Enrichment planting

The introduction of high value tree species into a poorly stocked natural forest to sustain the supply of desirable species. Usually, striplings/seedlings of up to 1m height planted at 5m intervals within 2m wide strips, 20m apart.

Forest

Community of trees on land with a minimum area of 1 hectare, minimum tree crown cover of 15%, or with existing tree species having the potential of attaining at least 15% crown cover, with trees that have a minimum height or potential to reach a height of 5.0 meters at maturity in situ.

Forest Degradation

The changes within the forest, usually caused by anthropogenic and environmental factors, that negatively affect the structure or function of the stand or site, thereby reducing its capacity to supply products and/or services [i.e. timber, NTFPs, carbon storage, watershed protection, biodiversity conservation etc.]

Forest Landscape Restoration

A process that aims to regain ecological integrity and functionality; and enhance human wellbeing in deforested or degraded forest landscapes. It involves people coming together to restore the function and productivity of degraded forest lands - through a variety of place-based interventions, including new tree plantings, managed natural regeneration, or improved land management.

Forest plantation

Forests established by deliberate seeding or planting, that possess features of uniformity, shape and often intensity of management. Usually, they are established on degraded lands with the same species and have the same age and a regular spacing.

Free range cattle ranching

A system of animal husbandry in which the livestock, especially cattle are left to graze or roam freely without any form of confinement either by a ranch or barbed wire. Example is the activities of Fulani herdsmen in some parts of Ghana that result in the destruction of farms and property.

Grassland

A grassland is a plant community, in which the structural dominants are grasses. It can also be seen as land covered with grasses and other herbaceous species. Woody plants may be present, but if so, they do not cover more than 10% of the ground. There are many different types of grassland designated by ecozone, topography, climate, soil conditions etc.

Planted Forest

Forest predominantly composed of trees established through planting and/or deliberate seeding. It includes forest plantations, enrichment plantings, trees-on-farm etc.

Reforestation

Re-establishment of forest through planting and/or deliberate seeding on degraded land previously classified as forest.

Smallholder forest plantations

These are forest plantations covering an area less than 4 ha (10 acres).

Sustainable forest management (SFM)

It is the process of managing forests to achieve one or more clearly defined objectives of management with regard to the production of a continuous flow of desired forest products and services, without undue reduction of its inherent values and future productivity and without undue undesirable effect on the physical and social environment.

Taungya system

A system whereby farmers and sometimes forest plantation workers are given the right to cultivate agricultural crops during the early stages of the forest plantation establishment. Food crop cultivation is often allowed to continue until trees shade crops due to canopy closure.

Trees-on-farm

Planting and/or nurturing of naturally occurring forest trees within farming systems.

APPENDICES

APPENDIX 1:

FOREST PLANTATION ESTABLISHMENT ACHIEVEMENTS UNDER THE NFPDP (2002 - 2015)

YEAR	MTS	CFMP	HIPC	PRIVATE DEVELOPERS	FSD PLANTATIONS	EXPANDED PROGRAM	FC/ INDUSTRY FUND PLANTATIONS	TOTAL PLANTED AREA
2002	17,341.00*			1,609.00**				18,950.00
2003	17,541.00*			1,609.00**				19,150.00
2004	16,090.00*		5,509.84	1,609.00**				23,208.84
2005	9,105.00*	1,136.00*	3,341.93	1,609.00**				15,191.93
2006	9,401.00*	2,298.00*	2,708.50	1,609.00**				16,016.50
2007	8,711.00*	2,731.00*	2,947.82	1,613.00**	78.5			16,081.32
2008	111*	2,930.00*	1,806.67	5,986.65	160			10,994.32
2009	2,427.30*	4,293.00*	902.84	3,894.35	140			11,657.49
2010	-	-	-	4,612.84	-	14,008.84 ¹	106.82	18,728.50
2011	-	-		4,439.88	-	6719.71 ¹	270.77	11,430.36
2012	-	-		3,549.89	-	5,854.34 ¹	95.3	9,499.53
2013	-	-		4,309.51	2,857.61	-	180.74	7,347.86
2014	-	-		7,795.51	-	-	487.56	8,283.07
2015	-	-	-	3,802.20	108.00	-	-	3,910.20
TOTAL	80,727.30	13,388.00	17,217.60	48,048.83	3,344.11	26,582.89	1,141.19	190,449.92

*Reported figures, yet to be verified by technical audit

**Achievement of Private Developers for the period 2002-2007 has been estimated based on total establishment collated at the end of 2007, averaged over the period, due to lack of proper documentation on yearly achievements.

¹Figures reviewed in 2013 following a joint verification of the effective area planted by the Service Companies and the Forest Services Division

APPENDIX 2:

RISK ASSESSMENT AND MITIGATION MEASURES

Source of Risk	Risk Evaluation		Overall Rating	Mitigation Measures / Recommended Actions
	Likelihood of Occurrence (Probability)	Likely Impact of Risk (Consequence)		
Natural / Environmental				
Prolonged Drought	Low	High	Medium	<ul style="list-style-type: none"> Analysis of climate data for good weather prediction Planting at the onset of the major rains Planting drought resistant strains Use of hydrogels and other soil amendment products Mulching Irrigation
Flood	Very Low	Moderate	Low	<ul style="list-style-type: none"> Analysis of climate data for good weather prediction Appropriate site selection (undertake due diligence) Construct flood drains / ditches
Pest/Diseases	Very Low	Moderate	Low	<ul style="list-style-type: none"> Development of Integrated Pest Management System (IPMS) Training of personnel in the IPMS to ensure sound implementation Undertake mixed species plantations Conservation / protection of good natural forest within and around forest plantations Matching species with site Planting pest / disease resistant strains Good silvicultural and stand management practices
Wind damage	Very Low	Low	Very Low	<ul style="list-style-type: none"> Avoiding extremely vulnerable sites Matching species with site Establish windbreaks where necessary

APPENDIX 2:

RISK ASSESSMENT AND MITIGATION MEASURES

Anthropogenic / Social				
Wildfire	Moderate	Extreme	High	<ul style="list-style-type: none"> Sensitization and training of forest fringe communities in fire prevention, pre-suppression and suppression. Establishment of community fire protection crew Construction of firebreaks (green firebreaks and fire rides) Undertake effective fuel treatment (e.g. removal of debris, weeds, prescribed burning) Fire patrols. Deploy Rapid Response Teams (RRT) to flash points. Build capacity of frontline staff in forest protection and forest law enforcement. Prosecution of offenders. Build capacity of local Community Based Organizations (CBOs) to support FC in forest protection.
Free range grazing by Cattle (Nomadic herdsmen)	Moderate	Moderate	Medium	<ul style="list-style-type: none"> Effective forest protection and law enforcement by FC and security agencies. Facilitate the institution of a policy on ranching. Deploy Rapid Response Teams (RRT) to flash points. Build capacity of frontline staff in forest protection and forest law enforcement. Prosecution of offenders. Build capacity of local Community Based Organizations (CBOs) to support FC in forest protection.
Economic				
Low price of timber	Very Low	Moderate	Low	<ul style="list-style-type: none"> Diversification of species planted Hedging In-depth market analyses of species
Poor management of plantations leading to low	Moderate	Moderate	Medium	<ul style="list-style-type: none"> Implementation of training and extension services on best practices

APPENDIX 2:

RISK ASSESSMENT AND MITIGATION MEASURES

yields and returns (mainly small and medium scale investors)				<ul style="list-style-type: none"> Engaging the services of professional foresters Provision of concessionary loans/grants for plantation maintenance by government/donors. Payment for Environmental Services
Political				
Change in Government Policy on Forest Plantation Investments by private sector (possibly through regime change)	Very Low	Moderate	Low	<ul style="list-style-type: none"> Foster multi-party involvement in policy and strategy development Encourage wider multi-stakeholder consultations in policy and strategy development
Change in Government Policy on Forest Plantation Investments by public sector (possibly through regime change)	Moderate	Moderate	Medium	<ul style="list-style-type: none"> Foster multi-party involvement in policy and strategy development Encourage wider multi-stakeholder consultations in policy and strategy development
Legal/Policy				
Insecure land tenure especially in off-reserve areas	Moderate	High	Medium	<ul style="list-style-type: none"> Investors are encouraged to verify land titles and other ownership documents especially in off-reserve areas before forest plantation establishment
Illegal logging (mainly public forest plantations)	Moderate	Moderate	Medium	<ul style="list-style-type: none"> Frequent patrols Deploy Rapid Response Teams (RRT) to flash points Build capacity of frontline staff in forest protection and forest law enforcement Prosecution of offenders Implement chain of custody protocols Build capacity of local Community Based Organizations (CBOs) to support FC in forest protection.

Illegal farming (within forest reserves)	Low	Low	Low	<ul style="list-style-type: none"> • Incorporate food crop intercropping strategies (i.e. taungya) • Frequent patrols • Deploy Rapid Response Teams (RRT) to flash points • Build capacity of frontline staff in forest protection and forest law enforcement • Prosecution of offenders • Build capacity of local Community Based Organizations (CBOs) to support FC in forest protection.
Illegal mining	Very Low	High	Low	<ul style="list-style-type: none"> • Frequent patrols • Deploy Rapid Response Teams (RRT) to flash points • Build capacity of frontline staff in forest protection and forest law enforcement • Prosecution of offenders • Law enforcement • Build capacity of local Community Based Organizations (CBOs) to support FC in forest protection.

Rating (Probability): Very High (5), High (4), Moderate (3), Low (2) and Very Low (1)

Rating (Consequence): Extreme (5), High (4), Moderate (3), Minor (2) and Insignificant (1)

Rating (Overall): Very High (5), High (4), Medium (3), Low (2) and Very Low (1)

APPENDIX 3:

RECOMMENDED TREE SPECIES FOR FOREST PLANTATION DEVELOPMENT IN GHANA

VEGETATION ZONE	SCIENTIFIC NAME	COMMON/TRADE NAME	KEY USES
Indigenous:			
	<i>Allanblackia parviflora</i>	Tallow Tree	Oils, Poles, Construction, Medicinal
	<i>Aningeria spp.</i>	Asanfena	Veneer, Plywood
	<i>Canarium schweinfurthii</i>	Bediwonua	Plywood, Veneer, Boards, Furniture
	<i>Ceiba pentandra</i>	Ceiba	Veneer, Plywood, Boards
	<i>Dalbergia retusa*</i>	Rosewood	Furniture, Veneer, Plywood
	<i>Dalbergia sissoo*</i>	Rosewood	Furniture, Veneer, Plywood
	<i>Entandrophragma angolensis</i>	Edinam	Plywood, Veneer, Boards, Furniture
	<i>Entandrophragma candollei</i>	Kosipo	Plywood, Veneer, Boards, Furniture
	<i>Entandrophragma cylindricum</i>	Sapele	Plywood, Veneer, Boards, Furniture
	<i>Entandrophragma utile</i>	Utile	Plywood, Veneer, Boards, Furniture
	<i>Guarea cedrata</i>	Guarea	Veneer, Plywood, Furniture, parquet
	<i>Hallea stipulosa</i>	Subaha	Furniture, Boards
	<i>Heritiera utilis</i>	Nyankom	Veneer, Plywood, Furniture
	<i>Khaya ivorensis, Khaya grandifolia, Khaya angolensis</i>	African Mahogany	Plywood, Veneer, Boards, Furniture
	<i>Lovoa klaineana</i>	African Walnut	Veneer, Plywood
	<i>Mansonia altissima</i>	Mansonia	Furniture, Parquet, Veneer
	<i>Milicia spp.</i>	Odum	Furniture, Parquet
	<i>Nauclea diderrichii</i>	Kusia	Furniture, Parquets, panelling
	<i>Pericopsis elata</i>	Kokrodua / Afromosia	Furniture, Parquet, Veneer
	<i>Piptadeniastrum africanum</i>	Dahoma	Mining Timber, Sleepers, Furniture
	<i>Pterygota macrocarpa</i>	Koto	Plywood, Veneer, Boards, Furniture
	<i>Pycnanthus angolensis</i>	Otie	Plywood, Veneer, Boards, Furniture
	<i>Strombosia glaucescens</i>	Afina	Mining Timber, Electricity transmission poles
	<i>Terminalia ivorensis</i>	Emire	Veneer, Plywood
	<i>Terminalia superba</i>	Ofram	Veneer, Plywood, Furniture
	<i>Tieghemella heckelii</i>	Makore	Plywood, Veneer, Boards, Furniture
	<i>Triplochiton scleroxylon</i>	Wawa	Plywood, Boards, Particle Board
Exotics:			
	<i>Aucoumea klaineana</i>	Aucoumea	Plywood, Veneer, Panelling,
	<i>Azadiracta excelsa*</i>	Sentang	Veneer, Furniture, Panelling
	<i>Bambusa spp</i>	Bamboo	Furniture, Energy
	<i>Cedrela odorata</i>	Cedrela	Furniture, Veneer, Plywood
	<i>Dendrocalamus spp</i>	Bamboo	Furniture
	<i>Eucalyptus spp.*</i>	Eucalyptus	Plywood, Veneer, Boards, Paper, Transmission Energy
	<i>Eucalyptus spp (including hybrids)</i>	Eucalyptus	Plywood, Veneer, Boards, Paper, Transmission Energy
	<i>Guadua spp.</i>	Bamboo	Furniture
	<i>Gmelina arborea</i>	Gmelina	Veneer, Plywood, Furniture, Parquet, Pulp
	<i>Oxytenanthera spp</i>	Bamboo	Furniture
	<i>Paulownia spp. *</i>	Paulownia	Plywood, Pulp, Parquets, Veneer
	<i>Pinus spp.</i>	Pines	Furniture, Window frames, Panelling, Floors and Roofing, Turpentine
	<i>Senna siamea</i>	Cassia	Energy (Fuel wood)
	<i>Shorea spp*</i>	Red Meranti	Veneer, Furniture, Parquet, Plywood, Panelling
	<i>Swietenia macrophylla *</i>	Mahogany	Plywood, Veneer, Boards, Furniture
	<i>Tectona grandis</i>	Teak	Veneer, Furniture, Parquet, Transmission poles

*Species to be introduced

High Forest Zone

APPENDIX 3:

RECOMMENDED TREE SPECIES FOR FOREST PLANTATION DEVELOPMENT IN GHANA

VEGETATION ZONE	SCIENTIFIC NAME	COMMON/TRADE NAME	KEY USES
Indigenous:			
Transitional Zone	<i>Aningeria spp.</i>	Asarfena	Veneer, Plywood
	<i>Ceiba pentandra</i>	Ceiba	Veneer, Plywood, Boards
	<i>Dalbergia melanoxylon*</i>	Blackwood	Furniture, Veneer, Plywood
	<i>Dalbergia retusa*</i>	Rosewood	Furniture, Veneer, Plywood
	<i>Dalbergia sissoo*</i>	Rosewood	Furniture, Veneer, Plywood
	<i>Daniellia oliveri</i>	Senya	Furniture, Flooring, Boat building
	<i>Khaya ivorensis, Khaya grandifolia, Khaya angolensis</i>	African Mahogany	Plywood, Veneer, Boards, Furniture
	<i>Lovoa klaineana</i>	African Walnut	Veneer, Plywood
	<i>Mansonia altissima</i>	Mansonia	Furniture, Parquets, Veneer
	<i>Milicia spp.</i>	Odum	Furniture, Parquet
	<i>Nauclea diderrichii</i>	Kusia	Furniture, Parquets, panelling
	<i>Pericopsis elata</i>	Kokrodua / Afromosia	Furniture, Parquet, Veneer
	<i>Piptadeniastrum africanum</i>	Dahoma	Mining Timber, Sleepers, Furniture
	<i>Pterocarpus erinaceus</i>	African Rosewood	Furniture, parquet
	<i>Terminalia ivorensis</i>	Emire	Veneer, Plywood
	<i>Terminalia superba</i>	Ofram	Veneer, Plywood, Furniture
	<i>Triplochiton scleroxyylon</i>	Wawa	Plywood, Boards, Particle Board
	Exotics:		
	<i>Acacia mangium</i>	Acacia	Energy (Charcoal), Paper
	<i>Azadirachta excelsa*</i>	Sentang	Veneer, Furniture, Panelling
	<i>Bambusa spp</i>	Bamboo	Furniture
	<i>Cedrela odorata</i>	Cedrela	Furniture, Veneer, Plywood
	<i>Dendrocalamus spp</i>	Bamboo	Furniture
	<i>Eucalyptus spp.*</i>	Eucalyptus	Plywood, Veneer, Boards, Energy
	<i>Eucalyptus spp. (including hybrids)</i>		
	<i>Oxytenanthera spp</i>	Bamboo	Furniture
	<i>Pinus spp</i>	Pines	Furniture, Window frames, Panelling, Floors and Roofing, Turpentine
	<i>Senna siamea</i>	Cassia	Energy (Fuel wood)
	<i>Tectona grandis</i>	Teak	Veneer, Furniture, Parquet, Transmission poles
Northern Zone	Indigenous:		
	<i>Anogeissus leiocarpus</i>	Anogeissus	Energy (Fuel wood), Tool handles
	<i>Ceiba pentandra</i>	Ceiba	Veneer, Plywood, Boards
	<i>Daniellia oliveri</i>	Senya	Furniture, Flooring, Boat building
	<i>Khaya senegalensis</i>	African Mahogany	Boards, Furniture
	<i>Millettia thonningii</i>	Millettia	Energy (Fuel wood), Medicinal
	<i>Pterocarpus erinaceus</i>	African Rosewood	Furniture, Fuel wood (Energy), Medicinal
	Exotics:		
	<i>Acacia spp.</i>	Acacia	Energy (Fuel wood)
	<i>Azadirachta indica</i>	Neem	Energy (Fuel wood)
	<i>Bambusa spp</i>	Bamboo	Furniture
	<i>Dalbergia melanoxylon*</i>	Blackwood	Furniture, Veneer, Plywood
	<i>Dendrocalamus spp</i>	Bamboo	Furniture
	<i>Eucalyptus spp. (including hybrids)</i>	Eucalyptus	Plywood, Veneer, Boards, Energy
	<i>Oxytenanthera spp</i>	Bamboo	Furniture
	<i>Senna siamea</i>	Cassia	Medicinal, Tool handles
	<i>Tectona grandis</i>	Teak	Veneer, Furniture, Panelling

APPENDIX 3:**RECOMMENDED TREE SPECIES FOR FOREST PLANTATION DEVELOPMENT IN GHANA**

VEGETATION ZONE	SCIENTIFIC NAME	COMMON/TRADE NAME	KEY USES
Coastal Savannah	<i>Exotics</i>		
	<i>Acacia spp.</i>	Acacia	Pulp, Energy (Fuel wood)
	<i>Azadirachta indica</i>	Neem	Energy (Fuel wood)
	<i>Bambusa spp</i>	Bamboo	Furniture
	<i>Ceiba pentandra</i>	Ceiba	Veneer, Plywood, Boards
	<i>Dendrocalamus spp</i>	Bamboo	Furniture
	<i>Eucalyptus spp (including hybrids)</i>	Eucalyptus	Plywood, Veneer, Boards, Energy
	<i>Oxytenanthera spp</i>	Bamboo	Furniture
	<i>Senna siamea</i>	Cassia	Energy (Fuel wood)
	<i>Tectona grandis</i>	Teak	Veneer, Furniture
<i>Indigenous</i>			
	<i>Millettia thonningii</i>	Millettia	Energy (Fuel wood), Medicinal

* Species to be introduced

Appendix 4

**GHANA FOREST PLANTATION STRATEGY
M & E FRAMEWORK**

GOAL OF STRATEGY: To achieve sustainable supply of planted forest goods and services to deliver a range of economic, social and environmental benefits

STRATEGIC OBJECTIVES	ACTIONS	PERFORMANCE INDICATORS	TIME FRAME (Years)					
			1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	
STRATEGIC OBJECTIVE 1: <i>Establishment and management of planted forests</i>	Action 1.1: Identify, survey and map suitable lands within forest reserves for plantation development	<i>Number of digital maps produced</i>						
	Action 1.2: Liaise with the Lands Commission, traditional councils and other landowners to identify off-reserve lands earmarked for commercial plantation development	<i>Area (ha) and number of off-reserve lands identified</i>						
	Action 1.3: Develop and maintain a system to update a register on degraded lands available for forest plantation (On-reserve and off-reserve) [Land Bank]	<i>Updated land register</i>						
	Action 1.4: Publish database of available on and off-reserve lands (Land bank) for plantation development	<i>Database published</i>						
	Action 1.5: Procure genetically improved /superior planting materials of selected exotic timber tree species	<i>Weight/number and species of planting materials procured</i>						
	Action 1.6: Collect seeds from plus native and exotic timber tree species	<i>Weight and species of seeds collected</i>						
	Action 1.7: Establish Seed Orchards (clonal and seedling) of selected exotic and native timber tree species (300 ha)	<i>Area (ha), number and species of seed orchards established</i>						
	Action 1.8: Maintain/Tend Seed Orchards (existing and new) / Seed Production Areas (SPAs)	<i>Area (ha) of SPAs and SOs maintained</i>						
	Action 1.9: Establish and operate a Tissue Culture Lab and Other Facilities (Vegetative Propagation Center)	<i>Quality of tissue culture facility constructed</i>						

STRATEGIC OBJECTIVES	ACTIONS	PERFORMANCE INDICATORS	TIME FRAME (Years)					
			1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	
	Action 1.10: Establish and operate three (3) State-of-the-Art Central tree nurseries (Kumasi / Sunyani / Tamale) - 6 million seedlings capacity / yr	Number of modern central tree nursery established and operated Number of seedlings produced						
	Action 1.11: Review existing plantation MoPs (A,B and C) and consolidate into one document	Plantation MoP ready for publishing						
	Action 1.12: Publish reviewed plantation MoP	Plantation MoP published						
	Action 1.13: Develop and publish MoP on Enrichment Planting	MoP on enrichment planting published						
	Action 1.14: Undertake coppice management of an estimated 15,000ha teak plantations harvested prior to 2015 and 10,000ha annually from 2027	Area (ha) of coppices managed stands						
	Action 1.15: Undertake Enrichment planting in poorly stocked / convalescence forest reserves	Number and area (ha) of poorly stocked forest reserves improved						
	Action 1.16: Undertake maintenance of Enrichment Planting sites (New and Existing)	Number and area (ha) of enrichment planting sites maintained						
	Action 1.17: Undertake replanting of an estimated 3,000ha harvested forest plantations (species other than teak).	Area (ha) and species of harvested stands replanted						
	Action 1.18: Maintain replanted sites (3,000 ha)	Area (ha) of replanted stands maintained						
	Action 1.19: Implement FC's MoP on wildfire management	Availability of fire reports indicating nationwide trends of fire incidence						
	Action 1.20: Construct fire rides (10meter wide) within existing government plantations (160,000ha) [Est. 19,200 km]	Length and quality of fire rides constructed						
	Action 1.21: Maintain / rehabilitate an estimated 235,000 ha (160,000 ha public and 75,000 ha private) existing forest plantations	Area (ha) of existing forest plantation maintained/rehabilitated						
	Action 1.22: Establish new plantations [20,000 ha/yr]	Area (ha) of new plantations established (with over 75% survival)						
	Action 1.23: Maintain newly established plantations	Area (ha) of new plantations maintained						
	Action 1.24: Establish Model Plantations for demonstration of best practice (200 ha/yr)	Area (ha) and number of model plantations established (with over 75% survival)						

STRATEGIC OBJECTIVES	ACTIONS	PERFORMANCE INDICATORS	TIME FRAME (Years)					
			1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	
	Action 1.25: Maintain existing (378ha) and newly established (200ha/yr) Model Plantations	Area (ha) and number of existing and new model plantations maintained						
	Action 1.26: Promote agro-forestry/farm forestry (trees on farm); [extension services and supply 5 million seedlings/yr]	Number of farms adopting the ToF system Number of seedlings supplied per year Number of participating farmers Area (ha) of participating farms						
	Action 1.27: Liaise with Minerals Commission to rehabilitate mined sites	Number and area (ha) of mined sites rehabilitated						
	Action 1.28: Liaise with Water Resources Commission, VRA, GWCL, others to rehabilitate degraded watersheds	Number and area (ha) of degraded watersheds rehabilitated						
	Action 1.29: Procure key logistics for field operations/monitoring and supervision (i.e. Vehicles, motorbikes, GPS, pruning saws, pruning shears, chainsaws, protective clothing, first aid and safety equipment etc.)	Number and type of key field operations logistics procured						
	Action 1.30: Facilitate forest plantations management and chain of custody certification (FSC, PEFC, etc)	Number and area (ha) of plantations certified by FSC, PEFC etc.						
	Action 1.31: Facilitate the enactment of policy/legislation to support ownership by farmers of planted trees on farms	Policy document or legislation on ownership of trees on farms						
STRATEGIC OBJECTIVE 2: <i>Forest plantation investment promotion</i>		Action 2.1: Prepare and publish a forest plantation investor handbook	Forest plantation investor handbook published					
		Action 2.2: Undertake studies and stakeholder consultations to support the introduction of a Reforestation Levy / Carbon Tax	Report on reforestation levy and carbon tax study published /submitted					
		Action 2.3: Expand the coverage of the Timber Export Levy to include all key timber species exported as air-dried lumber.	Number of key timber species exported as air dried lumber increased					
		Action 2.4: Facilitate the establishment of a specialized market for the trading of forest plantation stands	Number and area (ha) of plantations traded					

STRATEGIC OBJECTIVES	ACTIONS	PERFORMANCE INDICATORS	TIME FRAME (Years)						
			1 - 5	6 - 10	11 - 15	16 - 20	21 - 25		
STRATEGIC OBJECTIVE 3: <i>Employment creation and livelihoods</i>	Action 3.1: Recruit labour from fringe communities to undertake enrichment planting, plantation establishment and maintenance	Number of workers recruited							
	Action 3.2: Promote out-grower forest plantation schemes and establishment of private nurseries	Number of out-growers engaged Area (ha) of forest plantations under out-grower schemes							
	Action 3.3: Promote the establishment of community fire protection crews	Number of seedlings produced							
	Action 3.4: Undertake skills and enterprise development	Number of community fire protection crews established							
	Action 3.5: Monitor Implementation of Social Responsibility Agreements (i.e. Schools, Clinics, Water and Sanitation etc.) within fringe communities.	Number of skills and enterprise development programs held							
	Action 3.6: Facilitate infrastructural development within forest fringe communities (SRA etc)	Number of participants trained							
STRATEGIC OBJECTIVE 4: <i>Investment in Research, Extension services and Capacity Building</i>	Action 4.1: Assess capacity requirements for forest plantation development	Number of and value of infrastructural projects implemented							
	Action 4.2: Design and implement professional development programmes at the local and international levels to strengthen institutional capacity in order to improve delivery of services.	Assessment report							
	Action 4.3: Design and implement capacity-building and certification programmes for the private sector (i.e. plantation contractors, nursery operators, etc.) to upgrade their skills and knowledge to maintain high operational standards within the industry.	Number of professional development programmes designed and implemented Number and category of staff trained							
	Action 4.4: Review curricula of courses in plantation silviculture and management and introduce on-field attachment programs in line with current best practice	Number of capacity building programs organised Number of private sector players trained and certified							
	Action 4.5: Undertake training of FSD staff in best practice in plantation establishment and management	Number of courses reviewed/introduced Number of vacation attachment programmes organized							

STRATEGIC OBJECTIVES	ACTIONS	PERFORMANCE INDICATORS	TIME FRAME (Years)					
			1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	
	Action 4.6: Build capacity of timber processing industry to improve efficiency and utilization of small-diameter-logs	<i>Number of industry participants trained</i> <i>% increase in volume of small diameter logs utilized</i>						
	Action 4.7: Develop integrated pest management (IPM) systems and train personnel to implement the systems for monitoring, detecting and managing outbreak of diseases within plantations.	<i>Number of personnel trained</i> <i>Number of IPMs developed</i>						
	Action 4.8: Develop protocols for mass production of selected genetically improved planting materials	<i>Number of species with protocols developed</i> <i>Number of improved planting materials produced</i>						
	Action 4.9: Undertake trials of selected exotic and indigenous timber tree species (30ha/yr) to determine their suitability for plantation establishment and enrichment planting.	<i>Number and area (ha) of exotic and indigenous timber tree species tried</i>						
	Action 4.10: Design methodology, collect and analyse data on species trials	<i>Information on species trials produced</i>						
	Action 4.11: Maintain Species Trial stands	<i>Area (ha) of species trial stands maintained</i>						
	Action 4.12: Design and establish permanent sample plots (PSPs) in representative plantation sites across the country.	<i>Number and area (ha) of PSPs established</i>						
	Action 4.13: Collect and analyse data from established PSPs	<i>Information on PSPs produced</i>						
	Action 4.14: Collaborate with FORIG and other stakeholders to monitor and develop effective methods to control invasive plant species	<i>Area (ha) of previously invaded land devoid of invasive species</i> <i>Basal area of invasive tree species</i>						
	Action 4.15: Design methodology, collect and analyse data on key tree parameters	<i>Information on key tree parameters produced</i>						
	Action 4.16: Engage Consultants (2-year) [Tree Breeder, Vegetative Propagation and Tree Nursery Specialist]	<i>Number of consultants engaged</i>						
	Action 4.17: Engage Consultants (3-year) [Plantation Silviculturist with experience in ICT/GIS applications in plantation management, mechanization of field operations, Soil nutrient management, and forest certification]	<i>Number of consultants engaged</i> <i>Reports produced by consultants</i>						

