

REPORT OF THE DIRECTOR OF AUDIT

MITIGATION OF THE IMPACTS OF DEFORESTATION

Ministry of Agro Industry and Food Security

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ABBREVIATIONS AND ACRONYMS

BRGNP	Black River Georges National Park
CBD	Convention on Biological Diversity
CMA	Conservation Management Areas
ESA	Environmentally Sensitive Areas
FAO	Food and Agricultural Organisation
FRA	Forests and Reserves Act
FS	Forestry Services
GEF	Global Environment Facility
ha	Hectares
IAS	Invasive Alien Species
MAIFS	Ministry of Agro Industry and Food Security
MID	Maurice Ile Durable
MOE&SD	Ministry of Environment and Sustainable Development
MWF	Mauritius Wildlife Foundation
NBSAP	National Biodiversity Strategic Action Plan
NDU	National Development Unit
NGO	Non-governmental Organisations
NPCS	National Park and Conservation Service
PAN	Protected Area Network
UNDP	United Nations Development Programme

GLOSSARY

- 1 Biodiversity A variety of fauna and flora co-existing in sustainable way.
- 2 Catchment area An area where rainfall received is stored in the vegetation and released gradually.
- 3 Ecosystem Biological environment consisting of all organisms living in a particular area as well as all the non-living physical components of the environment with which the organisms interact and such as air, soil, water and sunlight.
- 4 Green cover An area covered with green vegetation which prevents rainfall from falling directly on the ground.
- 5 Gross National Product A method of measuring the production capacity of a country to produce goods and services.
- 6 Programme Based Budgeting System of budgeting whereby funds are allocated to identified programmes instead of department wise.
- 7 Silt Eroded soil and other deposits
- 8 Sustainable Development Development that meets the needs of this generation without compromising the rights of future generations.
- 9 Sustainable Land Management Land management that meets the needs of this generation without compromising the rights of future generations.

EXECUTIVE SUMMARY

Currently the forest cover is around 25 per cent of the land area of Mauritius and is below the world average. This includes native forest which accounts for less than two per cent of the total land area and is threatened to extinction by Invasive Alien Species which have degraded the forest. Most of the deforestation occurred during the colonial era spanning over four centuries. About 50 per cent of this forest cover is state owned with the other half under private ownership. The forest cover plays a vital role and its preservation is important. The vital functions are water and soil conservation. Where water is scarce, all major activities, mainly in agriculture, tourism or manufacturing, are seriously affected. It is also a natural habitat to flora and fauna.

Key findings

- The current legal framework is not enough to cater for loss of private forest land and also to regulate deer ranching activities which are harmful to our forest.
- There is slow implementation of the strategies identified in the forest policy.
- The impacts of deforestation and forest degradation are material and are the main causes for loss of biodiversity and habitat for wildlife and endangered species. Several species of endemic flora and fauna are in danger of extinction.
- It is costly to carry out restoration and conservation activities on state forest land. Limited conservation is being carried out on state land while that in private sector it is insignificant.
- The current tasks of expanding tree cover in water catchment areas by the Forestry Services are costly.
- The monitoring and enforcement mechanism need to be improved.
- No assessment has been carried out on the effectiveness of the National Tree Plantation Campaign. The River and Mountain Reserves Tree Plantation Campaign has not been effective as it did not address the requirement of small river reserve owners.
- The National Campaign on Afforestation has been launched on ad hoc basis without any target and fund commitment.

Recommendations

National Forest

It is recommended that as per Section 4 of the Forest and Reserves Act, Forestry Services through its parent ministry, declare all catchment areas surrounding any reservoir and any other forest in critical areas as National Forest. This includes private forest land in such critical areas considered as national importance.

Amending the Forest and Reserves Act

Government should amend the act to widen its scope in controlling felling of trees in private forest lands. It should be accompanied by the strengthening of the monitoring and enforcement mechanism at Forestry Services. This will reduce the indiscriminate destruction and conversion of private forest lands to other uses

Regulating Deer ranching and other activities

The area covering deer ranching is already too high and the impact of deer ranching in deforestation is quite damaging. Government should consider regulating deer ranching and ecotourism activities on both private and public forest land. This should be accompanied by proper monitoring and enforcement mechanism to prevent further deforestation and its impacts.

Financing of measures to mitigate deforestation through Maurice Ile Durable

One of the major constraints identified is the lack of funding in the implementation of the different strategies in the forest policy. The objective of preventing deforestation is in line with the concept of Maurice Ile Durable of preserving natural resources and achieving environmental sustainability. To align the objectives of the Forest policy with the objectives of Maurice Ile Durable it is recommended to set up a committee chaired by either a representative of Maurice Ile Durable or the Ministry of Agro Industry and Food Security to drive the implementation of the strategies identified in the forest policy.

CHAPTER ONE

INTRODUCTION

The forests in the Republic of Mauritius are small in area but perform vital functions. Forests play an important role in reducing soil erosion, carbon sequestration, and conservation of biodiversity resources, recreation and ecotourism. Currently, the Forestry Services (FS) and the National Park and Conservation Service (NPCS), two major government institutions under the aegis of the Ministry of Agro Industry and Food Security (MAIFS), are responsible for the management of State forest lands and mountain and river reserves in private lands. As a sector, forestry is subject to pressures from different directions. This performance audit report aims at whether government is doing enough to mitigate its impacts.

1.1 Definition of a Forest

In simple terms, a forest is a land area covered with trees. A forest includes: forest nurseries and seed orchards that constitute an integral part of the forest; forest roads, cleared tracts, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific scientific, historical, cultural or spiritual interest; windbreaks and shelterbelts of trees with an area of more than 0.5 ha and width of more than 20 metres; plantations primarily used for forestry purposes. It excludes land predominantly used for agricultural practices.

1.2 Forest cover in Mauritius

Currently, the total forest area is about 25 per cent of national land area that is estimated at 47,159 ha, of which 22,159 ha (47 per cent) are state-owned and the remaining 25,000 ha (53 per cent) are privately-owned. For the period 1990 to 2010 the total area of forest land decreased from 56,720 ha to 47,159 ha. The loss was minimal in state forest but there was concern over the quality of forest. The loss was more significant in private forest land. Statistics on private forest lands is only an estimate which has last been updated in 2004 by the FS following analysis of satellite maps from the Remote Sensing Unit. It decreased from the original estimate of 34,540 ha to 25,000 ha.

1.3 Importance of Forest in Mauritius

The forests in islands have great ecological, social and cultural significance. The environmental functions of forests in small islands like Mauritius far outweigh their direct economic functions. The forests of Mauritius perform vital functions, the most important of them being soil and water conservation. When wisely managed, they can contribute to environmental rehabilitation, creation of job opportunities, supply of wood and non-wood products, food security, ecotourism, recreation and national wellbeing. Forests also play an important role in carbon sequestration and in the conservation of biodiversity and wildlife. Mauritius is rich in endemic species. Consequently, conservation, protection, development of such species through sustainable management of forests and the environment are priority objectives of the overall national policy of Mauritius. In fact, the forests of the island are now managed more for these functions rather than for the production of timber. About half of all catchment areas in the uplands have already been set aside for protective functions. In these areas only the removal of damaged and diseased trees is permitted.

The forest sector provides direct and indirect employment to some 5,000 people in forest resource and watershed management activities, biodiversity conservation, tree planting to provide soil cover in environmentally fragile areas, wood production, primary and secondary processing of wood, wildlife capture and export, deer-ranching and eco-tourism. The contribution of the sector to the Gross National Product is estimated to be about one per cent.

Upland forests located in the major water catchment areas, are regulators of surface run-off, floods and ground water recharge. The native forests provide habitat for some very rare and endangered plants and birds as well as endemic reptiles and invertebrates. Coastal forests act as buffers against strong winds and cyclones, and offer natural backdrops to beaches frequented by tourists. The main tourist resorts are located in this belt. Mangroves, where they exist, serve as nurseries and breeding grounds for numerous fish and shellfish, including shrimps. Coastal forests and mangroves also help contain soil erosion and sedimentation of coastal waters.

There is a continually increasing demand on forests for wood and non-wood (honey, fruits, medicinal plants, etc.) products and services, population pressure on forest land and for recreation and other non-forestry purposes.

Rapid industrialisation during the past twenty years has resulted in higher standards of living and new aspirations of the people of Mauritius. However, a modern lifestyle also brings with it stress and pressure on the working people. This increases demand for leisure and recreation in natural surroundings by both local people and the 700,000 tourists who visit Mauritius annually.

Ecotourism is on the rise. More and more people are visiting the forests for leisure activities such as shooting, fishing, rambling, jogging, camping, picnicking, collecting wild fruits,

watching wildlife and, as a result, expecting better facilities and services from the forest sector. Annual revenue from ecotourism is estimated at US \$ 5 million.

1.4 Deforestation in Mauritius

Mauritius was once a very rich land of native forests, it has become now one of the most degraded native forest areas in the world. Currently, only about two per cent of the pristine native forest of Mauritius exists. Most of the loss of forest lands occurred during the Dutch, French and British settlement periods. This was mainly due to timber exploitation and conversion of forestlands for plantation of sugar cane. For the period post independence with the rising population and the rapid economic development the loss of forest lands further increased. Most of the forestland is now made up of planted forest and shrubs.

1.5 Impacts of Deforestation

Government commissioned a study on ‘Capacity Building for Sustainable Land Management’ with the help of the United Nations Development Programme (UNDP), Global Environment Facility (GEF) and the Food and Agricultural Organisation (FAO).

In May 2006 the report of the study identified deforestation as one of the three main causes of land degradation in Mauritius. The other two was overgrazing and unsustainable agricultural practices. The main bio-physical impacts of deforestation were as follows:

- Loss of habitat/biodiversity
- Loss of vegetative cover resulting in soil erosion
- Siltation of reservoirs and sedimentation of lagoons and coral reefs.

Concerns on the potential impact of deforestation have been raised publicly in the media on the followings:

- Decreased local rainfall and water availability during dry seasons
- Increased flooding during rainy periods
- The increasing level of green house gases and air quality.

1.6 Audit Motivation

A topic recurrently covered by the local media has been sustainable development and environmental issues. Repeated discussions have been held at national level on the question of land degradation and current water shortage in the country. It is being argued that land degradation in Mauritius is mainly due to deforestation, overgrazing, unsustainable agricultural practices and loss of wetlands. Impacts of land degradation are manifested in loss of fertile topsoil, decrease in pasture quality and productivity, increasing run-off and sedimentation of rivers, dams and lagoons.