STRATEGIC OBJECTIVES	ACTIONS	PERFORMANCE INDICATORS	TIME FRAME (Years)					
			1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	
	Action 4.18: Carry out feasibility study on the mechanisation of forest plantation field operations	<i>Report on feasibility studies published/submitted</i>						
	Action 4.19: Carry out a study on improving site productivity Management.	<i>Report on site productivity management studies published / submitted</i>						
	Action 4.20: Commission a study on benefit sharing arrangements (BSA) for off-reserve areas	<i>Report on BSA studies published / submitted</i>						
	Action 4.21: Train FSD staff to provide Extension Services to Private Sector Forest Plantation Developers and communities	<i>Number of FSD staff trained</i>						
	Action 4.22: Develop and publish standardized guide books for forest plantation extension services	<i>Guide book for forest plantation extension services published</i>						
	Action 4.23: Undertake a study to develop allometric models for Key plantation timber species to facilitate trading in Carbon.	<i>Report / paper on allometric modelling published / submitted</i>						
	Action 4.24: Undertake international educational tours to model plantation setups (i.e. Malaysia, Brazil, South Africa, Costa Rica, etc.) by key plantation staff	<i>Number of international educational tours undertaken</i> <i>Category of plantation staff participating in the tour</i>						
	Action 4.25: Undertake training in conflict management	<i>Number of disputes / conflicts resolved</i>						
STRATEGIC OBJECTIVE 5: Governance		Action 5.1: Conduct study to identify gaps in current governance processes	<i>Report on studies published / submitted</i>					
		Action 5.2: Review existing monitoring and accountability framework for plantation management	<i>Monitoring and accountability framework document published</i>					
		Action 5.3: Develop and advertise criteria for selection and award for exceptional performance in plantation development.	<i>Award criteria published in the media (print, radio, internet, TV etc.)</i>					

STRATEGIC OBJECTIVES	ACTIONS	PERFORMANCE INDICATORS	TIME FRAME (Years)					
			1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	
	Action 5.4: Institute award schemes for private plantation developers.	<i>Number of exceptional performers awarded</i>						
	Action 5.5: Introduce consultative processes and systems to involve key stakeholders in decision making concerning forest plantations.	<i>Number of stakeholders involved / engaged in decision making</i>						
	Action 5.6: Liaise with the plant protection department of MoFA to regulate importation of planting material for forest plantation establishment/nurseries	<i>Record / report on number and types of species imported</i>						
	Action 5.7: Strengthen enforcement of forest laws and regulations	<i>Number of cases and persons prosecuted</i>						
	Action 5.8: Set up a multi-stakeholder advisory committee to guide the implementation of the forest plantation strategy	<i>Number of stakeholders forming the committee and background</i>						
	Action 5.9: Develop and implement transparent mechanisms for pricing and allocation of forest plantation timber.	<i>Number of permits issued Criteria / procedure for pricing and allocation of plantation timber published in the media</i>						
	Action 5.10: Strengthen the existing structures for information sharing and conflict management (e.g. National Forest Forum)	<i>Number of disputes / conflicts resolved</i>						
	Action 5.11: Review Current Plantation Development Structure	<i>Report on reviewed plantation structure</i>						
	Action 5.12: Award exceptional performers	<i>Number of award recipients</i>						
	Action 5.13: ICT Systems Development	<i>Number of ICT Systems developed</i>						
	Action 5.14: ICT Training and Capacity Building	<i>Number of Males and females trained in the ICT system Number of FC Regions and Districts Trained and Capacity Built</i>						
	Action 5.15: ICT System Maintenance	<i>Report on ICT System maintenance</i>						

Appendix 5: POTENTIAL NUMBER OF JOBS TO BE CREATED OVER THE 25 YEAR PERIOD

Coupe/ Project Year	Coupe 1	Coupe 2	Coupe 3	Coupe 4	Coupe 5	Coupe 6	Coupe 7	Coupe 8	Coupe 9	Coupe 10	Coupe 11	Coupe 12	Coupe 13	Coupe 14	Coupe 15	Coupe 16	Coupe 17	Coupe 18	Coupe 19	Coupe 20	Coupe 21	Coupe 22	Coupe 23	Coupe 24	Coupe 25	Total Jobs Created/Yr					
1 (2016)	25000																									25,000					
Project Year	12500	25000																								37,500					
Project Year	12500	12500	25000																							50,000					
Project Year	12500	12500	12500	25000																						62,500					
Project Year	12500	12500	12500	12500	25000																					75,000					
Project Year	5000	12500	12500	12500	12500	25000																				80,000					
Project Year	5000	5000	12500	12500	12500	12500	25000																			85,000					
Project Year	5000	5000	5000	12500	12500	12500	12500	25000																		90,000					
Project Year	5000	5000	5000	5000	12500	12500	12500	12500	25000																	95,000					
Project Year	5000	5000	5000	5000	5000	12500	12500	12500	12500	25000																100,000					
Project Year	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	25000															105,000					
Project Year	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	25000														110,000					
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	25000													115,000					
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	25000												120,000					
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	25000											125,000					
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	130,000						
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	135,000					
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	140,000				
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	145,000			
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	150,000		
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	155,000	
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	160,000
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	165,000
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	170,000
Project Year	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	175,000
TOTAL	175,000	170,000	165,000	160,000	155,000	150,000	145,000	140,000	135,000	130,000	125,000	120,000	115,000	110,000	105,000	100,000	95,000	90,000	85,000	80,000	75,000	62,500	50,000	37,500	25,000	2,800,000					

Appendix 6: ACTIONS AND BUDGET

GHANA FOREST PLANTATION STRATEGY		Yearly Projected costs (US Dollars)						
Projected Costs	Responsibility	Unit Cost Per Activity (\$/units)	1	2	3	4	5	TOTAL (YR 1 - 5)
	Lead Collaborator(s)	Cost	Cost	Cost	Cost	Cost	Cost	Cost (US \$)
STRATEGIC OBJECTIVE 1: Establishment and management of planted forests								
Action 1.1: Identify, survey and map suitable lands within forest reserves for plantation development	FC		100,000	100,000	50,000			250,000
Action 1.2: Liaise with the Lands Commission, traditional councils and other Landowners to identify off-reserve lands earmarked for commercial plantation development	FC	MLNR, Lands Commission, OASL, Traditional Council, Landowners, Private Plantation Developers	50,000	25,000	25,000	25,000	25,000	150,000
Action 1.3: Develop and maintain a system to update on degraded lands available for forest plantation (On-reserve and off-reserve) [Land Bank]	FC		10,000	5,000	5,000	2,000	2,000	24,000
Action 1.4: Publish database of available on and off-reserve lands (land bank) for plantation development	FC	MLNR, Lands Commission, OASL, NHC	10,000	2,000	2,000	2,000	2,000	18,000
Action 1.5: Procure genetically improved /superior planting materials of selected exotic timber tree species	FC	FORIG, MLNR, NOFA, Private Sector	200,000	150,000	150,000	100,000		600,000
Action 1.6: Collect seed from plus native and exotic timber tree species	FC	FORIG, Fringe Communities	20,000	20,000	20,000	20,000	20,000	100,000
Action 1.7: Establish Seed Orchards of selected exotic and native timber tree species (1000 ha)	FC	FORIG, KNUST, UDS, UENR, Fringe Communities, Private Sector	\$2000/ha	400,000	600,000	600,000	200,000	2,000,000
Action 1.8: Maintain / Tend Seed Orchards (existing and new) / Seed Production Areas (SPAs)	FC	FORIG, KNUST, UDS, UENR, Fringe Communities, Private Sector	\$500/ha (yr2-5) \$250/ha (yr6 - 10), \$100/ha (yr11 +)	37,500	65,000	165,000	315,000	465,000
Action 1.9: Develop protocols for mass production of selected genetically improved planting material	FORIG	GAEC, FC, KNUST, Private Sector		50,000	50,000	50,000	50,000	200,000
Action 1.10: Establish and operate a Tissue Culture Lab and Other Facilities (Vegetative Propagation Center)	FC	FORIG, GAEC, Private Sector		750,000	350,000	25,000	25,000	1,175,000
Action 1.11: Establish and operate three (3) State-of-the-Art Central tree nurseries (Kumasi / Sunyani / Tamale) - 6 million seedlings capacity /yr	FC	FORIG, Universities, Private Sector		1,500,000	500,000	300,000	300,000	2,900,000
Action 1.12: Review existing plantation MoPs (A, B and C) and consolidate into one document	FC	MLNR, FORIG, Universities, Private Plantation Developers		30,000	50,000			80,000
Action 1.13: Publish reviewed plantation MoP	FC				50,000			50,000
Action 1.14: Develop and publish MoP on Enrichment Planting	FC	FORIG, Universities		50,000	30,000			80,000

Projected Costs		Yearly Projected costs (US Dollars)							
	Responsibility	Activity (\$/units)	Unit Cost Per	1	2	3	4	5	Total (YR 1 - 5)
Lead	Collaborator(s)		Cost	Cost	Cost	Cost	Cost	Cost	Cost (US \$)
Action 4.13: Collect and analyse data from established PSPs	FC	FORIG, Universities, Private Developers		5,000	5,000	5,000	5,000	5,000	20,000
Action 4.14: Collaborate with FORIG and other stakeholders to monitor and develop effective methods to control invasive plant species	FC / FORIG	Universities	50,000					50,000	100,000
Action 4.15: Design methodology, collect and analyse data on key tree parameters	FC / FORIG	Universities	10,000	15,000	20,000	20,000	20,000	85,000	
Action 4.16: Engage Consultants (2-year) [Tree Breeder, Vegetative Propagation and Tree Nursery Specialist]	FORIG / DPS	FORIG, UG, KNUST, UDS	250,000	250,000					500,000
Action 4.17: Engage Consultants (3-year) [Plantation Silviculturist with experience in ICT / GIS applications in plantation management, mechanization of field operations, Soil nutrient management, and forest certification]	Consultant	FC, MNLR, FORIG	150,000	150,000	150,000	150,000	150,000		450,000
Action 4.18: Carry out feasibility study on the mechanization of forest plantation field operations	Consultant	FC, FORIG, Universities, Private Sector	50,000	30,000					80,000
Action 4.19: Carry out a study on improving site productivity Management.	Consultant	FC, FORIG, Universities, Private Sector	50,000	50,000					100,000
Action 4.20: Commission a study on benefit sharing arrangements for off-reserve areas	Consultant	FC, FORIG, Universities, Private Sector, Traditional Authorities		50,000					50,000
Action 4.21: Train PSD staff to provide Extension Services to Private Sector Forest Plantation Developers and communities	FC / FORIG	FORIG, MOFA, Private Sector, Universities	20,000	100,000	200,000	100,000			420,000
Action 4.22: Develop and publish standardized guide books for forest plantation extension services	FC / Consultant	FORIG, MOFA, Private Sector, Universities	50,000	100,000					150,000
Action 4.23: Undertake a study to develop allometric models for key plantation timber species to facilitate trading in Carbon.	FORIG	FC, Universities, Private Sector	100,000	50,000	50,000				200,000
Action 4.24: Undertake international educational tours to model plantation setups (i.e. Malaysia, Brazil, South Africa, Costa Rica, etc.) by key plantation staff	FC	FORIG, MNLR, Private Sector	120,000	100,000	100,000				320,000
Action 4.25: Training in conflict management	FC / Consultant	Private Sector, Fringe Communities	50,000	20,000	20,000				90,000
Action 4.26: Build capacity of tree grower associations in group formation, administration, access to markets and product development & provide technical support	FC	FORIG, KNUST, UDS, UENR	30,000	30,000	30,000	20,000	20,000		130,000
Action 4.27: Support farmer field schools and demonstrations on good agroforestry practices and integrated nature-based livelihood options	FC / MoFA / COCOBOD	FORIG, KNUST, UDS, UENR	50,000	80,000	100,000	100,000	100,000		430,000
Action 4.28: Train and Build capacity of Forest Guards and Rapid Response Teams in Forest Protection and Law Enforcement	FC	Ghana Armed Forces, Ghana Police Service, Attorney Generals Dept.	50,000	100,000	100,000	100,000	50,000		400,000

GHANA FOREST PLANTATION STRATEGY				Yearly Projected costs (US Dollars)					
Projected Costs		Responsibility	Unit Cost Per Activity (\$/units)	1	2	3	4	5	TOTAL (YR 1 - 5)
Lead	Collaborator(s)		Cost	Cost	Cost	Cost	Cost	Cost	Cost (US \$)
Action 4.29: Build capacity of Community-base Organizations in Forest Protection	FC	Fringe Communities		50,000	50,000	50,000	50,000	50,000	210,000
SUB TOTAL			1,625,000	1,500,000	1,175,000	865,000	595,000	595,000	5,810,000
STRATEGIC OBJECTIVE 5:									
Governance									
Action 5.1: Conduct study to identify gaps in current governance processes	FC / Consultant	FC, MLGRD, Civil Society, GTA, GTMO, FAWAG, National House of Chiefs (NHC)		50,000	50,000	50,000	50,000	50,000	100,000
Action 5.2: Review existing monitoring and accountability framework for plantation management	FC / Consultant	MLNR, Civil Society, GIF, GIF/NHC		30,000	20,000				50,000
Action 5.3: Develop and advertise criteria for selection and award for exceptional performance in plantation development.	FC / Consultant	MLNR; Civil Society, GIF		5,000	5,000	5,000	5,000	5,000	25,000
Action 5.4: Institute award schemes for private plantation developers.	FC / Consultant	MLNR, Civil Society, GIF		20,000	20,000				40,000
Action 5.5: Introduce consultative processes and systems to involve key stakeholders in decision making concerning forest plantations.	FC	MLNR, Land Owners, Private Plantation Developers, FORIG, Universities		10,000	10,000				20,000
Action 5.6: Liaise with the plant protection department of MoFA to regulate importation of planting material for forest plantation establishment/nurseries	FC			2,000	2,000	2,000	2,000	2,000	6,000
Action 5.7: Strengthen enforcement of forest laws and regulations	FC	MLNR,		30,000	30,000	30,000	30,000	30,000	150,000
Action 5.8: Set up a multi-stakeholder advisory committee to guide the implementation of the forest plantation strategy	FC	MLNR, FPTSC		20,000	10,000	10,000	10,000	10,000	60,000
Action 5.9: Develop and implement transparent mechanisms for pricing and allocation of forest plantation timber.	FC / Consultant	MLNR; Civil Society, GIF, Private Sector (i.e. CTMO, GTA, etc.), NHC, FPTSC		25,000	30,000	25,000			80,000
Action 5.10: Strengthen the existing structures for information sharing and conflict management (e.g. National Forest Forum)	FC	MLNR, Civil Society, GIF/NHC		10,000	10,000	10,000			30,000
Action 5.11: Review Current Plantation Development Structure	FC				10,000	10,000	30,000		50,000
Action 5.12: Award exceptional performers	FC	MLNR, Civil Society,			50,000	50,000	50,000	50,000	200,000
SUB TOTAL			202,000	247,000	142,000	125,000	125,000	125,000	811,000
Monitoring and Evaluation									
Action 6.1: Carry out baseline studies	FC / Consultant	MLNR, Development Partners, Civil Society, FORIG, Universities, MOFEP, MESTI		80,000	20,000				100,000

GHANA FOREST PLANTATION STRATEGY		Yearly/ Projected costs (US Dollars)					
Projected Costs	Responsibility	Unit Cost Per Activity (\$/units)	Cost	Cost	Cost	Cost	TOTAL (YR 1 - 5)
Lead	Collaborator(s)						Cost (US \$)
Action 6.2: Develop ICT/GIS infrastructure to facilitate data capture, storage and retrieval, long-term planning and improve decision-making regarding field operations <i>FC</i>	Consultant		50,000	20,000			70,000
Action 6.3: Progress monitoring and reporting on planned activities <i>FC</i>	<i>MLNR, Development Partners, Civil Society, FORIG, Universities, MOFEP, MESTI</i>	200,000	200,000	200,000	200,000	200,000	1,000,000
Action 6.4: Publication and dissemination of Annual Reports to key stakeholders <i>FC</i>	<i>MLNR</i>	35,000	30,000	30,000	30,000	30,000	155,000
Action 6.5: Conduct summative evaluation <i>FC/ Consultant</i>	<i>MLNR, Development Partners, Civil Society, FORIG, Universities, MOFEP, MESTI, FPTSC</i>						-
SUB TOTAL		365,000	270,000	230,000	230,000	230,000	1,325,000
GRAND TOTAL		136,331,000	150,895,500	166,280,500	180,760,500	198,754,900	833,022,400

Appendix 6: ACTIONS AND BUDGET

GHANA FOREST PLANTATION STRATEGY							TOTAL (YR 5 - 10)
Projected Costs	Responsibility	6	7	8	9	10	Cost (US \$)
Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost	Cost
STRATEGIC OBJECTIVE 1: Establishment and management of planted forests							
Action 1.1: Identify, survey and map suitable lands within forest reserves for plantation development	FC						-
Action 1.2: Liaise with the Lands Commission, traditional councils and other landowners to identify off-reserve lands earmarked for commercial plantation development	FC	MNLR, Lands Commission, OASL, Traditional Council, Landowners, Private Plantation Developers					-
Action 1.3: Develop and maintain a system to update a register on degraded lands available for forest plantation (On-reserve and off-reserve) [Land Bank]	FC		2,000	2,000	2,000	2,000	10,000
Action 1.4: Publish database of available on and off-reserve lands (Land bank) for plantation development	FC	MNLR, Lands Commission, OASL, NHCC	2,000	2,000	2,000	2,000	10,000
Action 1.5: Procure genetically improved /superior planting materials of selected exotic timber tree species	FC	FORIG, MNLR, MOFA, Private Sector					-
Action 1.6: Collect seed from plus native and exotic timber tree species	FC	FORIG, Fringe Communities	20,000	20,000	20,000	20,000	100,000
Action 1.7: Establish Seed Orchards of selected exotic and native timber tree species (1000 ha)	FC	FORIG, KNUST, UDS, UENR, Fringe Communities, Private Sector					-
Action 1.8: Maintain / Tend Seed Orchards (existing and new) / Seed Production Areas (SPAs)	FC	FORIG, KNUST, UDS, UENR, Fringe Communities, Private Sector	490,000	440,000	365,000	290,000	265,000
Action 1.9: Develop protocols for mass production of selected genetically improved planting material	FORIG	GAEC, FC, KNUST, Private Sector					1,850,000
Action 1.10: Establish and operate a Tissue Culture Lab and Other Facilities (Vegetative Propagation Center)	FC	FORIG, GAEC, Private Sector	25,000	25,000	25,000	25,000	125,000
Action 1.11: Establish and operate three (3) State-of-the-Art Central tree nurseries (Kumasi / Sunyani / Tamale) - 6 million seedlings capacity /yr	FC	FORIG, Universities, Private Sector	300,000	300,000	300,000	300,000	1,500,000
Action 1.12: Review existing Plantation Maps (A,B and C) and consolidate into one document	FC	MNLR, FORIG, Universities, Private Plantation Developers					-
Action 1.13: Publish reviewed plantation Map	FC						-
Action 1.14: Develop and publish Map on Enrichment Planting	FC						-

GHANA FOREST PLANTATION STRATEGY

GHANA FOREST PLANTATION STRATEGY

Projected Costs		Responsibility		Cost		Cost		Cost		TOTAL (W 5 - 10)	
Lead	Collaborator(s)	6	7	8	9	10	Cost	Cost	Cost	Cost	Cost (US\$)
Action 3.5: Monitor implementation of Social Responsibility Agreements (i.e. Schools, Clinics, Water and Sanitation etc.) within fringe communities.	FC	Traditional Council, OASL, MIGRD, MLNR, GES, GHSG, Private Sector	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	50,000
Action 3.6: Facilitate infrastructural development within forest fringe communities (SRA etc)	FC / Private Sector	MDA	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	500,000
SUBTOTAL			325,000.00	1,625,000.00							
STRATEGIC OBJECTIVE 4: Investment in Research, Extension services and Capacity Building											
Action 4.1: Assess capacity requirements for forest plantation development	Consultants / FC	Private Sector, Fringe Communities									-
Action 4.2: Design and implement professional development programmes at the local and institutional levels to strengthen institutional capacity in order to improve delivery of services.	FC	MLNR, Universities, FORIG									100,000
Action 4.3: Design and implement capacity-building and certification programmes for the private sector to upgrade their skills and knowledge to maintain high operational standards within the industry.	FC	Consultant, MLNR									-
Action 4.4: Review curricula of courses in plantation silviculture and management and introduce on-field attachment programs in line with current best practice	FC	MLNR, Universities, FORIG									20,000
Action 4.5: Undertake training of FSD staff in best practice in plantation establishment and management	FC / Consultant	FORIG, KNUST, UDS									20,000
Action 4.6: Build capacity of timber processing industry to improve efficiency and utilization of small-diameter-logs	FC	GTMQ, FAWAG, Aid to Artisans, etc.	50,000				50,000				100,000
Action 4.7: Develop integrated pest management systems and train personnel to detect and managing outbreaks of diseases within plantations.	FORIG	KNUST; FFR; FC									-
Action 4.9: Undertake trials of selected exotic and indigenous timber tree species (50ha/yr) to determine their suitability for plantation establishment and enrichment planting.	FC / FORIG	Universities	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	625,000
Action 4.10: Design methodology/ collect and analyse data on species trials	FC / FORIG	Universities	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	75,000
Action 4.11: Maintain Species Trial stands	FC		135,000	150,000	165,000	180,000	195,000	195,000	195,000	195,000	825,000
Action 4.12: Design and establish permanent sample plots (PSPs) in representative plantation sites across the country.	FORIG, Universities, Private Developers		10,000				5,000				20,000

GHANA FOREST PLANTATION STRATEGY							TOTAL (GH¢ 5 - 10)
Projected Costs	Responsibility		6	7	8	9	10
	Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost (US\$)
Action 4.13: Collect and analyse data from established PSFs	FC	FORIG, Universities, Private Developers	5,000	5,000	5,000	5,000	25,000
Action 4.14: Collaborate with FORIG and other stakeholders to monitor and develop effective methods to control invasive plant species	FC /FORIG	Universities				50,000	50,000
Action 4.15: Design methodology, collect and analyse data on key tree parameters	FC /FORIG	Universities	20,000	20,000	20,000	20,000	100,000
Action 4.16: Engage Consultants (2-year) [Tree Breeder, Vegetative Propagation and Tree Nursery Specialist]	MLNR / FC /DPS	FORIG, UG, KNUST, UDS					-
Action 4.17: Engage Consultants (3-year) [Plantation Silviculturist with experience in ICT / GIS applications in plantation management, mechanisation of field operations, Soil nutrient management, and forest certification]	Consultant	FC, MLNR, FORIG					-
Action 4.18: Carry out feasibility study on the mechanisation of forest plantation field operations	Consultant	FC, FORIG, Universities, Private Sector					-
Action 4.19: Carry out a study on improving site productivity Management.	Consultant	FC, FORIG, Universities, Private Sector					-
Action 4.20: Commission a study on benefit sharing arrangements for off-reserve areas	Consultant	FC, FORIG, Universities, Private Sector, Traditional Authorities					-
Action 4.21: Train FSD staff to provide Extension Services to Private Sector Forest Plantation Developers and communities	FC / Consultant	FORIG, MOFA, Private Sector, Universities					-
Action 4.22: Develop and publish standardized guide books for forest plantation extension services	FC / Consultant	FORIG, MOFA, Private Sector, Universities					-
Action 4.23: Undertake a study to develop allometric models for Key plantation timber species to facilitate trading in Carbon.	FORIG	FC, Universities, Private Sector					-
Action 4.24: Undertake international educational tours to model plantation set-ups (i.e. Malaysia, Brazil, South Africa, Costa Rica, etc.) by key plantation staff	FC	FORIG, MLNR, Private Sector	100,000	50,000			150,000
Action 4.25: Training in conflict management	FC / Consultant	Private Sector, Fringe Communities					-
Action 4.26: Build capacity of tree grower associations in group formation, administration, access to markets and product development & provide technical support	FC	FORIG, KNUST, UDS, UENR	20,000	20,000	20,000	20,000	100,000
Action 4.27: Support farmer field schools and demonstrations on good agroforestry practices and integrated nature-based livelihood options	FC / MOFA / COCOBOD	FORIG, KNUST, UDS, UENR	50,000	50,000	50,000	50,000	280,000
Action 4.28: Train and Build capacity of Forest Guards and Rapid Response Teams in Forest protection and Law Enforcement	FC	Ghana Armed Forces, MLNR, Ghana Police Service, Attorney Generals Dept.	50,000	50,000	50,000	50,000	250,000

GHANA FOREST PLANTATION STRATEGY							TOTAL (YR 5 - 10)
Projected Costs	Responsibility	6	7	8	9	10	Cost
Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost	Cost
Action 4.29: Build capacity of Community-based Organizations in Forest Protection	Fringe Communities	20,000	20,000	20,000	20,000	20,000	100,000
SUB TOTAL		620,000	725,000	575,000	755,000	755,000	3,220,000
STRATEGIC OBJECTIVE 5: Governance							
Action 5.1: Conduct study to identify gaps in current governance processes	FC / Consultant	FC, MIGRD, Civil Society, GTAI, GTMO, FAIRAG, National House of Chiefs (NHC)					-
Action 5.2: Review existing monitoring and accountability framework for plantation management	FC / Consultant	MLNR, Civil Society, GIF/NHC					-
Action 5.3: Develop and advertise criteria for selection and award for exceptional performance in plantation development.	FC / Consultant	MLNR, Civil Society, GIF	5,000	5,000	5,000	5,000	25,000
Action 5.4: Institute award schemes for private plantation developers.	FC / Consultant	MLNR, Civil Society, GIF					-
Action 5.5: Introduce consultative processes and systems to involve key stakeholders in decision making concerning forest plantations.	FC	MLNR, Land Owners, Private Plantation Developers, FORIG, Universities					-
Action 5.6: Liaise with the plant protection department of MoFRA to regulate importation of planting material for forest plantation establishment/nurseries							-
Action 5.7: Strengthen enforcement of forest laws and regulations	FC	MLNR,	30,000	30,000	30,000	30,000	150,000
Action 5.8: Set up a multi-stakeholder advisory committee to guide the implementation of the forest plantation strategy	FC	MLNR, FPTSC	10,000	10,000	10,000	10,000	50,000
Action 5.9: Develop and implement transparent mechanisms for pricing and allocation of forest plantation timber.	FC / Consultant	MLNR, Civil Society, GIF, Private Sector (i.e. GTMO, GTAI, etc.), NHC, FPTSC					-
Action 5.10: Strengthen the existing structures for information sharing and conflict management (e.g. National Forest Forum)	FC	MLNR, Civil Society, GIF/NHC					-
Action 5.11: Review Current Plantation Development Structure	FC						-
Action 5.12: Award exceptional performers	FC	MLNR, Civil Society	50,000	50,000	50,000	50,000	250,000
SUB TOTAL		95,000	95,000	95,000	95,000	95,000	475,000
Monitoring and Evaluation							
Action 6.1: Carry out baseline studies	FC/ Consultant	MLNR, Development Partners, Civil Society, FORIG, Universities, MOEP, MESTI					-

GHANA FOREST PLANTATION STRATEGY		Responsibility	Lead	Collaborator(s)	Cost	Cost	Cost	Cost	TOTAL (GH¢ 5 - 10)
Projected Costs									
Action 6.2: Develop ICT/GIS infrastructure to facilitate data capture, storage and retrieval; long-term planning and improve decision-making regarding field operations	FC	Consultant			2,000,000				2,000,000
Action 6.3: Progress monitoring and reporting on planned activities	FC	MLNR, Development Partners, Civil Society, FORIG, Universities, MOFFEP, NESTI		200,000	200,000	200,000	200,000	200,000	1,000,000
Action 6.4: Publication and dissemination of Annual Reports to key stakeholders	FC	MLNR		30,000	30,000	30,000	30,000	30,000	150,000
Action 6.5: Conduct summative evaluation	FC/ Consultant	MLNR, Development Partners, Civil Society, FORIG, Universities, MOFFEP, NESTI, FPTSC							-
SUB TOTAL				230,000	2,230,000	230,000	230,000	230,000	3,150,000
GRAND TOTAL				118,250,120	125,220,120	130,665,120	141,410,120	146,445,120	662,060,600