According to the report on the State of the Environment of the Ministry of Environment and Sustainable Development (MOE&SD), significant erosion of top soil by rainfall following deforestation has occurred in most regions of Mauritius.

It is in this respect that the National Audit Office felt the need to undertake a performance audit to assess the extent to which government is taking adequate measures to mitigate the impacts of deforestation.

1.7 Objective and Scope of the Audit

1.7.1 Audit Objective

The objective of the audit is to determine whether government is taking adequate measures to mitigate the impacts of deforestation.

1.7.2 Audit Scope

Auditee

The MAIFS and its two departments namely the FS and NPCCS are the auditees.

Audit Object

The audit focused on activities, programmes, policies, resources allocated and regulatory framework to prevent deforestation and mitigate its impacts.

Time coverage

Data was collected for the period covering the past 21 years ending December 2011. This will illustrate adequately the trend in the deforestation and the actions taken by government to prevent deforestation.

Geographical coverage

The audit covered the mainland of Mauritius and the islets.

1.8 Assessment Criteria

The sources of the assessment criteria are given below. The key parameters contained therein were used to assess the measures taken by government to prevent deforestation and mitigate its impacts:

- National Forest Policy
- National Biodiversity Strategic Action Plan (NBSAP)
- Relevant legislations
- Targets and Indicators in Programme Based Budgeting (National Budget)
- FAO and UNDP guidelines
- Conventions related to forestry sector

1.9 Audit Methodology

The audit was conducted in accordance with International Organization of Supreme Audit Institutions standards. Those standards require that performance audit should be planned, conducted and reported on in a manner, which ensures that an audit of high quality is carried out in an economic, efficient and effective way and in a timely manner. The following methodologies were used for the audit to understand the audit area along with obtaining sufficient, relevant and reliable audit evidence that support the conclusions and recommendations.

As most of the activities and documents are at the Head office of the MAIFS, Headquarters of the FS and NPCS, the audit was focussed at these places. Site visits were carried in forest nurseries, private and state forest lands, and mountain and river reserves.

1.9.1 Documents reviewed

The team reviewed documents to understand the auditees, their activities and regulatory framework. The information in the documents were analysed to have a reliable picture of the performance of the ministry and its two departments related to forestry sector.

Documents listed below have been scrutinised in order to gather audit evidence:

- The FRA Act 1983(amended in 2003)
- Shooting & Fishing Lease Act 1966

- Pas Geometriques Act 1895
- National Forestry Policy of 2006
- Organisation Structure of both FS and NPCS
- Annual Reports of the FS and NPCS
- National Development Strategies
- International Conventions
- Consultant reports on Protected Area Network (PAN) , Environmental Sensitive Areas (ESA)

1.9.2 Interviews

Interviews were conducted during the audit. This method was used with the following aims:

- To confirm information obtained from documents review
- To compare different views and perspectives from a diverse range of individuals on the topic
- To better understand the topic, issues, process or programmes and activities
- Following up results from other data gathering techniques

Officers of different grades at the FS and the NPCS were interviewed to ascertain the role each one is playing as well as to obtain relevant information:

Also, officers of the MOE&SD, Mauritius Wildlife Foundation and Mauritius Sugar Industry Research Institute were interviewed to help the team to better understand the audit area.

1.10 Data Validation Process

The FS, NPCS and MAIFS were given an opportunity by the Audit Team to familiarise themselves with contents of Chapter Three, Four and Five. They confirmed the accuracy of the information presented in this report.

CHAPTER TWO

DESCRIPTION OF FOREST MANAGEMENT

This chapter describes the different roles and responsibilities of the key stakeholders involved in forest management. It also describes the organisation structure and activities of the two government entities, FS and NPCS responsible to implement forest policy. It includes a description of the measures taken by government to mitigate the impact of deforestation.

2.1 Key Stakeholders

There are many stakeholders involved in the management of forests. The key stakeholders, their roles and responsibilities are given in the Table 1.

Table 1: Key Stakeholders

Key Stakeholders	Key Roles & Responsibilities
Ministry of Agro Industry and Food Security	Implementation of National Forest policy
Forest Services	Management of all state forest land and mountain and river reserves in private lands
National Park and Conservation Services	Management of conservation activities in National Parks and Islets
Ministry of Finance and Economic Development	National level projects planning strategies and Forestry budget
Ministry of Housing and Lands	Land use planning issues, particularly in relation to allocation of state-owned forest lands for development projects
Ministry of Tourism	Management of ecotourism projects
Ministry of Environment and Sustainable Development	Responsible for Environmentally Sensitive Areas, environmental impact assessment, role of forests in rural development
Private Forest owners	Management of privately owned forests

Source: Forest Policy

2.2 Specific Roles and Responsibilities of Key Actors

The FS and NPCS operate under the aegis of the MAIFS.

2.2.1 Forestry Services

As regards to forestry resources, Government is now placing more emphasis on environmental function and non-consumptive uses of forests in three areas which are:

- soil and water conservation;
- conservation of biodiversity; and
- ecotourism and recreation.