Appendix 6: ACTIONS AND BUDGET

GHANA FOREST PLANTATION STRATEGY							TOTAL (YR 11 - 15)
Projected Costs		Responsibility	11	12	13	14	15
	Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost (US \$)
Action 1.15: Undertake copice management of an estimated 15,000ha teak plantations harvested prior to 2016 and 10,000ha annually from 2022	FC	Fringe Communities, Private Sector		3,500,000	3,500,000		10,500,000
Action 1.16: Undertake enrichment planting in poorly-stocked forest reserves (5,000 ha/yr)	FC	FORIG, Universities, Fringe Communities	1,000,000	1,000,000	1,000,000	1,000,000	5,000,000
Action 1.17: Undertake maintenance of Enrichment Planting sites (New and Existing)	FC	Fringe Communities	5,468,320	5,868,320	6,268,320	6,668,320	31,341,600
Action 1.18: Undertake replanting of an estimated 3,000ha harvested forest plantations (species other than teak).	FC	Fringe Communities, Private Sector					-
Action 1.19: Maintain replanted sites (3000 ha)	FC	Fringe Communities, Private Sector	700,000	500,000	300,000	300,000	2,100,000
Action 1.20: Implement FC's MoP on wildfire management	FC	Private Developers, Loggers, GFS, Fringe Communities, Civil society, Media, Ghana Police Service	200,000	200,000	200,000	200,000	1,000,000
Action 1.21: Construct fire ridges (10-meter wide) within existing government plantations (160,000ha) [Est. 19,200 km]	FC	Fringe Communities, Feeder roads, MHDAs, Private sector					-
Action 1.22: Maintain / rehabilitate an estimated 235,000 ha (160,000 ha public and 75,000 ha private) existing forest plantations	FC/Private Sector	Fringe Communities					-
Action 1.23: Establish new plantations (25,000 ha/yr)	FC/Private Sector	Fringe Communities	37,500,000	37,500,000	37,500,000	37,500,000	187,500,000
Action 1.24: Maintain newly established plantations	FC/Private Sector	Fringe Communities	100,000,000	102,500,000	105,000,000	107,500,000	525,000,000
Action 1.25: Establish Model plantations for demonstration of best practice (200 ha/yr)	FC	FORIG, Private Sector, Universities, Fringe Communities					-
Action 1.26: Maintain existing (378ha) and newly established (200ha/yr) Model Plantations	FC	FORIG, Private Sector, Universities, Fringe Communities	297,800	257,800	217,800	177,800	1,089,000
Action 1.27: Promote agro-forestry/farm forestry (trees on farm); extension services and supply 5 million seedlings/yr	FC/MoFA/ COCOBOD	Farmers, Nursery Operators, etc.	1,850,000	1,850,000	1,850,000	1,850,000	9,250,000
Action 1.28: Liaise with Minerals Commission to rehabilitate mined sites	FC / EPA	Minerals Commission, Mining Companies	20,000	20,000	20,000	20,000	100,000
Action 1.29: Liaise with Water Resources Commission, VRA, GWC/VR, EPA, others to rehabilitate degraded water-sheds	FC	Water Resources Commission, VRA, EPA, others	20,000	20,000	20,000	20,000	100,000
Action 1.30: Procure key logistics for field operations/monitoring and supervision i.e. vehicles, motorbikes, GPS, pruning saws, pruning shears, chainsaws, protective clothing, first aid and safety equipment etc.	FC	MMLNR, MoFEP					3,000,000

GHANA FOREST PLANTATION STRATEGY							Projected Costs			Responsibility			11			12			13			14			15			TOTAL (YR 11 - 15)	
	Lead	Collaborator(s)		Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost			
Action 1.31: Facilitate forest plantations management and chain of custody certification (FSC, PEFC, etc)	FC	M/LNR		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000		25,000					
Action 1.32: Facilitate the enactment of policy/legislation to support ownership by farmers of planted trees on farms	M/LNR	FC / AG Dept., Parliamentary Select Committee		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000		25,000					
Action 1.33: Promote the development of NTFPs within forest plantations	FC	FORIG, MoFA, M/LNR																						-					
SUB TOTAL				147,655,120		150,285,120		159,400,120		159,215,120		159,215,120		162,060,120		162,060,120		178,615,600		178,615,600									
STRATEGIC OBJECTIVE 2: Forest plantation investment promotion																													
Action 2.1: Prepare and publish a forest plantation investor handbook	FC	FORIG, Private Plantation Developers, M/LNR																						-					
Action 2.2: Undertake studies and stakeholder consultations to support the introduction of a Reforestation Levy / Carbon Tax, etc. to support forest plantation development	FC / Consultant	M/LNR, Civil society, MoFEP, AGI, PURC, MESTI																						-					
Action 2.3: Expand the coverage of the Timber Export levy to include all key timber species exported as air-dried lumber.	FC	M/LNR, MoFEP																						-					
Action 2.4: Facilitate the establishment of a specialized market for the trading of forest plantation stands	FC / Consultant	M/LNR, Ghana Stock Exchange, Min. of Trade, MoFEP																						-					
Action 2.5: Facilitate the enactment of Forest Plantation Act	M/LNR	FC / AG Dept., Parliamentary Select Committee, Forest Plantation Investors																						-					
Action 2.6: Establish and Manage forest plantation investors (large, medium, small) forum	FC	M/LNR, Forest Plantation Investors		10,000		10,000		10,000		10,000		10,000		10,000		10,000		10,000		10,000		10,000		50,000					
Action 2.7: Support Tree Grower Group formation and operation	FC	M/LNR, Tree Grower Associations		10,000		10,000		10,000		10,000		10,000		10,000		10,000		10,000		10,000		10,000		50,000					
SUB TOTAL				20,000		20,000		20,000		20,000		20,000		20,000		20,000		20,000		20,000		20,000		100,000					
STRATEGIC OBJECTIVE 3: Employment creation and livelihoods																													
Action 3.1: Recruit labour from fringe communities to undertake enrichment planting, plantation establishment and maintenance	FC / Private Sector	MDA, Fringe Communities		10,000		10,000		10,000		10,000		10,000		10,000		10,000		10,000		10,000		10,000		50,000					
Action 3.2: Promote cut-grower forest plantation schemes and establishment of private nurseries	FC / Private Sector	Fringe Communities		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000		25,000					
Action 3.3: Promote the establishment of community fire protection crews	FC / GFS	Fringe Communities, MDA		100,000		100,000		100,000		100,000		100,000		100,000		100,000		100,000		100,000		100,000		500,000					
Action 3.4: Undertake skills and enterprise development	FC / Private Sector	MDA, Fringe Communities, Consultants		100,000		100,000		100,000		100,000		100,000		100,000		100,000		100,000		100,000		100,000		500,000					

GHANA FOREST PLANTATION STRATEGY

Projected Costs										TOTAL (YR 11 - 15)	
	Lead	Collaborator(s)	Responsibility	11	12	13	14	15	Cost	Cost	
Action 3.5: Monitor Implementation of Social Responsibility Agreements (i.e. Schools, Clinics, Water and Sanitation etc.) within fringe communities.	FC	Traditional Council, OASL, MLCRD, MLNR, GES, GHSC, Private Sector									
Action 3.6: Facilitate infrastructural development within forest fringe communities (SRA etc)	FC / Private Sector	MDA		100,000	100,000	100,000	100,000	100,000	500,000		
SUBTOTAL				315,000.00	315,000.00	315,000.00	315,000.00	315,000.00	1,575,000.00		
STRATEGIC OBJECTIVE 4: Investment in Research, Extension services and Capacity Building											
Action 4.1: Assess capacity requirements for forest plantation development	Consultants / FC	Private Sector, Fringe Communities									
Action 4.2: Design and implement professional development programmes at the local and international levels to strengthen institutional capacity in order to improve delivery of services.	FC	MLNR, Universities, FORIG									
Action 4.3: Design and implement capacity-building and certification programmes for the private sector to upgrade their skills and knowledge to maintain high operational standards within the industry.	FC	Consultant, MLNR									
Action 4.4: Review curricula of courses in plantation silviculture and management and introduce on-field attachment programs in line with current best practice	FC	MLNR, Universities, FORIG		20,000					20,000		
Action 4.5: Undertake training of FSD staff in best practice in plantation establishment and management	FC / Consultant	FORIG, KNUST, IDS									
Action 4.6: Build capacity of timber processing industry to improve efficiency and utilization of small-diameter-logs	FC	GTMQ, FAWAG, Aid to Artisans, etc.									
Action 4.7: Develop integrated pest management systems and train personnel to implement the systems for monitoring, detecting and managing outbreak of diseases within plantations.	FORIG	KNUST, FFRT; FC									
Action 4.9: Undertake trials of selected exotic and indigenous timber tree species (50ha/yr) to determine their suitability for plantation establishment and enrichment planting.	FC / FORIG	Universities									
Action 4.10: Design methodology, collect and analyse data on species trials	FC / FORIG	Universities	5,000	5,000	5,000	5,000	5,000	5,000	5,000	25,000	
Action 4.11: Maintain Species Trial stands	FC		210,000	195,000	180,000	165,000	150,000	150,000	900,000		
Action 4.12: Design and establish permanent sample plots (PSPs) in representative plantation sites across the country.	FC	FORIG, Universities, Private Developers		5,000						10,000	

GHANA FOREST PLANTATION STRATEGY							
Projected Costs		Responsibility		11	12	13	14
Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost	Total (YR 11 - 15)
Action 4.29: Build capacity of Community-base Organizations in Forest Protection	Fringe Communities	15,000	15,000	15,000	15,000	15,000	75,000
SUB TOTAL		350,000	320,000	290,000	280,000	260,000	1,500,000
STRATEGIC OBJECTIVE 5: Governance							
Action 5.1: Conduct study to identify gaps in current governance processes	FC / Consultant	FC, M/LGRD, Civil Society, GTIA, GTMO, FAWAG, National House of Chiefs (NHC)					-
Action 5.2: Review existing monitoring and accountability framework for plantation management	FC / Consultant	M/LNR, Civil Society, GIF/NHC					-
Action 5.3: Develop and advertise criteria for selection and award for exceptional performance in plantation development.	FC / Consultant	M/LNR, Civil Society, GIF	5,000	5,000	5,000	5,000	25,000
Action 5.4: Institute award schemes for private plantation developers.	FC / Consultant	M/LNR, Civil Society, GIF					-
Action 5.5: Introduce consultative processes and systems to involve key stakeholders in decision making concerning forest plantations.	FC	M/LNR, Land Owners, Private Plantation Developers, FORIG, Universities					-
Action 5.6: Laise with the plant protection department of MoFA to regulate importation of planting material for forest plantation establishment/nurseries							-
Action 5.7: Strengthen enforcement of forest laws and regulations	FC	M/LNR,	30,000	30,000	30,000	30,000	150,000
Action 5.8: Set up a multi-stakeholder advisory committee to guide the implementation of the forest plantation strategy	FC	M/LNR, FPTSC	10,000	10,000	10,000	10,000	50,000
Action 5.9: Develop and implement transparent mechanisms for pricing and allocation of forest plantation timber.	FC / Consultant	M/LNR, Civil Society, GIF, Private Sector (i.e. GTMO, GTIA, etc.), NHC, FPTSC					-
Action 5.10: Strengthen the existing structures for information sharing and conflict management (e.g. National Forest Forum)	FC	M/LNR, Civil Society, GIF/NHC					-
Action 5.11: Review Current Plantation Development Structure	FC						-
Action 5.12: Award exceptional performers	FC	M/LNR, Civil Society,	50,000	50,000	50,000	50,000	250,000
SUB TOTAL		95,000	95,000	95,000	95,000	95,000	475,000
Monitoring and Evaluation							
Action 6.1: Carry out baseline studies	FC / Consultant	M/LNR, Development Partners, Civil Society, FORIG, Universities, MOEFP, MESTI					-

GHANA FOREST PLANTATION STRATEGY		Responsibility		11	12	13	14	15	TOTAL (GR 11 - 15)	
Projected Costs	Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost	Cost	Cost (US\$)	
Action 6.2: Develop ICT/GIS infrastructure to facilitate data capture, storage and retrieval; long-term planning and improve decision-making regarding field operations	FC	Consultant							-	
Action 6.3: Progress monitoring and reporting on planned activities	FC	M/LNR, Development Partners, Civil Society, FORIG, Universities, MOFEP, MESTI	200,000	200,000	200,000	200,000	200,000	200,000	1,000,000	
Action 6.4: Publication and dissemination of Annual Reports to key stakeholders	FC	M/LNR	30,000	30,000	30,000	30,000	30,000	30,000	150,000	
Action 6.5: Conduct summative evaluation	FC/ Consultant	M/LNR, Development Partners, Civil Society, FORIG, Universities, MOFEP, MESTI, FPTSC							-	
SUB TOTAL			230,000	230,000	230,000	230,000	230,000	230,000	1,150,000	
GRAND TOTAL			148,655,120	151,265,120	160,350,120	160,155,120	162,980,120	162,980,120	783,415,600	

Appendix 6: ACTIONS AND BUDGET

GHANA FOREST PLANTATION STRATEGY						
Projected Costs		Responsibility		16	17	18
	Lead	Collaborator(s)	Cost	Cost	Cost	Cost
Action 1.15: Undertake copice management of an estimated 15,000ha teak plantations harvested prior to 2016 and 10,000ha annually from 2017	FC	Fringe Communities, Private Sector	3,500,000	3,500,000	3,500,000	3,500,000
Action 1.16: Undertake Enrichment planting in poorly stocked forest reserves (5,000 ha/yr)	FC	FORIG, Universities, Fringe Communities	1,000,000	1,000,000	1,000,000	1,000,000
Action 1.17: Undertake maintenance of Enrichment Planting sites (New and Existing)	FC	Fringe Communities	7,468,320	7,868,320	8,268,320	8,668,320
Action 1.18: Undertake replanting of an estimated 3,000ha harvested forest plantations (species other than teak).	FC	Fringe Communities, Private Sector				
Action 1.19: Maintain replanted sites (3000 ha)	FC	Fringe Communities, Private Sector	300,000	300,000	300,000	300,000
Action 1.20: Implement FC's MoP on wildfire management	FC	Private Developers, Loggers, GFS, Fringe Communities, Civil Society, Media, Ghana Police Service	200,000	200,000	200,000	200,000
Action 1.21: Construct fire rides (10-meter wide) within existing government plantations (160,000ha) [Est: 19,200 km]	FC	Fringe Communities, Feeder roads, MMDAs, Private sector				
Action 1.22: Maintain / rehabilitate an estimated 235,000 ha (160,000 ha public and 75,000 ha private) existing forest plantations	FC/Private Sector	Fringe Communities				
Action 1.23: Establish new plantations [25,000 ha/yr]	FC/Private Sector	Fringe Communities	37,500,000	37,500,000	37,500,000	37,500,000
Action 1.24: Maintain newly established plantations	FC/Private Sector	Fringe Communities	112,500,000	115,000,000	117,500,000	120,000,000
Action 1.25: Establish Model Plantations for demonstration of best practice (200 ha/yr)	FC	FORIG, Private Sector, Universities, Fringe Communities				
Action 1.26: Maintain existing (378ha) and newly established (200ha/yr) Model Plantations	FC	FORIG, Private Sector, Universities, Fringe Communities	137,800	137,800	137,800	137,800
Action 1.27: Promote agro-forestry/farm forestry (trees on farm); extension services and supply 5 million seedlings/yr]	FC/MoFA/ COCOBOD	Farmers, Nursery Operators, etc.	1,850,000	1,850,000	1,850,000	1,850,000
Action 1.28: Liaise with Minerals Commission to rehabilitate mined sites	FC / EPA	Minerals Commission, Mining Companies	20,000	20,000	20,000	20,000
Action 1.29: Liaise with Water Resources Commission, VRA, EPA, others	FC	Water Resources Commission, VRA, EPA, others	20,000	20,000	20,000	20,000
Action 1.30: Procure key logistics for field operations/monitoring and supervision (i.e. Vehicles, motorcycles, GPS, pruning saws, pruning shears, chainsaws, protective clothing, first aid and safety equipment etc.)	FC	MNLR, MoFEP				
			3,000,000			
						3,000,000
						100,000
						100,000
						9,250,000
						689,000
						689,000
						100,000
						100,000
						100,000
						100,000
						17,500,000
						17,500,000

GHANA FOREST PLANTATION STRATEGY

Projected Costs	Responsibility	16	17	18	19	20	TOTAL (YR 15 - 20)
Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost	Cost (US \$)
Action 4.13: Collect and analyse data from established PSFs	FC	FORIG, Universities, Private Developers	5,000	5,000	5,000	5,000	5,000
Action 4.14: Collaborate with FORIG and other stakeholders to monitor and develop effective methods to control invasive plant species	FC / FORIG	Universities					25,000
Action 4.15: Design methodology, collect and analyse data on key tree parameters	FC / FORIG	Universities					-
Action 4.16: Engage Consultants (2-year) [Tree Breeder, Vegetative Propagation and Tree Nursery Specialist]	MNUR / FC / DPs	FORIG, UG, KNUST, UDS					-
Action 4.17: Engage Consultants (3-year) [Plantation Silviculturist with experience in ICT / GIS applications in plantation management, soil nutrient management, and forest certification]	Consultant	FC, MNUR, FORIG					-
Action 4.18: Carry out feasibility study on the mechanisation of forest plantation field operations	Consultant	FC, FORIG, Universities, Private Sector					-
Action 4.19: Carry out a study on improving site productivity Management.	Consultant	FC, FORIG, Universities, Private Sector					-
Action 4.20: Commission a study on benefit sharing arrangements for off-reserve areas	Consultant	FC, FORIG, Universities, Private Sector, Traditional Authorities					-
Action 4.21: Train FSD staff to provide Extension Services to Private Sector Forest Plantation Developers and communities	FC / Consultant	FORIG, MoFA, Private Sector, Universities					-
Action 4.22: Develop and publish standardized guide books for forest plantation extension services	FC / Consultant	FORIG, MoFA, Private Sector, Universities					-
Action 4.23: Undertake a study to develop allometric models for key plantation timber species to facilitate trading in Carbon.	FORIG	FC, Universities, Private Sector					-
Action 4.24: Undertake international educational tours to model plantation setups (i.e. Malaysia, Brazil, South Africa, Costa Rica, etc.) by key plantation staff	FC	FORIG, MNUR, Private Sector					-
Action 4.25: Training in conflict management	FC / Consultant	Private Sector, Fringe Communities					-
Action 4.26: Build capacity of tree grower associations in group formation, administration, access to markets and product development & provide technical support	FC	FORIG, KNUST, UDS, UENR	10,000	10,000	10,000	10,000	50,000
Action 4.27: Support farmer field schools and demonstrations on good agroforestry practices and integrated nature-based livelihood options	FC / MoFA / COCOBOD	FORIG, KNUST, UDS, UENR	50,000	50,000	50,000	50,000	250,000
Action 4.28: Train and Build capacity of Forest Guards and Rapid Response Teams in Forest Protection and Law Enforcement	FC	GNLR, Ghana Police Service, Attorney Generals Dept.	25,000	25,000	25,000	25,000	125,000

GHANA FOREST PLANTATION STRATEGY							
Projected Costs		Responsibility	16	17	18	19	20
Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost	Total (GH¢ 15 - 20) Cost (US \$)
Action 4.29: Build capacity of Community-base Organizations in Forest Protection	FC	Fringe Communities	15,000	15,000	15,000	15,000	75,000
SUB TOTAL		280,000	260,000	260,000	260,000	260,000	1,320,000
STRATEGIC OBJECTIVE 5: Governance							
Action 5.1: Conduct study to identify gaps in current governance processes	FC / Consultant	FC, MILGRD, Civil Society, GTA, GTMO, FAWAG, National House of Chiefs (NHC)					-
Action 5.2: Review existing monitoring and accountability framework for plantation management	FC / Consultant	MILNR, Civil Society, GIF, NHC					-
Action 5.3: Develop and advertise criteria for selection and award for exceptional performance in plantation development.	FC / Consultant	MILNR, Civil Society, GIF	5,000	5,000	5,000	5,000	25,000
Action 5.4: Institute award schemes for private plantation developers.	FC / Consultant	MILNR, Civil Society, GIF					-
Action 5.5: Introduce consultative processes and systems to involve key stakeholders in decision making concerning forest plantations.	FC	MILNR, Land Owners, Private Plantation Developers, FORIG, Universities					-
Action 5.6: Liaise with the plant protection department of MoFA to regulate importation of planting material for forest plantation establishment/nurseries							-
Action 5.7: Strengthen enforcement of forest laws and regulations	FC	MILNR,	30,000	30,000	30,000	30,000	150,000
Action 5.8: Set up a multi-stakeholder advisory committee to guide the implementation of the forest plantation strategy	FC	MILNR, FPTSC	10,000	10,000	10,000	10,000	50,000
Action 5.9: Develop and implement transparent mechanisms for pricing and allocation of forest plantation timber.	FC / Consultant	MILNR, Civil Society, GIF, Private Sector (i.e. GTMO, GTA, etc.), NHC, FPTSC					-
Action 5.10: Strengthen the existing structures for information sharing and conflict management (e.g. National Forest Forum)	FC	MILNR, Civil Society, GIF, NHC					-
Action 5.11: Review Current Plantation Development Structure	FC						-
Action 5.12: Award exceptional performers	FC	MILNR, Civil Society	50,000	50,000	50,000	50,000	250,000
SUB TOTAL		95,000	95,000	95,000	95,000	95,000	475,000
Monitoring and Evaluation							
Action 6.1: Carry out baseline studies	FC / Consultant	MILNR, Development Partners, Civil Society, FORIG, Universities, MoFEP, MESTI					-

GHANA FOREST PLANTATION STRATEGY						
Projected Costs		Responsibility	16	17	18	19
	Lead	Collaborator(s)	Cost	Cost	Cost	Total (GRN 15 - 20) Cost (US\$)
Action 6.2: Develop ICT/GIS infrastructure to facilitate data capture, storage and retrieval, long-term planning and improve decision-making regarding field operations	FC	Consultant				-
Action 6.3: Progress monitoring and reporting on planned activities	FC	MLNR, Development Partners, Civil Society, FORIG, Universities, MOFEP, MESTI	200,000	200,000	200,000	200,000
Action 6.4: Publication and dissemination of Annual Reports to key stakeholders	FC	MLNR	30,000	30,000	30,000	30,000
Action 6.5: Conduct summative evaluation	FC/ Consultant	MLNR, Development Partners, Civil Society, FORIG, Universities, MOFEP, MESTI, FPTSC	230,000	230,000	230,000	230,000
SUB TOTAL			165,900,120	171,780,120	171,680,120	174,580,120
GRAND TOTAL						1,150,000
						851,420,600

Appendix 6: ACTIONS AND BUDGET

GHANA FOREST PLANTATION STRATEGY											
Projected Costs	Lead	Responsibility	Collaborator(s)	21	22	23	24	25	(YR 21 - 25)	TOTAL	GRAND TOTAL (YEAR 1 - 25)
				Cost	Cost	Cost	Cost	Cost	Cost	Cost	(US \$)
STRATEGIC OBJECTIVE 1: Establishment and management of planted forests											
Action 1.1: Identify, survey and map suitable lands within forest reserves for plantation development	/C	M/LNR, Lands Commission, OAS, Traditional Councils, Landowners, Private Plantation Developers							-	250,000	
Action 1.2: Liaise with the Lands Commission, traditional councils and other landowners to identify off-reserve lands earmarked for commercial plantation development	/C								-	150,000	
Action 1.3: Develop and maintain a system to update a register on degraded lands available for forest plantation (On-reserve and off-reserve) [Land Bank]	/C	M/LNR, Lands Commission, OAS, NHC		2,000	2,000	2,000	2,000	2,000	10,000	64,000	
Action 1.4: Publish database of available on and off-reserve lands (Land bank) for plantation	/C	M/LNR, Lands Commission, FORIG, M/NR, MOFA, Private Sector		2,000	2,000	2,000	2,000	2,000	10,000	58,000	
Action 1.5: Procure genetically improved (superior planting materials of selected exotic timber tree species	/C	FORIG, Fringe Communities							-	600,000	
Action 1.6: Collect seed from plus native and exotic timber tree species	/C	FORIG, KNUST, UDS, UENR, Fringe Communities, Private Sector							-	300,000	
Action 1.7: Establish Seed Orchards of selected exotic and native timber tree species (1000 ha)	/C	FORIG, KNUST, UDS, UENR, Fringe Communities, Private Sector		115,000	115,000	115,000	115,000	115,000	575,000	2,000,000	
Action 1.8: Maintain / Tend Seed Orchards (existing and new) / Seed Production Areas (SPAs)	/C	GAEC, FC, KNUST, Private Sector							-	4,937,500	
Action 1.9: Develop protocols for mass production of selected genetically improved planting material	FORIG	FORIG, GAEC, Private Sector							-	200,000	
Action 1.10: Establish and operate a Tissue Culture Lab and Other Facilities (Vegetative Propagation Center)	/C	FORIG, GAEC, Private Sector		25,000	25,000	25,000	25,000	25,000	125,000	1,675,000	
Action 1.11: Establish and operate three (3) State-of-the-art Central tree nurseries (Kumasi / Sunyani / Tamale) - 6 million seedlings capacity /yr	/C	FORIG, Universities, Private Sector		300,000	300,000	300,000	300,000	300,000	1,500,000	8,900,000	
Action 1.12: Review existing plantation MoPs (A,B and C) and consolidate into one document	/C	M/LNR, FORIG, Universities, Private Plantation Developers							-	80,000	
Action 1.13: Publish reviewed plantation MoP	/C								-	50,000	
Action 1.14: Develop and publish MoP on Environment Planting	/C	FORIG, Universities							-	80,000	

GHANA FOREST PLANTATION STRATEGY									
Projected Costs	Responsibility	21	22	23	24	25	Total (Yrs 21-25)	GRAND TOTAL (YEAR 1 - 25)	
	Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost	(US \$)	
Action 1.15: Undertake coupe management of an estimated 15,000ha teak plantations harvested prior to 2016 and 10,000ha annually from 2027	FC	Fringe Communities, Private Sector	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	17,500,000	61,250,000
Action 1.16: Undertake enrichment planting in commercially-stocked forest reserves (5,000 ha/yr)	FC	FORIG, Universities, Fringe Communities						-	20,000,000
Action 1.17: Undertake maintenance of Enrichment Planting sites (New and Existing)	FC	Fringe Communities	9,468,320	9,118,320	8,768,320	8,418,320	8,068,320	43,841,600	146,006,900
Action 1.18: Undertake replanting of an estimated 3,000ha harvested forest plantations (species other than teak)	FC	Fringe Communities, Private Sector						-	4,500,000
Action 1.19: Maintain replanted sites (3000 ha)	FC	Fringe Communities, Private Sector	300,000	300,000	300,000	300,000	300,000	1,500,000	14,700,000
Action 1.20: Implement FC's Non-Plan wildlife management	FC	Private Developers, Loggers, GFS, Fringe Communities, Civil society, Media, Ghana Police Service	200,000	200,000	200,000	200,000	200,000	1,000,000	5,000,000
Action 1.21: Construct fire ridges (10-meter wide) within existing government plantations (160,000ha) [Est. 19,200 km]	FC	Fringe Communities, Feeder roads, MNIDAS, private sector						-	9,600,000
Action 1.22: Maintain & rehabilitate an estimated 235,000 ha (60,000 ha public and 75,000 ha private) existing forest plantations	FC/Private Sector	Fringe Communities						-	411,250,000
Action 1.23: Establish new plantations [25,000 ha/yr]	FC/Private Sector	Fringe Communities	37,500,000	37,500,000	37,500,000	37,500,000	37,500,000	187,500,000	937,500,000
Action 1.24: Maintain newly established plantations	FC/Private Sector	Fringe Communities	125,000,000	127,500,000	130,000,000	132,500,000	135,000,000	650,000,000	2,325,000,000
Action 1.25: Establish Model Plantations for demonstration of best practice (200 ha/yr)	FC	FORIG, Private Sector, Universities, Fringe Communities						-	2,000,000
Action 1.26: Maintain existing (378ha) and newly established (200ha/yr) Model Plantations	FC	FORIG, Private Sector, Fringe Communities	137,800	137,800	137,800	137,800	137,800	689,000	6,447,400
Action 1.27: Promote agro-forestry/farm forestry (trees on farm); extension services and re-harvesting 5 million seedlings/year	FC/MoFA/COCOBOD	Farmers, Nursery Operators, etc.	1,850,000	1,850,000	1,850,000	1,850,000	1,850,000	9,250,000	46,250,000
Action 1.28: Liaise with Minerals Commission to rehabilitate mining sites	FC / EPA	Minerals Commission, Mining Companies	20,000	20,000	20,000	20,000	20,000	100,000	500,000
Action 1.29: Liaise with Water Resources Commission, VRA, GIVCL, others to rehabilitate degraded watersheds	FC	Water Resources Commission, VRA, EPA, others	20,000	20,000	20,000	20,000	20,000	100,000	500,000
Action 1.30: Procure key logistics for field operations/monitoring and supervision (i.e. vehicles, motorcycles, GPS, pruning saws, pruning shears, chainsaws, protective clothing, first aid and safety equipment etc.)	FC	MNLR, MoFEP	3,000,000					6,000,000	21,000,000