Activities of the Forestry Services

The FS carry out the following activities to achieve the above objectives:

- Soil and water conservation
- Planting of native trees and other plants suitable for watershed protection around lakes and rivers in reserves
- Trees planted on steep slopes and coastal zones to reduce soils erosion
- Mitigation of the destruction of forests by recurrent cyclones, fire, insect pests and diseases

Conservation of biodiversity

- Abandoned sugar cane lands in ESA planted with multi-purpose tree species in combination with agricultural crops for agro-forestry, deer ranching and ecotourism
- Increased quality of native forests in identified priority locations with endemic and indigenous species
- Production, sale and use of known Invasive Alien Species (IAS) reduced

Ecotourism and recreation

- Sustainable management of state forest land leased for deer ranching
- Existing ecotourism sites on state lands well maintained
- Increased ecotourism and activities on state forest land
- Enhanced livelihoods of Mauritian communities through developing small scale forest based business.

Organisation Structure of the Forestry Services

The FS are organised as follows:

The administrative unit of management is the Forest Section under the control of a Forester assisted by one or several Forest Guards. 24 sections are grouped territorially into four Ranges, each administered by a Forest Ranger assisted by two deputy Forest Rangers. The activities of the Forest Range are to:

- Assist in the management of state forest lands, nature reserves, mountains, rivers & road reserves
- Patrol of state forest lands, nature reserves, mountains, rivers and road reserves within the section and to enforce legislation relating to forestry.
- Prosecute offenders in court on forestry matters
- Undertakes works pertaining to reforestation and afforestation
- Ensures the sustainable management of forest lands leased for Shooting & Fishing (Deer Ranching)
- Monitors silviculture¹ works-supervise weeding, cleaning & planting
- Visits sites and gives recommendations for clearance for approval of relevant permits by authorities concerned.
- Activities of the Bio-diversity Unit:
 - Management of nature reserves
 - Management & production of critically endangered plants

¹ It involves the restoring and conserving the forest land through different activities such as clearing, weeding, recruiting, stacking and pruning.

- Reintroduction of critically endangered & rare plants
- Weeding operation in rich Biodiversity areas
- Vegetation surveys & field works

Two Ranges constitute a Division which is administered by a Divisional Forest Assistant.

2.2.2 National Parks and Conservation Services

The NPCS was established on 9 May 1994 under Section 8 of the Wildlife and National Parks Act of 1993. Prior to that enactment, it was a unit within the FS.

Organisation of the NPCS

The NPCS is headed by a Director who has the role to manage the organization and advise the MAIFS on all matters related to the conservation of native terrestrial biodiversity. The Director is assisted by a Deputy Director. There are two management and six technical units. One Senior Research and Development Officer (SRDO) is responsible for monitoring and coordinating activities in these technical units. Each technical unit is headed by a Research and Development Officer and is assisted by Technical Officers and Technical Assistants. The units are as follows:

- Policy and Management Unit- responsible for the drafting of policies and legislative framework, preparation of budget.
- Park management unit- responsible for the management of Black River Gorges National Park (BRGNP) and other protected areas
- Flora unit- responsible for the protection and management of native flora
- Fauna unit- responsible for the protection and management of native fauna
- Islets management unit- responsible for the management islets declared as parks or nature reserves.
- Wetland unit- responsible for the management and wise use of wetlands legally proclaimed.
- Public Awareness and Education Unit- responsible for the sensitization of the public on native biodiversity and conservation.

- Convention on International Trade in Endangered Species Unit- responsible for the issue of permits, certificates for trade of endangered species.

Main activity of NPCS

The NPCS is one of the lead agencies for the implementation of the NBSAP. The NPCS is responsible for the BRGNP, Bras D'Eau National Park, Islet National Parks and the Ramsar site at Terre Rouge. At present the NPCS has an equipped native plant propagation centre, a captive breeding centre, four field research stations, a shade house, information centres at Pétrin and Black River, a fernery and a green house at Curepipe. The Service runs various conservation programmes such as management of offshore islets, management of Conservation Management Areas, control of pests, management of wetlands and awareness raising.

2.3 Key stakeholder- Owners of Private Forest

From 1990 to 2003, private forest cover was assumed to remain unchanged at 34,540 ha. In 2004, following a remote sensing exercise by the FS the estimate was revised to 25,000 ha. The private forest consists mainly of degraded forests which are heavily invaded with exotic vegetation.² Owing to severe pressure on land, these areas are being gradually clearfelled to other land uses. The actual trend in privately owned forest lands (as stated in the Forest Policy) is as follows:

- Loss of forest due to land conversion for residential and development projects
- Degradation due to intensive deer ranching activities and invasion by alien species
- Increase in venison production
- Development of ecotourism
- Unsustainable forest management
- Loss of biodiversity

There is no significant investment in the creation of forest plantation for the following reasons:

- Long term investment with a long term payback period
- High risk to investment from natural calamities, that is, drought, cyclone, pests , fire.

² Forest Policy

- High cost of labour
- Better and quicker returns from other land uses

2.4 Other Key Stakeholders

2.4.1 Ministry of Environment and Sustainable Development

The MOE&SD is the National Focal Point for the United Nations Convention on Biological Diversity (CBD), although in practice most CBD-related activities are carried out by the NPCS. The Ministry of Environment National Development Unit is directly involved with environmental protection through the identification of ESA, administration of Environmental Impact Assessments (EIA) and pollution abatement activities. The Ministry has sections specializing in information and education, pollution control, integrated coastal zone management, policy and planning, environmental law and environmental assessment.