GHANA FOREST PLANTATION STRATEGY		Projected Costs		Responsibility		21		22		23		24		25		TOTAL (YR 21 - 25)		GRAND TOTAL (YEAR 1 - 25)	
		Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost (US \$)	Cost (US \$)		
Action 1.31: Facilitate forest plantations management and chain of custody certification (FSC, PEFC, etc)	FC	MLNR		5,000		5,000		5,000		5,000		5,000		5,000		25,000		25,000	125,000
Action 1.32: Facilitate the enactment of policy/legislation to support ownership by farmers of planted trees on farms	MLNR	FC, AG Dept, Parliamentary Select Committee		5,000		5,000		5,000		5,000		5,000		5,000		25,000		25,000	125,000
Action 1.33: Promote the development of NTFPs within forest plantations	FC	FORIG, MoFA, MLNR																100,000	
SUB TOTAL																		4,031,198,800	
STRATEGIC OBJECTIVE 2: Forest plantation investment promotion																			
Action 2.1: Prepare and publish a forest plantation investor handbook	FC	FORIG, Private Plantation Developers, MLNR																120,000	
Action 2.2: Undertake studies and stakeholder consultations to support the introduction of a Forest Reproduction Levy/ Carbon Tax, etc. to support forest plantation development	FC	FCJ, MLNR, Civil society, NOFEP, AGU, PURC, MESTI																300,000	
Action 2.3: Expand the coverage of the Timber Export Levy to include all key timber species exported as air-dried lumber.	FC	MLNR, NOFEP																20,000	
Action 2.4: Facilitate the establishment of a specialized market for the trading of forest plantation stands	FC	FCJ, MLNR, Ghana Stock Exchange, Min. of Trade, NOFEP																150,000	
Action 2.5: Facilitate the enactment of Forest Plantation Act	MLNR	FC, AG Dept, Parliamentary Select Committee, Forest Plantation Investors																150,000	
Action 2.6: Establish and Manage forest plantation investors (large, medium, small) forum	FC	MLNR, Forest Plantation Investors		10,000		10,000		10,000		10,000		10,000		10,000		50,000		50,000	300,000
Action 2.7: Support Tree Grower Group formation and operation	FC	MLNR, Tree Grower Associations		10,000		10,000		10,000		10,000		10,000		10,000		50,000		50,000	270,000
SUB TOTAL																		1,310,000	
STRATEGIC OBJECTIVE 3: Employment creation and livelihoods																			
Action 3.1: Recruit labour from fringe communities to undertake enrichment planting, plantation establishment and maintenance	FC / Private Sector	NDA, Fringe Communities		10,000		10,000		10,000		10,000		10,000		10,000		50,000		50,000	250,000
Action 3.2: Promote out-grower forest plantation schemes and establishment of private nurseries	FC / Private Sector	Fringe Communities		5,000		5,000		5,000		5,000		5,000		5,000		25,000		25,000	125,000
Action 3.3: Promote the establishment of community fire protection crews	FC / GFS	Fringe Communities, NDA, Private Sector		100,000		100,000		100,000		100,000		100,000		100,000		500,000		500,000	2,500,000
Action 3.4: Undertake skills and enterprise development	FC / Private Sector	NDA, Fringe Communities, Consultants		100,000		100,000		100,000		100,000		100,000		100,000		500,000		500,000	2,500,000

GHANA FOREST PLANTATION STRATEGY								GRAND TOTAL (YEAR 1 - 25) (US \$)	
Projected Costs	Responsibility	21	22	23	24	25	TOTAL (YR 21 - 25)	Cost (US \$)	
	Lead Collaborator(s)	Cost	Cost	Cost	Cost	Cost			
Action 4.13: Collect and analyse data from established PSFs	FC / FORIG Universities, Private Developers	5,000	5,000	5,000	5,000	5,000	25,000	25,000	120,000
Action 4.14: Collaborate with FORIG and other stakeholders to monitor and develop effective methods to control invasive plant species	FC / FORIG Universities						-	-	150,000
Action 4.15: Design methodology, collect and analyse data on key tree parameters	FC / FORIG Universities						-	-	185,000
Action 4.16: Engage Consultants (2-year) [Tree Breeder, Vegetative Propagation and Tree Nursery Specialist]	MNLR / FC / DPS						-	-	500,000
Action 4.17: Engage Consultants (3-year) [Plantation Silviculturist with experience in ICT / GIS applications in plantation management, mechanization of field operations, Soil nutrient management, and forest certification]	Consultant FC, MNLR, FORIG						-	-	450,000
Action 4.18: Carry out feasibility study on the mechanisation of forest plantation field operations	FC, FORIG, Universities, Private Sector						-	-	80,000
Action 4.19: Carry out a study on improving site productivity Management.	FC, FORIG, Universities, Private Sector						-	-	100,000
Action 4.20: Commission a study on benefit sharing arrangements for off-reserve areas	FC, FORIG, Universities, Private Sector, Traditional Authorities						-	-	50,000
Action 4.21: Train FSD staff to provide Extension Services to Private Sector Forest Plantation Developers and communities	FORIG, MOFA, Private Sector, Universities						-	-	420,000
Action 4.22: Develop and publish standardized guide books for forest plantation extension services	FORIG, MOFA, Private Sector, Universities						-	-	150,000
Action 4.23: Undertake a study to develop allometric models for Key plantation timber species to facilitate trading in Carbon.	FORIG FC, Universities, Private Sector						-	-	200,000
Action 4.24: Undertake international educational tours to model plantation setups (ie. Malaysia, Brazil, South Africa, Costa Rica, etc.) by key plantation staff	FORIG, MNLR, Private Sector						-	-	470,000
Action 4.25: Training in conflict management	FC/ Private Sector, Fringe Communities Consultant						-	-	90,000
Action 4.26: Build capacity of tree grower associations in group formation, administration, access to markets and product development & provide technical support	FORIG, KNUST, UPS, UENR	10,000	10,000	10,000	10,000	10,000	50,000	50,000	400,000
Action 4.27: Support farmer field schools and demonstrations on good agroforestry practices and integrated nature-based livelihood options	FC / MoFA / COCOBOD	50,000	50,000	50,000	50,000	50,000	250,000	250,000	1,460,000
Action 4.28: Train and Build capacity of Forest Guards and Rapid Response Teams in Forest Protection and Law Enforcement	FC Ghana Armed Forces, Ghana Police Service, Attorney Generals Dept.	25,000	25,000	25,000	25,000	25,000	125,000	125,000	1,025,000

GHANA FOREST PLANTATION STRATEGY		Responsibility		21	22	23	24	25	TOTAL	GRAND TOTAL (YEAR 1 - 25) (US \$)
Projected Costs	Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Cost	Cost	(YR 21 - 25) Cost (US \$)	535,000
Action 4.29: Build capacity of Community-base Organizations in Forest Protection	FC	Fringe Communities	15,000	15,000	15,000	15,000	15,000	15,000	75,000	75,000
SUB TOTAL			280,000	280,000	280,000	280,000	280,000	280,000	1,320,000	13,170,000
STRATEGIC OBJECTIVE 5:										
Governance										
Action 5.1: Conduct study to identify gaps in current governance processes	FC/ Consultant	FC, MIGRD, Civil Society, GTIA, GTMO, FAWAG, National House of Chiefs (NHC)							-	100,000
Action 5.2: Review existing monitoring and accountability framework for plantation management	FC/ Consultant	MLNR, Civil Society, GIF, NHC							-	50,000
Action 5.3: Develop and advertise criteria for selection and award for exceptional performance in plantation development.	FC/ Consultant	MLNR, Civil Society, GIF	5,000	5,000	5,000	5,000	5,000	5,000	25,000	125,000
Action 5.4: Institute award schemes for private plantation developers.	FC/ Consultant	MLNR, Civil Society, GIF							-	40,000
Action 5.5: Introduce consultative processes and systems to involve key stakeholders in decision making concerning forest plantations.	FC	MLNR, Land Owners, Private Plantation Developers, FORIG, Universities							-	20,000
Action 5.6: Laiise with the plant protection department or MoFA to regulate importation of planting material for forest plantation establishment/nurseries									-	6,000
Action 5.7: Strengthen enforcement of forest laws and regulations	FC	MLNR,	30,000	30,000	30,000	30,000	30,000	30,000	150,000	750,000
Action 5.8: Set up a multi-stakeholder advisory committee to guide the implementation of the forest plantation strategy	FC	MLNR, FPSTSC	10,000	10,000	10,000	10,000	10,000	10,000	50,000	260,000
Action 5.9: Develop and implement transparent mechanisms for pricing and allocation of forest plantation timber.	FC/ Consultant	MLNR, Civil Society, GIF, Private Sector (i.e. GTMO, GTIA, etc.), NHC, FPSTSC							-	80,000
Action 5.10: Strengthen the existing structures for information sharing and conflict management (e.g. National Forest Forum)	FC	MLNR, Civil Society, GIF, NHC							-	30,000
Action 5.11: Review Current Plantation Development Structure	FC								-	50,000
Action 5.12: Award exceptional performers	FC	MLNR, Civil Society	50,000	50,000	50,000	50,000	50,000	50,000	250,000	1,200,000
SUB TOTAL			95,000	95,000	95,000	95,000	95,000	95,000	475,000	2,711,000
Monitoring and Evaluation										
Action 6.1: Carry out baseline studies	FC/ Consultant	MLNR, Development Partners, Civil Society, FORTG, Universities, MOFEP, MESTI							-	100,000

GHANA FOREST PLANTATION STRATEGY							
Projected Costs		Responsibility					
	Lead	Collaborator(s)	Cost	Cost	Cost	Cost	Total (YR 21 - 25) Cost (US \$)
Action 6.2: Develop ICT/GIS infrastructure to facilitate data capture, storage and retrieval, long-term planning and improve decision-making regarding field operations	FC	Consultant					2,070,000
Action 6.3: Progress monitoring and reporting on planned activities	FC	MLNR, Development Partners, Civil Society, FORTG, Universities, MOFEP, MESTI	200,000	200,000	200,000	200,000	1,000,000
Action 6.4: Publication and dissemination of Annual Reports to key stakeholders	FC	MLNR	30,000	30,000	30,000	30,000	150,000
Action 6.5: Conduct summative evaluation	FC/ Consultant	MLNR, Development Partners, Civil Society, FORTG, Universities, MOFEP, MESTI, FPSC				100,000	100,000
SUB TOTAL			230,000	230,000	230,000	330,000	1,250,000
GRAND TOTAL			182,390,120	181,520,120	183,670,120	185,820,120	91,070,120
							4,064,389,800

APPENDIX 6:**YIELD CALCULATIONS**

YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13
Cumulative Area (ha)	25,000	50,000	75,000	100,000	125,000	150,000	175,000	200,000	225,000	250,000	275,000	300,000	325,000
VOLUME (cbm)	250,000	500,000	750,000	1,000,000	1,250,000	1,500,000	1,750,000	2,000,000	2,250,000	2,500,000	2,750,000	3,000,000	3,250,000

YEAR	14	15	16	17	18	19	20	21	22	23	24	25
Cumulative Area (ha)	350,000	375,000	400,000	425,000	450,000	475,000	500,000	525,000	550,000	575,000	600,000	625,000
VOLUME (cbm)	3,500,000	3,750,000	4,000,000	4,250,000	4,500,000	4,750,000	5,000,000	5,250,000	5,500,000	5,750,000	6,000,000	6,250,000

Cumulative Vol. Yr1 -25 (m³)**81,250,000**AV. Annual Vol (m³)**3,250,000**NB: MAI = 10 m³/ha

APPENDIX 8a: SUMMARY OF PROJECTED COST (US \$)

YEAR	EXPENDITURE (US\$)
1	136,331,000
2	150,895,500
3	166,280,500
4	180,760,500
5	198,754,900
6	118,250,120
7	125,270,120
8	130,685,120
9	141,410,120
10	146,445,120
11	148,665,120
12	151,265,120
13	160,350,120
14	160,155,120
15	162,980,120
16	165,900,120
17	171,780,120
18	171,680,120
19	174,580,120
20	177,480,120
21	182,390,120
22	181,520,120
23	183,670,120
24	185,820,120
25	191,070,120
TOTAL	4,064,389,800

GHANA FOREST PLANTATION STRATEGY: 2016 - 2040
APPENDIX 8b: SUMMARY OF PROJECT INVESTMENT INCOME (US \$)
TEAK

YEAR	PARTICULARS OF INCOME	AVERAGE UNIT PRICE	QUANTITY	INCOME	REMARKS
1 (2016)	Telegraphic poles	\$15	1,000,000	\$15,000,000	50 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2004/2005 coupes)
2 (2017)	Telegraphic poles	\$15	1,000,000	\$15,000,000	50 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2006/2007 coupes)
3 (2018)	Telegraphic/Transmission poles	\$22	3,000,000	\$65,000,000	50 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2007/2008 coupes). 200 stems removed per hectare merchantable (10,000 ha of 2002 coupe - second thinning)
4 (2019)	Telegraphic/Transmission poles	\$23	5,000,000	\$115,000,000	50 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2009/2010 coupes). 200 stems removed per hectare merchantable (20,000 ha of 2003/2004 coupes - second thinning)
5 (2020)	Telegraphic/Transmission poles	\$24	4,500,000	\$107,500,000	50 stems out of 200 stems removed per hectare merchantable (10,000 ha of 2010/2011 coupes). 200 stems removed per hectare merchantable (20,000 ha of 2004/2005 coupes - second thinning)
6 (2021)	Telegraphic/Transmission poles	\$24	4,500,000	\$107,500,000	50 stems out of 200 stems removed per hectare merchantable (10,000 ha of 2012/2013 coupes). 200 stems removed per hectare merchantable (20,000 ha of 2006/2007 coupes - second thinning)

7 (2022)	Low-tension Transmission poles	\$25	4,000,000	\$100,000,000	200 stems removed per hectare merchantable (20,000 ha of 2007/2008 coupes - second thinning)
8 (2023)	Telegraphic/Transmission poles	\$28	6,000,000	\$167,500,000	50 stems out of 200 stems removed per hectare merchantable (10,000 ha of 2014 coupe). 200 stems removed per hectare merchantable (20,000 ha of 2009/2010 coupes - second thinning). 150 stems removed per hectare merchantable (10,000 ha of 2002 coupe - third thinning)
9 (2024)	Telegraphic/Transmission poles/ saw logs	\$34	7,250,000	\$246,197,917	100 stems out of 200 stems removed per hectare merchantable (15,000 ha of 2015 coupe + 7,500 ha coppice mgt. area). 200 stems removed per hectare merchantable (10,000 ha of 2010/2011 coupes - second thinning). 150 stems removed per hectare merchantable (20,000 ha of 2003/2004 coupes - third thinning)
10 (2025)	Telegraphic/Transmission poles/ saw logs	\$34	5,750,000	\$196,458,333	100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2016 coupe + 7500 ha coppice mgt. area). 150 stems removed per hectare merchantable (20,000 ha of 2004/2005 coupes - third thinning)
11 (2026)	Telegraphic/Transmission poles/ saw logs	\$32	7,000,000	\$224,583,333	100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2017 coupe). 200 stems removed per hectare merchantable (10,000 ha of 2012/2013 coupes - second thinning). 150 stems removed per hectare merchantable (20,000 ha of 2006/2007 coupes - third thinning)
12 (2027)	Telegraphic/Transmission poles/ saw logs	\$32	5,000,000	\$158,333,333	100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2018 coupe). 150 stems removed per hectare merchantable (20,000 ha of 2007/2008 coupes - third thinning).