2.4.2 Mauritian Wildlife Foundation (MWF)

The MWF, a local NGO, was established in 1984 to help save critically threatened birds and plants from extinction. The MWF has played a major role in Mauritius in monitoring and research programs, in implementing species conservation management and restoration projects, and in strengthening conservation partnerships with the private sector. The MWF was instrumental in driving the establishment of Conservation Management Areas (CMA) from their inception in the 1980's. MWF, and its partner organisations, have collaborative working partnerships with the Forestry Service and the NPCS, and maintain a Memorandum of Agreement with the Government to support this collaboration. MWF is currently actively involved in islet restoration, ecotourism on Ile aux Aigrettes, species recovery management for rare birds, forest surveys, rare plant propagation, and public education and awareness.

2.5 Measures taken by Government to mitigate the Impacts of Deforestation

A range of activities relating to the management and expansion of protected areas, and the mitigation of threats posed by IAS within these protected areas, need to be undertaken that would have positive impacts on native ecosystems and their flora and fauna. The lead agencies are the NPCS and FS which are involved in these activities under the NBSAP.

2.5.1 Expansion of the Conservation Estate

Following a government commitment to conserve privately owned lands of high biodiversity value that are currently excluded from the Protected Area system, a grant of US \$ 60,000 has been allocated under the Environment Investment Programme II for the identification and

mapping of different categories of ESA's on both state and privately owned land that would require some form of protection. The MOE&SD had undertaken the study ESAs in Mauritius and Rodrigues. A strategic management plan for these ESA's has been drafted to guide and regulate the development, use and management of each category and type of ESA. The implementation of the strategy will, if practicable and affordable, be phased in over five years and will be implemented by at least six state agencies and coordinated by the MOE&SD, in cooperation with private lessees and landowners. In line with the commitment to conserve privately owned lands of high biodiversity, the government is actively encouraging private land owners as well as small cane growers to convert marginal sugar cane lands to native forests, particularly where these areas overlap with, or are adjacent to, the designated ESA's.

2.5.2 Control of IAS on State-Owned Land on the Mainland

Invasive species control (plants and animals), forest restoration and endemic bird re-introduction activities within the state protected areas on the mainland are being carried out. The current CMA is over a total area of 245 ha. New CMA will be created.

2.5.3 Nature-based Tourism and Recreation

The NPCS is maintaining nature-based tourism infrastructure and services (e.g. trails, picnic sites, view sites at BRGNP) in the national parks and bird sanctuaries. A project is under way to capture 300,000 tourists visit to the BRGNP. This may yield revenue of Rs 30 million. The FS will continue to develop a network of trails (and associated infrastructure) within forest and nature reserves. A number of guided visits on quad bikes or jeeps, guided walks, canoeing trips down rivers and abseiling down waterfalls will be provided by the private sector in the protected areas. Several private landowners are developing tourism products and services on land designated as 'private nature reserves' or 'nature parks'. The Ministry of Tourism will continue to:

- upgrade the main road through the BRGNP;
- improve the road network in the forest reserves and nature reserves; and
- install directional and informational signage.

2.5.4 Financing of State Protected Areas

The Conservation Fund will be used to finance the capital and recurrent operational and maintenance costs of the national parks and bird sanctuaries (US \$ 700,000). The National Environment Fund will finance, on a special projects basis, specific biodiversity conservation activities within the PAN.

2.5.5 Propagation of Native Plants for Restoration Programmes in Protected Areas

Nine nurseries (Five from MAIFS and four from MWF) will continue to propagate critically endangered species for species recovery programmes and mass-produce native plants for restoration projects. The field gene bank at Pigeon Wood (a collaborative project between the NPCS and the MWF) will be maintained to conserve the genetic diversity of the rarest upland plant species.

2.5.6 Restoration of Degraded Land

NPCS will continue to implement pilot project to demonstrate the feasibility of using native plants to reduce land degradation and erosion in an area cleared in the past to provide pasture for deer within the BRGNP. Storm drains will also be constructed to reduce problems associated with surface runoff. The FS will maintain the pilot replanting program in a degraded area adjacent to the Perrier Nature Reserve.

2.5.7 UNDP-GEF Expanding Coverage and Strengthening Management of PAN project

The goal of this project is to conserve the globally significant native forest biodiversity of Mauritius. The objective is to expand and ensure effective management of the PAN to safeguard threatened biodiversity. The project is expected to help the country to achieve conservation and restoration on an area of 18,650 ha by 2016 (NBSAP target) – 10 per cent of the land coverage of Mauritius. The current area protected is only 8,027 ha and composed entirely of state-owned land.

The long-term solution proposed by this project is a reconfigured network of private and state protected areas that is designed to safeguard a representative sample of Mauritius's terrestrial biodiversity under an effective and adaptive management regime. This ideal solution requires that protected areas agencies have adequate systemic, institutional and operational capacity to:

- identify, prioritize and target gaps in representation that can be filled through protected area expansion, and complementary conservation, efforts on private and state-owned land;
- develop regulatory drivers and an incentives framework to support protected area expansion, and complementary conservation, efforts on private and state-owned land;
- establish and administer a conservation stewardship program to implement protected area expansion initiatives on privately owned or managed land;
- effectively plan, resource and manage an expanded PAN comprising both private and state protected areas;

- mitigate the threats to, and pressures on, the unique biodiversity contained within the expanded PAN;
- ensure better integration of the PAN into the country's socio-economic development priorities, in particular development of the tourism industry, to ensure its long-term financial sustainability;
- respond effectively to the needs of, and meaningfully involve, different stakeholder groups in the ongoing planning and operational management of the expanded PAN.

The total cost of the project is estimated at US \$ 15,764,400 (some Rs 450 million). The GEF is financing US \$ 4,000,000 and the remaining will be co-financed by government, private owners and one NGO.

CHAPTER THREE

FINDINGS

This chapter presents the findings which relate to the following aspects:

- Forest coverage and policy
- Monitoring and enforcement mechanism
- Measures taken to mitigate the impacts of deforestation

3.1 Forest Coverage

Sustainable Forest Management is the management of forests according to the principles of sustainable development. Sustainable forest management uses very broad social, economic and environmental goals. It is generally accepted by FAO that forested land should ideally be one third of the total land area to properly achieve the three goals from the social, economical and environmental perspectives. The world average of forest area to total land area is 31 per cent. Many countries for example India, Bhutan, Gambia have set a minimum target for their forest cover. In Mauritius the forest coverage has gradually decreased from 30 per cent in late eighties to currently less than 25 per cent of the total land area. It is likely to decrease further in future due to pressure for converting forested land to other purposes. However, government has not yet determined a minimum acceptable target of forest coverage for the country.

3.1.1 Implementation of Forest Policy

Forests and their products, and their services are key for the well being of society. Due to the multiplicity of interests and issues surrounding forests and their use the development of a national forest policy is important to guide future directions on the way forests are managed (FAO's guidelines).

A forests policy, which dealt with all the aspects of forests, was developed for Mauritius in 1963. It was subsequently revisited in 2006 in the light of new developments in the forest sector. The new policy identified issues, goals, objectives and recommended different strategies to address the issues. The FS developed a National Forest Action Programme (NFAP) to translate the different strategies into concrete actions with objectives, targets and indicators. The document was submitted to FAO to seek financial support for the implementation of the different strategies. However, the NFAP did not receive the support of

FAO as it contained various shortcomings and was not approved by the MAIFS. The draft NFAP has not been subsequently amended. The following issues were observed:

- The roles and responsibilities of the different stakeholders in the implementation of the different strategies in the policy could not be identified.
- Indicators and targets were not developed.
- There was no mechanism to monitor the implementation of the policy.
- The implementation of the strategies was not time framed.
- The policy describes the directions and the strategies for the forestry sector in the coming decade. As at end of 2011, FS is midway in the implementation of the policy no mid-term review was carried out to identified constraints and challenges.

FAO funded the development of the Forest Policy to the tune of US \$ 80,000.

As the FS did not manage to secure funds from other sources, the implementation of the different strategies in the policy was directly linked to the availability of fund in its budget. The projects are submitted for approval and funding from the MAIFS and then implemented. An analysis of the different budgets for the last five years showed that FS were mainly focussed on the following activities:

- Creation of fire breaks
- Sensitisation campaigns
- Propagation of endangered endemic flora
- Survey of new areas for biodiversity

These activities are only part of the activities earmarked in the Forest Policy.

3.2 Monitoring and Enforcement Mechanism

3.2.1 Limitations of Current Legislation

Adequate regulatory framework is essential for an effective management of forest resources. Monitoring and enforcement activities by the Forestry Service are done as part of their mandate. The Forests and Reserves Act (FRA) is the main act that provides a framework for the management of forests in Mauritius, and covers 60 per cent of the total forested land. It consists of all the state forest land, and mountain and river reserves on private lands. The other 40 per cent which are private forest lands have remained unregulated and have been outside the monitoring and enforcement mechanism of FS. Government has recognised the

importance of trees in our fragile ecosystem, and decided that trees including indigenous/endemic trees should henceforth be protected.

In May 2011, Government has proposed to amend the FRA so that the FS could control the felling of trees at national level in all privately owned lands and privately owned forest lands. After more than one year the amendments have not yet been finalised as a consensus among the different stakeholders could not be reached.

3.2.2 Deer Ranching Activities

Deer ranching is becoming a popular activity in both private and state forest lands. About 10,000 ha state forest land, that is, around 25 per cent of the total forest area, including environmentally sensitive water catchment areas, are leased for deer ranching and are managed under the Shooting and Fishing Act of 1966. This act stipulates that the grazing area should not exceed five per cent of the land leased, and that the stocking density should not be more than 2.5 deer head per hectare. The aim of these safeguards is to prevent the harmful effect of this activity to trees and young seedlings. The following has been observed:

- With the increase in demand of venison (from 450 tonnes in 2006 to 650 tonnes in 2010) by the population, this activity is gradually shifting from a game to a commercial activity. It is also becoming more extensive in private forest land as it is a lucrative business. Currently there is no legal framework that regulates deer ranching as a commercial activity in both private and state forest land.
- During the last decade, the FS have identified several cases of grazing exceeding five per cent of the land leased.
- FS did not take any action against the lessees instead it had to reforest the excess grazing area at its own cost.
- Further, FS could not monitor the deer stock density of 2.5 head per hectare as the forest officers are not trained in monitoring and enforcement same.
- Deer ranching is degrading the forest as deers cause considerable damage to both native and planted forest by destroying trees, seedlings and require clearing of forest land for pastures.