13 (2028)	Telegraphic/Transmission poles/ saw logs	\$38	9,500,000	\$361,527,778
14 (2029)	Telegraphic/Transmission poles/ saw logs	\$40	14,500,000	\$574,821,429
15 (2030)	Telegraphic/Transmission poles/ saw logs	\$45	14,000,000	\$630,000,000
16 (2031)	Telegraphic/Transmission poles/ saw logs	\$42	12,500,000	\$519,886,364

100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2019 coupe), 200 stems removed per hectare merchantable (10,000 ha of 2014 coupe - second thinning). 150 stems removed per hectare merchantable (20,000 ha of 2009/2010 coupes - third thinning). 250 stems removed per hectare (10,000ha of 2002 coupe - final harvest)

100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2020 coupe). 200 stems removed per hectare merchantable (15,000 ha of 2015 coupe + 7500 ha copice - second thinning). 150 stems removed per hectare merchantable (20,000 ha of 2010/2011 coupes - third thinning). 250 stems removed per hectare (20,000ha of 2003/2004 coupes - final harvest)

100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2021 coupe), 200 stems removed per hectare merchantable (20,000 ha of 2016 coupe + 7500 ha copice - second thinning). 150 stems removed per hectare merchantable (10,000 ha of 2012/2013 coupes - third thinning). 250 stems removed per hectare (20,000ha of 2004/2005 coupes - final harvest)

100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2022 coupe), 200 stems removed per hectare merchantable (20,000 ha of 2017 coupe - second thinning). 150 stems removed per hectare merchantable (10,000 ha of 2014 coupe - third thinning). 250 stems removed per hectare (20,000ha of 2006/2007 coupes - final harvest)

				100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2023 coupe). 200 stems removed per hectare merchantable (20,000 ha of 2018 coupe - second thinning). 150 stems removed per hectare merchantable (15,000 ha of 2015 coupe - third thinning). 250 stems removed per hectare (20,000ha of 2007/2008 coupes - final harvest)
17 (2032)	Telegraphic/Transmission poles/ saw logs	\$41	13,250,000	\$549,734,043
18 (2033)	Telegraphic/Transmission poles/ saw logs	\$41	14,000,000	\$580,851,064
19 (2034)	Telegraphic/Transmission poles/ saw logs	\$36	11,500,000	\$419,594,595
20 (2035)	Telegraphic/Transmission poles/ saw logs	\$36	11,500,000	\$419,594,595

21 (2036)	Telegraphic/Transmission poles/ saw logs	\$36	11,500,000	\$419,594.595
				100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2027 coupe), 200 stems removed per hectare merchantable (20,000 ha of 2022 coupe - second thinning). 150 stems removed per hectare merchantable (20,000 ha of 2019 coupe - third thinning). 250 stems removed per hectare (10,000ha of 2014 coupes - final harvest)
22 (2037)	Telegraphic/Transmission poles/ saw logs	\$39	12,750,000	\$500,892,857
				100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2028 coupe), 200 stems removed per hectare merchantable (20,000 ha of 2023 coupe - second thinning). 150 stems removed per hectare merchantable (20,000 ha of 2020 coupe - third thinning). 250 stems removed per hectare (15,000ha of 2015 coupes - final harvest)
23 (2038)	Telegraphic/Transmission poles/ saw logs	\$39	14,000,000	\$550,000,000
				100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2029 coupe), 200 stems removed per hectare merchantable (20,000 ha of 2024 coupe - second thinning). 150 stems removed per hectare merchantable (20,000 ha of 2021 coupe - third thinning). 250 stems removed per hectare (20,000ha of 2016 coupes - final harvest)
24 (2039)	Telegraphic/Transmission poles/ saw logs	\$39	14,000,000	\$550,000,000
				100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2030 coupe), 200 stems removed per hectare merchantable (20,000 ha of 2025 coupe - second thinning). 150 stems removed per hectare merchantable (20,000 ha of 2022 coupe - third thinning). 250 stems removed per hectare (20,000ha of 2017 coupes - final harvest)

			100 stems out of 200 stems removed per hectare merchantable (20,000 ha of 2031 coupe). 200 stems removed per hectare merchantable (20,000 ha of 2026 coupe - second thinning). 150 stems removed per hectare merchantable (20,000 ha of 2023 coupe - third thinning). 250 stems removed per hectare (20,000ha of 2018 coupes - final harvest)
25 (2040)	Telegraphic/Transmission poles/ saw logs	\$39	14,000,000 \$550 000,000
TOTAL			\$ 8,144,570,234

GHANA FOREST PLANTATION STRATEGY: 2015 - 2040
APPENDIX 8C: SUMMARY OF PROJECT INVESTMENT INCOME (US \$)
OTHER SPECIES (i.e Cedrela, Ofraim, Emire, Gmelina etc)

YEAR	PARTICULARS OF INCOME	AVERAGE UNIT PRICE	QUANTITY	INCOME	REMARKS
3 (2018)	Small saw logs	\$25	400,000	\$10,000,000	
4 (2019)	Small saw logs	\$25	800,000	\$20,000,000	200 stems removed per hectare merchantable (2,000 ha of 2002 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]
5 (2020)	Small saw logs	\$25	800,000	\$20,000,000	200 stems removed per hectare merchantable (4,000 ha of 2003/2004 coupes) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]
6 (2021)	Small saw logs	\$25	800,000	\$20,000,000	200 stems removed per hectare merchantable (4,000 ha of 2004/2005 coupes) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]
7 (2022)	Small saw logs	\$25	800,000	\$20,000,000	200 stems removed per hectare merchantable (4,000 ha of 2006/2007 coupes) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]
8 (2023)	Small saw logs	\$25	800,000	\$20,000,000	200 stems removed per hectare merchantable (4,000 ha of 2007/2008 coupes) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]
9 (2024)	Small saw logs	\$25	400,000	\$10,000,000	200 stems removed per hectare merchantable (4,000 ha of 2009/2010 coupes) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]
10 (2025)	Small saw logs	\$25	400,000	\$10,000,000	200 stems removed per hectare merchantable (2,000 ha of 2010/2011 coupes) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]
13 (2028)	medium-sized saw logs	\$40	600,000	\$24,000,000	300 stems removed per hectare merchantable (2,000 ha of 2002 coupe) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (25-year rotation)

14 (2029)	medium-sized saw logs	\$40	1,200,000	\$48,000,000	300 stems removed per hectare merchantable (4,000 ha of 2003/2004 coupes) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (25-year rotation)
15 (2030)	Small/medium sized saw logs	\$33	2,400,000	\$78,000,000	200 stems removed per hectare merchantable (6,000* ha of 2015 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³ ; 300 stems removed per hectare merchantable (4,000 ha of 2004/2005 coupes) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (25-year rotation)
16 (2031)	Small/medium sized saw logs	\$33	2,400,000	\$78,000,000	200 stems removed per hectare merchantable (6,000* ha of 2016 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³ ; 300 stems removed per hectare merchantable (4,000 ha of 2006/2007 coupes) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (25-year rotation)
17 (2032)	Small/medium sized saw logs	\$33	2,400,000	\$78,000,000	200 stems removed per hectare merchantable (6,000* ha of 2017 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³ ; 300 stems removed per hectare merchantable (4,000 ha of 2007/2008 coupes) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (25-year rotation)
18 (2033)	Small/medium sized saw logs	\$33	2,200,000	\$73,000,000	200 stems removed per hectare merchantable (5,000 ha of 2018 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³ ; 300 stems removed per hectare merchantable (4,000 ha of 2009/2010 coupes) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (25-year rotation)
19 (2034)	Small/medium sized saw logs	\$31	1,600,000	\$49,000,000	200 stems removed per hectare merchantable (5,000 ha of 2019 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³ ; 300 stems removed per hectare merchantable (2,000 ha of 2010/2011 coupes) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (25-year rotation)

					200 stems removed per hectare merchantable (5,000 ha of 2020 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]; 300 stems removed per hectare merchantable (2,000 ha of 2012/2013 coupe) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (25-year rotation); 300 stems removed per hectare merchantable (6,000* ha of 2015 coupe) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (20-year rotation)
20 (2035)	Small/medium sized saw logs	\$36	3,400,000	\$121,000,000	
21 (2036)	Small/medium sized saw logs	\$39	2,800,000	\$108,640,000	200 stems removed per hectare merchantable (5,000 ha of 2021 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]; 300 stems removed per hectare merchantable (6,000* ha of 2016 coupe) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (20-year rotation)
22 (2037)	Small/medium sized saw logs	\$35	2,800,000	\$97,000,000	200 stems removed per hectare merchantable (5,000 ha of 2022 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]; 300 stems removed per hectare merchantable (6,000* ha of 2017 coupe) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (20-year rotation)
23 (2038)	Small/medium sized saw logs	\$34	2,500,000	\$85,000,000	200 stems removed per hectare merchantable (5,000 ha of 2023 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]; 300 stems removed per hectare merchantable (5,000 ha of 2018 coupe) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (20-year rotation)
24 (2039)	Small/medium sized saw logs	\$34	2,500,000	\$85,000,000	200 stems removed per hectare merchantable (5,000 ha of 2024 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]; 300 stems removed per hectare merchantable (5,000 ha of 2019 coupe) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (20-year rotation)
25 (2040)	Small/medium sized saw logs	\$34	2,500,000	\$85,000,000	200 stems removed per hectare merchantable (5,000 ha of 2025 coupe) (second thinning - first commercial thinning) [pre-thinning stocking - 500/ha, MTV = 1m ³]; 300 stems removed per hectare merchantable (5,000 ha of 2020 coupe) (final harvest) [pre-harvest stocking - 300/ha, MTV = 1.5m ³] (20-year rotation)
TOTAL				\$ 1,139,640,000	

* includes 1000ha/yr (Yr-1-3) Replanting

APPENDIX 8d: PROJECTED REVENUE FROM SALES OF SEEDS AND SEEDLINGS

SEEDLINGS						SEEDS		
YEAR	QUANTITY	PRICE (US\$)	INCOME (US\$)	YEAR	WEIGHT (kg)	PRICE (US\$)	INCOME (US\$)	
1	2,000,000	0.5	1,000,000	1	173,125	5	865,625	
2	4,000,000	0.5	2,000,000	2	173,125	5	865,625	
3	6,000,000	0.5	3,000,000	3	173,125	5	865,625	
4	6,000,000	0.5	3,000,000	4	173,125	5	865,625	
5	6,000,000	0.5	3,000,000	5	173,125	5	865,625	
6	6,000,000	0.5	3,000,000	6	173,125	5	865,625	
7	6,000,000	0.5	3,000,000	7	207,750	5.83	1,211,875	
8	6,000,000	0.5	3,000,000	8	277,000	6.88	1,904,385	
9	6,000,000	0.5	3,000,000	9	380,875	7.73	2,943,135	
10	6,000,000	0.5	3,000,000	10	380,875	7.73	2,943,135	
11	6,000,000	0.5	3,000,000	11	380,875	7.73	2,943,135	
12	6,000,000	0.5	3,000,000	12	380,875	7.73	2,943,135	
13	6,000,000	0.5	3,000,000	13	380,875	7.73	2,943,135	
14	6,000,000	0.5	3,000,000	14	380,875	7.73	2,943,135	
15	6,000,000	0.5	3,000,000	15	380,875	7.73	2,943,135	
16	6,000,000	0.5	3,000,000	16	380,875	7.73	2,943,135	
17	6,000,000	0.5	3,000,000	17	380,875	7.73	2,943,135	
18	6,000,000	0.5	3,000,000	18	380,875	7.73	2,943,135	
19	6,000,000	0.5	3,000,000	19	380,875	7.73	2,943,135	
20	6,000,000	0.5	3,000,000	20	380,875	7.73	2,943,135	
21	6,000,000	0.5	3,000,000	21	380,875	7.73	2,943,135	
22	6,000,000	0.5	3,000,000	22	380,875	7.73	2,943,135	
23	6,000,000	0.5	3,000,000	23	380,875	7.73	2,943,135	
24	6,000,000	0.5	3,000,000	24	380,875	7.73	2,943,135	
25	6,000,000	0.5	3,000,000	25	380,875	7.73	2,943,135	
TOTAL	138,000,000			TOTAL	7,825,250		58,343,305	
							127,343,305	

APPENDIX 8e: FINANCIAL ANALYSIS

YEAR	EXPENDITURE (\$)	INCOME (\$)	NET CASHFLOW (\$)	DISCOUNT RATE	NET PRESENT VALUE
1	136,331,000	15,865,625	(120,465,375)		
2	150,895,500	16,865,625	(134,029,875)		
3	166,280,500	77,865,625	(88,414,875)		
4	180,760,500	138,865,625	(41,894,875)	10%	\$799,473,516
5	198,754,900	131,365,625	(67,389,275)		
6	118,250,120	131,365,625	13,115,505		
7	125,270,120	124,211,875	(1,058,245)		
8	130,685,120	192,404,385	61,719,265		
9	141,410,120	262,141,052	120,730,932		
10	146,445,120	212,401,468	65,956,348		
11	148,665,120	230,526,468	81,861,348		
12	151,265,120	164,276,468	13,011,348		
13	160,350,120	391,470,913	231,120,793		
14	160,155,120	628,764,564	468,609,444		
15	162,980,120	713,943,135	550,963,015		
16	165,900,120	603,829,499	437,929,379		
17	171,780,120	633,677,178	461,897,058		
18	171,680,120	659,794,199	488,114,079		
19	174,580,120	474,537,730	299,957,610		
20	177,480,120	546,537,730	369,057,610		
21	182,390,120	534,177,730	351,787,610		
22	181,520,120	603,835,992	422,315,872		
23	183,670,120	640,943,135	457,273,015		
24	185,820,120	640,943,135	455,123,015		
25	191,070,120	640,943,135	449,873,015		
TOTAL	4,064,389,800	9,411,553,539	5,347,163,739		

IRR 19.4%