3.2.3 Forest Land Information System

With the help of UNDP the FS developed a forest land information system to monitor forest and forest pastures land including a system for monitoring forest encroachment, clearing of forest for deer pasture, the clearing of forest on mountain reserves and encroachment on wet land. The development of the system has costed US \$ 200,000 and was partly financed by

UNDP. It is a specialized geographical information system designed to support improved decision making about forests and use as a tool for monitoring and evaluation of the forests of Mauritius. The system is currently not being used due to the following main reasons:

- the data used in the system has not been agreed by relevant stakeholders
- it is costly to obtain updated data
- it has not yet been handed over to the FS as there is no dedicated unit to operate the system need to collect more data

3.3 Restoration and Conservation

3.3.1 Reforestation and Afforestation

Reforestation and Afforestation is an effective means to combating deforestation. During the period 2002 to 2010 only Rs 13 million was spent on these activities. On average Rs 1.5 million, which is less than one per cent of the budget allocated to the FS, is dedicated to this activity. With the increase in reforestation and afforestation costs each year less and less hectares are afforested. The FS planted only 55 ha of forest land in 2010 compared to 133 ha in the 2001.

High cost of increasing forest covers

There has been a decision by the MAIFS to ban commercial logging in catchment areas and to increase tree cover in these areas. Some 500 hectares of State Land released from abandoned sugar cane plantations and tea cultivations in the catchment areas would be used for timber production. These timbers would be sold to some 62 licensed timber merchants. An exercise by National Audit Office to match the cost of planting of one hectare of timber with the revenue it would generate in 20 to 25 years at time of harvests. The cost of establishing the plantation per hectare in the first year was some Rs 300,000, ignoring the annual maintenance cost during the 20 to 25 year period. The revenue that it would generate in 20 to 25 years through sale of logs, poles and firewood was estimated at some Rs 130,000. Ignoring net present value of the cash inflow, any potential increase in selling price and opportunity cost of alternative use of this land, the net outflow is Rs 170,000 per hectare. For the 500 ha, it represents a net outflow of Rs 85 million. This represents a very expensive way of increasing forest cover.

National Tree Plantation Campaign (NTPC)

NTPC was launched in 1985. Under this campaign, plants were distributed free of charge to government institutions, parastatal bodies, schools and socio-cultural, religious and youth organisations, The objective of the campaign was as follows:

- Increase the tree cover over the island
- Encourage tree planting throughout Mauritius
- Propagation and conservation of native plants
- Raising awareness among members of the public
- Increase source of carbon sequestration

The FS is the implementing agency of the NTPC, responsible for plants production, issue, monitoring and the technical guidance. The FS had a quota of 700,000 plants while the Horticultural Division had a quota of 100,000. As of date some Rs 10 million has been spent on the campaign. The MOE&SD has on its own started a campaign to distribute ornamental plants freely under the Mauritius Ile Durable project. The FS carries out ad hoc sample surveys on the beneficiaries premises to ensure that the trees have been planted. The Agricultural Research and Extension Unit (AREU) of the MAIFS has been entrusted the task to carry out a similar exercise at national level. As at date no survey has been carried out. At the MAIFS level, no assessment has been carried to ensure the effectiveness of the campaign.

River and Mountain Reserves Planting Campaign.

A River and Mountain Reserves Planting Campaign was launched in 1998 to encourage tree planting and public participation. Under this campaign, riparian owners (owners of river reserves) would be provided 150,000 seedlings free. As at date some 40,000 seedlings has been issued to eleven owners, who own large sugar estates. Currently, there is no progress on this campaign. A report produced by the FS in 1994 on river reserves revealed that much clearing and illegal construction has been effected on the privately owned river reserves. Though the law prevents any infrastructural development on the river reserves, it cannot compel the owners to plant trees. This represents missed opportunity of making best use of limited land resources in Mauritius. The report recommended that fruit trees may be planted on the river reserves. Trees available under the campaign were non-fruit trees. Generally, small river reserve owners were not interested in planting trees which did provide any immediate economic benefit to them.

National Campaign on Afforestation.

The MAIFS launched a National Campaign on afforestation in February 2011. The campaign neither had any specific target nor was there any fund earmarked. The FS proposed afforestation of eight ha at five different locations. As at date only four ha has so far been afforested, mainly due to lack of funding. Currently the Forest Policy does not state what area of Mauritius should be under forest cover. In the absence of a Forest Action Plan, there is no indication what area would be afforested and the funding required in the medium to long term. The need to increase forest cover is of national interest because the impact of soil erosion, scarcity of water, greenhouse gas affects everybody be it private or public. It is only government who is using the limited state lands and meeting the cost of the campaign. Private forest lands are continuously being cleared for projects without any commitment to compensate for the loss of green cover

3.3.2 *Silvicultural Operations*

These operations aim at maintaining, restoring and conserving the forest land through different activities such as clearing, weeding, recruiting, stacking and pruning. The areas covered by these operations significantly decreased from 2000 ha in the year 2001 to 750 ha in year 2010. This was mainly due to resource constraints both financial and human.

In situ conservation was effected at various places in the different nature reserves. These reserves contain native plant populations which are threatened to extinction by IAS. In the year 2010, IAS were uprooted and removed on a total extent of about eight ha. This represented only four per cent of the total nature reserves.

3.3.3 *Conservation Management Areas*

Currently there are 1,500 ha of good native forest in state-owned forest land. It includes 800 ha which are protected by law. The total area rich in biodiversity actively managed by FS slowly increased from 189 ha in 2006 to 247 ha in 2011. It represented only 17 per cent of the total native forest that was actively managed. It is still on the low side when compared to the size of the protected area

The spread of invasive exotic plant species on the mainland of Mauritius is thus accelerating unabated in both the state protected areas and on the public and state land. At the current rate of spread, and lack of management control, it is most likely that the remaining patches of native vegetation on the Mauritius mainland will be overrun by invasive weeds within one to two decades. The costs associated with the existing invasive alien plant control program in CMAs are currently very high. It is approximately in the range of Rs 300, 000 to Rs 400, 000 per ha per year, limiting the ability of protected area institutions to extend the clearing program.

3.3.4 Education and Awareness

One of the aims of the forest policy is to carry out education and awareness programmes at all levels on the need to conserve the forest and its biodiversity.

The FS is doing the following to create awareness and to education the population:

- Several Nature Walks have been created with the objective to build awareness of Mauritians as well as tourists on the importance of forest and tree planting campaign all around the country
- Sensitisation programmes on biodiversity conservation
- Exhibitions – FS also takes part in these exhibitions where the general public are further sensitise on the importance of forest and biodiversity.

However, most talks were limited to primary school. Very few talks were conducted among students from secondary and tertiary levels. This was mainly due to lack of training in communication skills of the forest officers. Also, decision makers and private forest owners were not targeted. There was limited use of other form of media.

CHAPTER FOUR

CONCLUSIONS

The forest in Mauritius is small and is subject to pressures for alternative purposes. We are already experiencing the impacts of deforestation in various ways. Government is aware that if nothing is done to reduce the loss of forest it will not take long to reach the critical point. As a result government is putting much effort to address the problem. Various measures are being taken to mitigate the impacts of deforestation. Nevertheless, the followings were noted:

Legal Framework

Although the major loss of forest is in private land the current legal framework is not enough to cater for the loss of private forest land. Deer ranching are harmful to our forest. It is shifting from a game to a commercial activity. It is also becoming extensive in private forest land as it is becoming a lucrative business. Currently there is no legal framework that regulates deer ranching as a commercial activity in both private and state forest land.

Monitoring and Enforcement

The current monitoring and enforcement mechanism are not enough in state forest land. Monitoring and enforcement were not effective in state forest land especially in respect of deer ranching and ecotourism activities. Except for mountains and reserves it was practically inexistent in private forest land.

Restoration and Conservation

The restoration and conservation activities are important to preserve the forest and eventually reduce deforestation. It is costly to carry out restoration and conservation activities in state forest land. These activities so far undertaken by government were implemented at a very slow pace for lack of fund. Limited conservation is being carried out on state land while that in private sector it is insignificant.

Implementation of the Forest Policy

Government has taken good initiative in developing a forest policy which has identified the issues pertaining to deforestation, develop strategies and activities to combat deforestation and mitigate its impacts. Despite the good intention of government some strategies and activities could not be translated into concrete actions for lack of fund while others were implemented at a very slow pace. At this rate deforestation and its impacts are likely to continue in future.

CHAPTER FIVE

RECOMMENDATIONS

In the light of the audit findings and conclusions, the following recommendations are formulated to assist in mitigating the impacts of deforestation.

5.1 National Forest

It is recommended that as per Section 4 of the FRA, FS through its parent ministry, declare all catchment areas surrounding any reservoir and any other forest in critical areas as National Forest. This includes private forest land in such critical areas considered as national importance.

5.2 Amending the FRA

It is recommended that Government should amend the act to widen its scope in controlling felling of trees in private forest lands. It should be accompanied by the strengthening of the monitoring and enforcement mechanism at FS. This will reduce the indiscriminate destruction and conversion of private forest lands to other uses.

5.3 Regulating Deer Ranching and Other Activities

The area covering deer ranching is already too high and the impact of deer ranching in deforestation is quite damaging. Government should consider regulating deer ranching and ecotourism activities on both private and public forest land. This should be accompanied by proper monitoring and enforcement mechanism to prevent further deforestation and its impacts.

5.4 Financing of measures to mitigate deforestation through MID

One of the major constraints identified is the lack of funding in the implementation of the different strategies in the forest policy. The objective of preventing deforestation is in line with the concept of MID of preserving natural resources and achieving environmental sustainability. To align the objectives of the Forest policy with the objectives of MID it is recommended to set up a committee chaired by either a representative of MID or the MAIFS to drive the implementation of the strategies identified in the forest policy. This will be beneficial in the following ways :

- Help to better coordinate efforts among various governmental agencies in the implementation of the strategies in the forest policy
- Help to identify gaps and priorities and determining ways for their implementation
- Request financing of projects from MID fund to make the strategies more sustainable
- Monitoring the implementation of strategies with scheduled plans/ programmes